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PUBLIC AUTHORITY LIABILITY AND THE COST OF DISASTERS

1. Introduction

Recently, a lot of attention has been paid to the question how various instruments which are used to compensate victims of a disaster affect *ex ante* disaster risk reduction. The traditional way of dealing with *ex post* recovery was to use taxpayers' money in order to provide *ad hoc* compensation to disaster victims. *Ad hoc* refers to the fact that in some cases, often based on political needs, compensation is provided and in others it is not. In yet other systems compensation is provided via a structural compensation fund. These funds also rely on the contributions of tax payers, but the conditions under which compensation is provided are more or less specified in a structural manner in legislation. Still, the question whether the disaster fund will compensate again often depends upon political arguments. This *ex post* compensation to victims has been seriously criticized in the law and economics literature.¹ The general critique is that *ex post* recovery creates a moral hazard problem: since victims will expect the government *ex post* to compensate it will dilute *ex ante* incentives to seek prevention. There is, however, another potentially perverse effect that may play a role in the case of compensation for victims of disasters. Public choice literature indicates that politicians can gain substantial rents from *ex post* compensation as a result of which there will be a tendency to overcompensate *ex post* and to underinvest *ex ante*. The problem is that investments in *ex ante* prevention may not pay off during the term of office of the politician and therefore not provide sufficient political rewards.² But from the victim's perspective the problem is that this guarantee on politically motivated *ex post* compensation is only present in the case that the loss will actually be qualified as the result of a disaster. Consequently, a second cause of perverse incentives among victims may emerge: victims have (at least a partial) interest in the damage being relatively large since that will increase the likelihood of *ex post* government compensation. That may hence be an additional argument why victims may lack incentives for *ex ante* investments in prevention or for investing in damage mitigation after the disaster has occurred. In case of relatively small damages the political interest to intervene will be lower, thus creating an incentive for victims to contribute to larger damages in order to be able to count on government compensation *ex post*.

¹ See for example Epstein (1996) and Kaplow (1991).

² Depoorter (2006).

The question we are interested in is how the prospect of public authority liability could affect the incentives of victims. If there is indeed a problem that victims may have perverse incentives in the sense that they would prefer relatively large damages, one could argue that this tendency could be countered by using public authority liability. The argument would be that many natural disasters are caused through the negligence of public authorities as a result of which the victim could try to hold the public authority liable to compensate for his losses. In contrast to *ex post* recovery, compensation in case of public authority liability is not limited to situations of catastrophic losses. At first blush one could therefore hold that making more use of public authority liability could be a useful tool to remedy the potentially perverse incentives of victims in case of *ex post* recovery. Moreover, since public authority liability would apply in a normal tort context, if victims would have taken insufficient preventive measures *ex ante* or would not have sufficiently mitigated the damage *ex post*, it could potentially lead to comparative negligence. In case of comparative negligence the victim's right of compensation would be reduced according to his contribution to the loss.

In this article however, we will show that there is a danger that under particular circumstances these perverse incentives of victims may not be reduced by introducing public authority liability. We look at a situation of bilateral care. This is generally qualified in the literature as a situation where the incidence of harm and/or its extent can be limited by investments of both the injurer (here the government) and the victim (here the citizen).³ In an ideal setting, a rule of comparative negligence would incentivize the government to spend an optimal amount of care. The citizen, being the residual bearer of the loss, would consequently also take optimal care. However, public authority liability may backfire and lead to more losses than without such liability. We focus on the circumstances under which perverse incentives of citizens may increase under a system with liability, increasing the costs of disasters. We focus *inter alia* on (1) the fact that public authorities may be much more inclined to intervene *ex post* when damages exceed a certain threshold. With respect to this issue, we provide empirical data concerning several countries, which largely rely on government provided compensation; (2) the difficulties that may exist to incentivize public authorities through liability rules; (3) specific characteristics of comparative negligence that may make public authorities liable for the lion share of the damages; (4) the problem of negative expected value suits for relatively small damages (and the fact that existing instruments to foster small but strong claims are often inadequate).

A few issues should be clarified. First, we focus on the potentially perverse effect of recovery on *ex ante* incentives of victims. Recovery is the *ex post* intervention needed to return the social

³ Shavell (1987, p. 11).

welfare trajectory to where it would have been had the disaster never occurred.⁴ It has been pointed out that similar perverse effects do not occur in case of relief. Relief concerns the provision of temporary shelter, transitional housing and other rescue efforts.⁵ For that reason we disregard relief in this article. Second, we largely focus on natural hazards and therefore not on so-called man-made or technological hazards.⁶ Note, however, that it is claimed that many natural disasters are caused by negligent decisions of governments (for example providing permits to build in flood-prone areas). As a result there is a blurring boundary between natural and man-made disasters, which precisely gives rise to public authority liability, the central focus of our article. The third preliminary remark concerns the fact that we concentrate on *ex post* government compensation (*ad hoc* or via funds) and public authority liability as compensation tools and analyze how those *ex post* mechanisms affect *ex ante* incentives of victims for prevention. We do not analyze yet another *ex post* compensation instrument, more particularly disaster insurance, which is considered to have more beneficial effects on providing adequate incentives for prevention to victims.⁷ Including insurance would needlessly complicate the analysis. Moreover, some of the problems we address (of perverse incentives) would no longer exist precisely because this would be prevented through the control of moral hazard by insurers.⁸

We proceed as follows. First, we offer a brief literature overview and indicate the importance of the several instruments that we are discussing in actual practice in order to provide the academic and policy setting (section 2). We develop the model in section 3. Section 4 unpacks the several elements of the model and section 5 concludes.

2. Academic and policy context

We will briefly sketch the various developments in the literature concerning the interdependencies between *ex post* compensation of disaster victims and *ex ante* incentives for disaster risk reduction. We will also provide some policy context which will enable the reader to better understand the issues at stake in this article.

Countries use quite a variety of different models to compensate victims of catastrophes.⁹ Some countries (like Germany, Italy and the Netherlands) have no specific regime in place.¹⁰ No specific

⁴ Leonard and Howitt (2010).

⁵ Suggerman (2007, p. 32).

⁶ On this distinction, see Bruggeman (2010, p. 8).

⁷ See Kunreuther (1968) and Priest (1996).

⁸ Strongly advocated by Kunreuther (2006).

⁹ Faure and Hartlief (2006).

regulatory measures have been implemented and governments may provide compensation for victims on an *ad hoc* basis. In other jurisdictions a compensation fund for victims has been created which provides partial (but unlike tort law, typically not full) compensation. Such a disaster fund exists *inter alia* in Belgium and Austria. In a third type of compensation model, regulation mandates that first party home insurance coverage should be extended to include natural disasters. This approach is used in France, Belgium and Taiwan and is also being discussed in Germany and Italy.¹¹ A fourth model is one in which public-private partnerships are developed whereby the state intervenes to facilitate private insurance. This model is for example applied in the US with the California Earthquake Authority (CEA) and with the National Flood Insurance Plan (NFIP).¹²

The focus of our article is on the model whereby the government provides *ex post* compensation either *ad hoc* or via a structural compensation fund. The literature has been very critical of this *ex post* compensation, arguing that it will provide perverse incentives to potential victims to take effective preventive measures. *Ex post* government compensation was qualified by Epstein as ‘catastrophic response to catastrophic risk’.¹³ *Ex post* compensation may also create the problem of diluting incentives to purchase *ex ante* insurance since victims can simply free-ride on the state. This problem has been referred to as the ‘charity hazard’.¹⁴ *Ex post* compensation may further lead to negative redistributive effects since some victims (who probably purchased houses at lower prices in flood-prone areas) may free-ride on the general taxpayers who finance the *ex post* relief.¹⁵ Note however that it was recently pointed out that this criticism on *ex post* intervention by the government only applies to *ex post* recovery (compensation to victims) and not to immediate relief during the disaster as that will not have the same negative effects on incentives for disaster risk reduction.¹⁶

Depoorter also indicated that politicians may receive a too little reward from *ex ante* disaster management policies as a result of which these policies may be undersupplied. The political reward for *ex post* compensation may to the contrary be very strong as a result of which *ex post* compensation is likely to be oversupplied.¹⁷

¹⁰ As we will explain below the Netherlands does have a specific act dealing with compensation for victims of disasters, but because it is applied only rarely in practice it does not play a major role.

¹¹ Faure (2007, p. 340).

¹² See further Bruggeman, Faure and Heldt (2012).

¹³ Epstein (1996).

¹⁴ Coate (1995) and Raschky and Weck-Hannemann (2007).

¹⁵ Faure (2013, p. 257).

¹⁶ Dari-Mattiacci and Faure (2015).

¹⁷ Depoorter (2006).

There is overwhelming evidence of ad hoc compensation when damage is relatively large. For example in Germany after the ‘flood of the century’ of the river Elbe in 2002, *ad hoc* compensation was provided through the so called *Flutopferhilfesolidaritätsgesetz* which provided a total amount of compensation of €8.1 billion.¹⁸ In Italy the amounts paid by the government as *ad hoc* compensation are on average €3.5-4 billion per year as a consequence of which a relevant share of the states’ yearly budget is devoted to restoring damage as a result of catastrophes.¹⁹

There is also evidence that disaster compensation is often politically motivated. For example, Gerrett and Sobel showed this for the disaster expenditures by the United States Federal Emergency Management Agency: states that are politically important to the president have a higher rate of disaster declaration by the president and disaster expenditures are higher in states which have congressional representation on FEMA oversight committees.²⁰ Hence they argue that nearly half of all disaster relief is motivated politically rather than by need.

There is no data on the efforts of individual victims as far as disaster mitigation is concerned. However, there is some evidence that politicians do indeed systematically underinvest in disaster mitigation. For example, substantial amounts were paid in ex post recovery after hurricane Katrina. Total costs for Katrina were (as of February 2006) estimated to be USD 96 Billion – 300,000 homes were destroyed or rendered uninhabitable and 1,330 people died. Comparatively, Katrina was far more costly than the total estimated damage of the 9/11 terrorist attacks, reported to be approximately USD 18 billion.²¹ However, there is equally overwhelming evidence that ex ante efforts in disaster risk mitigation were largely lacking. Indeed, many reports issued after Katrina point to serious underinvestment with respect to preparedness, particularly by public authorities (both FEMA and state authorities; reports on desirable precautionary efforts by individuals that were not taken are not available). For example, the Bipartisan committee report *A Failure of Initiative* reports that FEMA sustained losses of USD 80 million and USD 90 million in fiscal years 2003 and 2004 and that “these budget reductions were preventing FEMA officials from maintaining adequate levels of trained and ready staff.”²² The Department of Homeland Security presented similar data,

¹⁸ Magnus (2006, p. 133).

¹⁹ Monti and Chiaves (2006, pp. 169-171).

²⁰ Gerrett and Sobel (2003).

²¹ Townsend (2006, p. 7).

²² H.R. Rep. No. 109-377, at 7 (2006) [hereinafter *A Failure of Initiative*], available at http://katrina.house.gov/full_katrina_report.htm (last visited Dec. 25, 2015), at 156.

reporting, inter alia, that between 1995 and 2003 FEMA's budget decreased to such an extent that the organization was "unable to conduct a large scale catastrophic event exercise."²³

When losses are not considered as "catastrophic", there will be no *ex post* government compensation and victims will hence need to look for other solutions to seek redress. In some cases they may still look to the government. It is theoretically possible to imagine situations where public authorities would be at fault in case of a natural disaster. In fact, some scholars have held that there are no natural disasters, but only natural events that turn into disasters as a result of human intervention.²⁴ Indeed, there are many ways, particularly through the design of critical infrastructure, to *ex ante* reduce the probability of damage or mitigate the seriousness of the consequences.²⁵ Precautionary measures to reduce the likelihood of disasters can be taken by individuals but, especially where large-scale measures are concerned, by governments as well. Many disasters can be prevented and a lack of precautionary measures is often the real reason why natural events have catastrophic consequences.²⁶ A failure to prevent a disaster or to take adequate measures to mitigate the damage can hence in some cases be attributed to a government. It could for example be held that the government failed to give an adequate warning (e.g. in case of a flooding), or it could be questioned why governments provide building permits allowing the construction of houses in flood-prone areas or on the slopes of active volcanoes.

Critical questions concerning the role of public authorities are often asked after a natural disaster causes substantial damage. For example, in the case of Hurricane Katrina, Shughart showed that no effective precautionary measures had been taken before Katrina was announced because of bureaucratic myopia, inertia, and corruption.²⁷ As a consequence, the question of governmental responsibility was raised in the wake of Katrina.²⁸ However, most of those lawsuits were not successful.²⁹ Even when the probability of a finding of negligence of a public authority is low, politicians may have a strong incentive to compensate victims of disasters, especially for cases that get ample media coverage. In the case of flooding damage in the Dutch village of Wilnis for example,

²³ Office of Inspector Gen., Office of Inspections & Special Rev., Dep't of Homeland Security, OIG-06-32, A Performance Review of FEMA's Disaster Management Activities in Response to Hurricane Katrina 13–17 (2006) [hereinafter A Performance Review], at 129.

²⁴ O'Keefe, Westgate and Wisner (1976, p. 566); Zeckhauser (1996, p. 134).

²⁵ Leonard and Howitt (2010, p. 18).

²⁶ O'Keefe, Westgate and Wisner (1976, p. 566).

²⁷ Shughart (2006).

²⁸ See Walters and Kettl (2006). See generally on the failures of planning and response in relation to Katrina: Bier (2006).

²⁹ See Schleifstein (2013), http://www.nola.com/environment/index.ssf/2013/12/federal_judge_dismisses_most_o.html; see also Levitt and Whitaker (2009, p. 207); <http://www.usatoday.com/story/news/nation/2013/12/28/judge-ends-katrina-flooding-lawsuits-against-feds/4233217/>.

public authority liability was denied (see the next paragraph), but the government still intervened through solidarity payments (see 4.1.).

One reason why lawsuits against public authorities are often not brought in cases of natural disasters is that governments generously intervene with public aid. For example, in the case of Katrina, a report of the U.S. Senate refers to a total amount of USD 88 billion that the U.S. Federal Government had committed as of March 8, 2006 to the response, recovery and rebuilding efforts.³⁰

Victims have so far not been very successful in holding public authorities liable for the consequences of disasters. One of the rare cases where public authority liability was accepted was in France after the disastrous flooding at Grand Bornand on 14 July 1987 which caused 23 persons to die in addition to substantial damage to property. A sudden thunderstorm in the mountains caused two rivers to surge very rapidly and wash away camping grounds located nearby the river. Both the state and the local authorities were sued and were held liable by the court of appeals of Lyon. The state was held liable for a lack of care in authorizing the development of a camping ground in an area likely to be flooded by the mountain torrent; the municipality was bound to give a warning of possible dangers which had not been done.³¹ Victims were less successful in the Netherlands in a case where a 150 year old dike along a canal became weaker during the dry summer of 2003 and failed to hold back water. The dike break led to substantial damage in the village of Wilnis which belongs to the municipality De Ronde Venen. The municipality sued the regional water board who had competence to maintain the dike for compensation of the flood damage which was caused to the nearby housing quarter of the village of Wilnis. The case went all the way up to the Supreme Court (Hoge Raad) which denied in a decision of 17 December 2010 the liability of the regional water board.³² The Hoge Raad held that a dike can also constitute a structure within the meaning of the strict liability rule of Article 6:174 of the Civil Code regarding the liability of the owner of a defective construction. However, the Hoge Raad held that in addressing the question of the defectiveness of the dike, the court should take into account the state of the art of building a peat dike known at the time of the construction as well as the available financial means of the water board. Also the extraordinary circumstances of the case and the fact that the hazard (possible defectiveness of the dike in case of long drought) was unknown to the owner of the dike, should be taken into account.

³⁰ Report of the Senate Committee on Homeland Security and Governmental Affairs, *Hurricane Katrina: A Nation Still Unprepared*, Executive Summary, May 2006, at 17, available at <http://www.disastersrus.org/katrina>.

³¹ For details see Cannarsa, Lafay and Moréteau (2006, pp. 94-95).

³² Hoge Raad, 17 December 2010, NJ 2012/155.

As a result the liability of the public authority (more particularly the regional water board)³³ was denied.³⁴

Some legislators have reacted with creating immunities for public authorities in order to limit the scope of government liability. Recent scholarship has defended those immunities, arguing that public authorities are multi-task agents that need a large margin of discretion since they have to weigh various externalities.³⁵ A too extensive public authority liability could potentially lead to so-called chilling effects.³⁶ Notwithstanding these theoretical objections it has also been argued that there is a serious potential for public authority liability precisely given the earlier mentioned tendency of politicians to underinvest in precautionary efforts because these do not lead to substantial political gains during the term of office of the particular politician.³⁷

This leads us to the core focus of our contribution. At first blush public authority liability could play an important role in providing incentives for disaster risk reduction. It could be the symbolic stone that kills two birds: on the one hand public authority liability could provide better incentives to authorities to invest adequately in disaster risk reduction; on the other hand it could - because of the comparative negligence defense- cure the perverse incentives of victims and thus provide appropriate incentives for disaster risk reduction to victims as well. However, as we will show in a model in the next section, these expectations may for a number of reasons be too optimistic.

3. The model

3.1. Notations and assumptions

In our model, the government needs to decide whether or not to take some precautionary measure to reduce the probability of harm materializing due to a disaster. The victim cannot affect the probability of harm, but can take some care measure which mitigates the level of harm. We compare two alternative legal frameworks: a solidarity system and a negligence system. In the solidarity system, the government compensates a fraction of the victim's loss if that loss exceeds a certain threshold. In case the loss does not exceed the threshold, the victim receives nothing. The alternative is a rule of comparative negligence. Under this liability rule, the government needs to pay the victim's full loss if the government did not take care and the victim took care, and a fraction of the loss if both did not take care. In all other situations, the victim bears the full loss. We further

³³ The municipality of the Ronde Venen (where Wilnis was located) acted as a victim to claim compensation.

³⁴ Giesen and Keirse (2011, pp. 428-431).

³⁵ De Geest (2012).

³⁶ De Mot and Faure (2014).

³⁷ Faure (2016, p. 114).

assume that the parties are risk neutral, and that the parties bear their costs of trial themselves (the American rule of cost allocation applies).

We will use the following notations:

p_0 : the probability of harm if the government takes no care

p_1 : the probability of harm if the government takes care (with $p_1 < p_0$)

H_0 : the harm if the potential victim takes no care to reduce the harm

H_1 : the harm if the potential victim takes care to reduce the harm ($H_1 < H_0$)

c : the prevention costs of the victim

α : the share of the harm the government compensates in the absence of public authority liability ($0 < \alpha < 1$)

T : the threshold level in the solidarity system (if the harm $< T$, then there's no compensation; if the harm $\geq T$, the compensation equals α times the harm)

β : the share of the harm the victim obtains in compensation when both the government and the victim took insufficient care under a rule of comparative negligence ($0 < \beta < 1$)

C_p : the litigation costs of the plaintiff under comparative negligence when the government failed to take care but the victim took care

C_p' : the litigation costs of the plaintiff under comparative negligence when both the government and the victim failed to take care

Our model makes some simplifying assumptions. First, we assume that the parties do not have an opportunity to settle the case. All disputes end up in trial. Second, when the victim takes no care (takes care), there's only one possible level of damages H_0 (H_1), and the victim can perfectly predict ex ante whether $H_0 > T > H_1$ or not. In section 3.5., we look at the consequences of relaxing these assumptions.

3.2. The solidarity system

We start with the solidarity system and look at the situation in which $H_0 > T > H_1$. The victim's loss equals $c + p_i H_1$ when the victim takes care (with $i=0$ if the government does not take care, and $i=1$ if the government does take care): the victim pays for the costs of care, and there's a probability of p_i that a loss of H_1 will occur (given that the victim takes care). Since that loss does not exceed

the threshold T , the victim does not receive any compensation. If the victim does not take care, the victim's loss equals $(1 - \alpha)p_i H_0$: the victim does not incur any precaution costs, but there's a probability that a loss H_0 will occur (given that the victim does not take care). Since the loss exceeds the threshold, the victim will receive a part (α) of the loss as compensation and will receive no compensation for the other part $(1 - \alpha)$. Clearly, the victim will take no care if the loss with taking care is larger than the loss with taking no care, thus if $c + p_i H_1 > (1 - \alpha)p_i H_0$.

The perverse incentive of the victim not to take care clearly increases with his or her prevention cost, with the share of the harm the government compensates when the loss exceeds the threshold, and with the level of harm if the potential victim takes care (as long as $H_1 < T$). The incentive decreases with the probability of harm³⁸ and with the level of harm if the potential victim takes no care.

3.3. Comparative negligence

Under a rule of comparative negligence, in case the government takes care, the victim can decide to take care as well, or to take no care. If the victim takes care, his or her loss equals $c + p_1 H_1$: the victim pays for the cost of care, and there is a probability of p_1 (since the government takes care) that (s)he will suffer a loss of H_1 (given that the victim took care and given that the government also took care and will thus not have to compensate any loss). If the victim does not take care, the victim's loss is simply $p_1 H_0$: given that the government takes care, the probability of a loss is p_1 , and the level of the losses equals H_0 since the victim does not take care. The victim bears the full loss since the government took care. The victim prefers to take care as long as $c + p_1 H_1 < p_1 H_0$, thus as long as $c < p_1 H_0 - p_1 H_1$. We can conclude that when the government takes care, the victim takes care as long as it's efficient to do so.

Now we look at the situation in which the government takes no care. This situation is more complex, because in order to obtain compensation from the government, the trial costs of the victim need to be relatively low compared to the expected value of a trial. If the victim takes care, her or his loss equals $c + p_0 C_p$ if $C_p \leq H_1$: since the victim has a positive expected value suit, (s)he will be able to sue and obtain compensation for the loss. However, the victim bears her cost of trial (the American rule applies). If however $C_p > H_1$, the victim has a negative expected value suit and will not be able to go to court to obtain compensation. In that case, the victim's total loss equals $c + p_0 H_1$. If the victim takes no care, whether (s)he will have a positive or a negative expected value suit

³⁸ $c + p_i H_1 > (1 - \alpha)p_i H_0$ can be rewritten as $\frac{c}{p_i} + H_1 > (1 - \alpha)H_0$.

depends on whether $\beta H_0 \geq C_p'$ or not (βH_0 is the fraction of the harm that the government will need to compensate under a rule of comparative negligence when both parties were negligent). If the victim has a positive expected value suit ($\beta H_0 \geq C_p'$), then the victim's loss equals $p_0[(1 - \beta)H_0 + C_p']$. If however the victim has a negative expected value suit ($\beta H_0 < C_p'$), then the victim's loss equals p_0H_0 . Unlike in the situation in which the government takes care, the decision of the victim whether to take care or not depends on several factors when the government does not take care. Formally, when the government does not take care, the victim will take no care if:

$$c + p_0C_p > p_0[(1 - \beta)H_0 + C_p'] \text{ in case } C_p \leq H_1 \text{ and } \beta H_0 \geq C_p'$$

$$c + p_0C_p > p_0H_0 \text{ in case } C_p \leq H_1 \text{ and } \beta H_0 < C_p'$$

$$c + p_0H_1 > p_0[(1 - \beta)H_0 + C_p'] \text{ in case } C_p > H_1 \text{ and } \beta H_0 \geq C_p'$$

$$c + p_0H_1 > p_0H_0 \text{ in case } C_p > H_1 \text{ and } \beta H_0 < C_p'$$

In all four situations, the incentive of the victim not to take care increases with the cost of taking care and decreases with the probability of harm and with the level of harm if the potential victim takes no care. In the first and the second situation, the incentive also increases with the plaintiff's litigation costs in case he takes care and the government didn't. In the third and the fourth situation, the incentive increases with the level of harm in case the victim takes care. In the first and the third situation, the incentive increases with the share of the harm the victim obtains in compensation when both the government and the victim took insufficient care, and decreases with the litigation costs of the plaintiff when both the government and the victim failed to take care.

3.4. Comparison of the solidarity system and comparative negligence

We can now compare the victim's incentives under a solidarity system and a rule of comparative negligence (and more specifically the situation in which the government takes no care). We need to distinguish between four different possible situations:

(1) We start with the situation in which under a rule of comparative negligence the plaintiff's claim has positive expected value only if he did not take care ($C_p > H_1$ and $\beta H_0 \geq C_p'$). In this situation, the victim will take no care if $c + p_0H_1 > p_0[(1 - \beta)H_0 + C_p']$ under comparative negligence,

while he will take no care under the solidarity system if $c + p_0H_1 > (1 - \alpha)p_0H_0$. Clearly, the incentive not to take care may be worse under comparative negligence. This will be the case when $p_0[(1 - \beta)H_0 + C_p'] < (1 - \alpha)p_0H_0$, thus if $(\beta - \alpha)H_0 - C_p' > 0$.

(2) We now turn to the situation in which under comparative negligence the plaintiff's claim has positive expected value whether he took care or not ($C_p \leq H_1$ and $\beta H_0 \geq C_p'$). Here the victim will take no care if $c + p_0C_p > p_0[(1 - \beta)H_0 + C_p']$. Under the solidarity system, the victim will take no care if $c + p_0H_1 > (1 - \alpha)p_0H_0$. Once again, the incentive not to take care may be worse under comparative negligence. This will be the case if $c + p_0C_p - p_0[(1 - \beta)H_0 + C_p'] > c + p_0H_1 - (1 - \alpha)p_0H_0$, thus if $(\beta - \alpha)H_0 - C_p' - (H_1 - C_p) > 0$. Note that, due to the fact that $C_p \leq H_1$, the incentive is more likely to be worse under comparative negligence in the situation in which the plaintiff's claim has positive expected value only if he did not take care (see situation 1 above) than in the situation in which the plaintiff's claim has positive expected value whether he took care or not. The reason is that in the former situation, the victim receives nothing when he takes care (and consequently damages are relatively low), but he still receives something in the latter situation ($H_1 - C_p$).

(3) When the plaintiff's claim has negative expected value whether he took care or not ($C_p \leq H_1$ and $\beta H_0 < C_p'$), the victim will take no care if $c + p_0H_1 > p_0H_0$, thus if $c > p_0H_0 - p_0H_1$. Note that under this condition we don't want the victim to take care, because the cost of taking care (c) outweighs the benefits of taking care ($p_0H_0 - p_0H_1$). Intuitively, since the victim bears all the harm, he makes optimal decisions regarding taking care. Under the solidarity system, the victim will take no care if $c > (1 - \alpha)p_0H_0 - p_0H_1$. So under that system the victim may still take no care even though taking care would be efficient (this follows from the fact that $1 - \alpha < 1$).

(4) When the plaintiff's claim has positive expected value only if he took care ($C_p \leq H_1$ and $\beta H_0 < C_p'$), the victim will take no care if $c + p_0C_p > p_0H_0$, thus if $c > p_0H_0 - p_0C_p$. Clearly, the victim will take no care only when it's efficient to do so ($p_0H_0 - p_0C_p > p_0H_0 - p_0H_1$ given that $C_p \leq H_1$). Under a solidarity system, when the government takes no care, the victim takes no care if $c + p_0H_1 > (1 - \alpha)p_0H_0$. Like before, under that system the victim may still take no care even though taking care would be efficient.

3.5. Relaxing some assumptions

Our model has made some simplifying assumptions. First, with respect to the comparative negligence rule, we have assumed that the parties do not have an opportunity to settle the case. All disputes end up in court. One could argue that when settlement is possible, plaintiffs will more often be able to obtain compensation even when the level of harm is relatively low, and this would make the perverse incentives of the victim vanish. However, relaxing the assumption of no settlement is not likely to alter our results qualitatively. Even when we allow parties to settle in our model, when a suit has negative expected value, the defendant will usually not offer any positive settlement amount.³⁹ And with respect to positive expected value suits, a settlement will often reflect the superior bargaining power of the defendant, so that the ultimate settlement amount will be considerably lower than the expected judgment.

Second, when the victim takes no care (takes care), we have assumed there's only one possible level of damages H_0 (H_1), and the victim can perfectly predict ex ante whether $H_0 > T > H_1$ or not. In reality of course, the victim will not be able to perfectly predict the level of damages when he takes care or not. Also, the precise value of the threshold T may not be perfectly known in advance. Consequently, given a certain level of precaution, a victim will seldomly be entirely sure that his loss will be qualified as the result of a disaster or not in the solidarity system. And in a negligence system, the victim will likewise not be sure that his suit will have positive expected value in case he takes no care. Under both systems, this will provide a counterweight against the perverse incentive of the victim. Whether this counterbalancing effect will be large enough to induce the victim to take care when it's efficient to do so, will now also depend on her or his estimate of the probability that (s)he will not receive compensation when (s)he takes no care, and his or her degree of risk aversion.⁴⁰

3.6. Summary

These are the main findings of our analysis:

a) The perverse incentive for the victim not to take care can exist under both the solidarity system and under comparative negligence.

³⁹ When the plaintiff has a negative expected value suit but the defendant is unsure about this, the plaintiff may obtain a positive settlement amount. But this amount will be (often considerably) lower than the expected judgment, because the defendant's settlement offer will reflect the possibility that the plaintiff's claim has negative expected value.

⁴⁰ From a modelling perspective, our model could for example be altered by introducing a distribution for the victim's loss when (s)he takes no care, with some values lower than T, and some values larger than T.

b) Under comparative negligence, the perverse incentive of the victim only exists when the government cannot be incentivized to take care.

c) Under comparative negligence, the perverse incentive of the victim only exists if the plaintiff's claim has positive expected value when he did not take care. In that case, the perverse incentive is larger in the situation in which the plaintiff's claim has negative expected value when he takes care than in the situation in which the plaintiff's claim has positive expected value in case he takes care.

d) When perverse incentives may exist under both the solidarity system and comparative negligence, the probability that the perverse incentive is worse under a rule of comparative negligence than under the solidarity system increases with (1) the share of the harm the victim obtains in compensation when both the government and the victim took insufficient care under a rule of comparative negligence, and decreases with (2) the share of the harm the government compensates in the absence of public authority liability and (3) the litigation costs of the plaintiff under comparative negligence when both the government and the victim failed to take care. Furthermore, it (4) increases (decreases) with the level of harm when the potential victim takes no care to reduce the harm in case the share of the harm the victim obtains in compensation when both the government and the victim took insufficient care under a rule of comparative negligence is larger (smaller) than the share of the harm the government compensates in the absence of public authority liability. When the plaintiff's claim has positive expected value when (s)he took care, it also increases with (5) the harm if the potential victim takes care to reduce the harm and decreases with (6) the litigation costs of the plaintiff under comparative negligence when the government failed to take care but the victim took care.

4. Unpacking the elements of the model

4.1. The probability of government intervention increases with damages

In the solidarity system, the perverse incentive of the victim exists because the government does not compensate relatively small losses, but does provide compensation for (a fraction of) relatively large losses. The question arises whether this is realistic.

In order to test this hypothesis we will review the conditions under which the governments intervene in particular legal systems in the case of (natural) disasters. We will examine whether it is indeed so that the government only provides *ex post* recovery when a particular threshold is passed, i.e. the damage is relatively large. We will analyse this both by looking at (where available) statutory conditions and at the compensation in practice. If it would indeed appear that the government only

intervenes in case of relatively large losses, this would confirm the likeliness of perverse incentives of victims of a disaster as it was demonstrated in the model.

We will proceed as follows. We address compensation practice in four European countries: Belgium, Germany, Italy and the Netherlands. The reason we have chosen those four legal systems is that they all have a regime whereby *ex post* recovery for disasters is provided (either via a structural fund on a statutory basis or ad hoc). We deliberately did not choose a country like France where comprehensive disaster insurance exists. Note that in Belgium a comprehensive disaster insurance was introduced in 2005, but the *ex post* recovery via the disaster fund has not been totally abolished.⁴¹

In Belgium, the Act of 12 July 1976 created the so-called Disaster Fund. It is financed in the aftermath of a natural catastrophe by advances from the Treasury, loans and where necessary, allocations drawn from the state budget, gifts, legacies and profits from the national lottery. Interestingly the Disaster Fund will only intervene after a royal decree has recognized the existence of the disaster and its geographical area. In 1986, the government introduced the following criteria:

- the total damage should at least be (at that time) 50,000 Belgian francs (€ 1.239.467);
- the average amount of damage per family should be 225.000 Belgian francs (€ 5.577);
- a similar disaster only happens every 20 years.⁴²

A more recent guidance note of the relevant Belgian agency of 2006 now indicates that the Disaster Fund will only intervene when the disaster has caused a total of € 50 million in damage or when particular technical criteria have been fulfilled. Those criteria can again be linked to the magnitude of the damage. For example for precipitation there should be a rainfall of at least 30 l/m² per hour or 60 l/m² per 24 hours.⁴³ The financial criterion has hence in 2006 been substantially increased compared to the previous situation whereas in the past also a criterion of a minimum damage per household applied. Since 2005 the importance of the Disaster Fund in Belgium is somewhat reduced as a result of the introduction of a comprehensive disaster cover for specific risks.⁴⁴ The Disaster Fund therefore only applies for risks not covered by the compulsory insurance.

Finally we should mention that since 2014 in the federal structure of Belgium the allocation of compensation for victims of disasters has been attributed to the regions. The Flemish Region has issued an Order of 23 December 2016 concerning the compensation of damage caused by general

⁴¹ Bruggeman, Faure and Haritz (2011, pp. 768-772).

⁴² Van Nuffel (1995, p. 47) and Durant (2006, p. 60).

⁴³ See https://ibz.be/sites/default/files/media/docs/omzendbrief_erkenning_ramp.pdf.

⁴⁴ Bruggeman, Faure and Haritz (2011, pp. 770-772).

disasters in the Flemish Region. Interestingly, also Article 2 of this Order holds that only natural phenomena which satisfy the financial criteria mentioned in Article 3 or specific technical criteria mentioned in Article 4 will be considered as a general disaster (which hence can lead to compensation). Article 3 holds that a natural phenomenon will be considered a disaster in the sense of the Order when it has caused a damage of at least € 30 million to private and public property in the Flemish Region.

In Germany the situation is different than in Belgium in the sense that there is no structural disaster fund that determines *ex ante* under which condition compensation is available for victims. Although a structural act specifying the conditions under which victims of disasters may receive compensation does not exist, there is relevant ad hoc legislation. For example, after the 2002 flood (which mostly hit the Bundesland Saxonia in the east of Germany, leading to 21 casualties and 110 people injured), the total property damage reached € 6,198 billion.⁴⁵ Interestingly the Federal Republic of Germany enacted an ad hoc specific legislation for the compensation of the victims, the *Flutopferhilfesolidaritätsgesetz*, which established a fund to support the victims of that catastrophe.⁴⁶ Although the 2002 Act only applies to the 2002 flood, legal doctrine argues that “it is very likely that the federal legislator would react in a rather similar way if other catastrophes of comparable size occurred”.⁴⁷ The *Flutopferhilfesolidaritätsgesetz* created a solidarity fund which on the one hand pays so-called *Soforthilfe* (limited financial assistance, similar to disaster relief) and in addition financial aid for the removal of the damage and for reconstruction (*Aufbauhilfe*). The financial means of the fund amount to €8,1 billion, financed by the tax payers of the *Federation* and the *Länder*.⁴⁸ The Act is especially designed to compensate for property damage.⁴⁹ This example already underscores (again) our point that only when the damage is relatively large, victims can count on *ex post* recovery. Also other incidents, more particularly floodings, confirm this picture. After a flood in 2013 another ad hoc catastrophe fund was created to compensate the victims of the flood which had taken place mostly in the land *Sachsenanhalt*. The total compensation was, according to a report of the German Bundestag, more than €6,6 billion.⁵⁰

⁴⁵ Magnus (2006, p. 140).

⁴⁶ Magnus (2006, p. 121).

⁴⁷ Magnus (2006, p. 123).

⁴⁸ Magnus (2006, p. 124).

⁴⁹ *Ibidem*.

⁵⁰ See Bericht zur Fludkatastrophe 2013: Katastrophenhilfe, Entschädigung, Wiederaufbau, Deutscher Bundestag 17.Wahlperiode, Drucksache 17/14743 of 19 September 2013, p. 4-7 and see Bundesministerium des Inneren (Federal Ministry for the Interior), Fludkatastrophe 2013, Katalog der Hilfeleistungen, Deutscher Bundestag 17.Wahlperiode, Drucksache 17/14743, p. 13.

Italy follows to a large extent the German model. In other words, there is a national emergency fund which can be used after the state of emergency has been declared by the central government. The Act on the state of emergency does not contain financial thresholds, but the regions need to estimate all losses and damages before requesting the application of the state of emergency. In practice the state of emergency (and thus the possibility to call on the National Emergency Fund) is only applied (and recognized) in case of large losses.⁵¹ The Italian government “spent on average € 3,5-4 billion each year to indemnify damages caused by catastrophic events”.⁵² State indemnification of disaster losses follows a routine procedure: the regional government proposes the declaration of a state of emergency and as a result state funding is provided for the victims.⁵³ Legal doctrine in Italy holds that “the enactment of special laws and provisions indemnifying the owners of properties affected by single disasters generated a sort of reliance on the government by Italian citizens, who know they may always count on the state for recovery, which is one of the reasons why private insurance covering natural disasters has never fully developed in Italy”.⁵⁴

The civil protection department of Italy has an excel sheet with all amounts that have been compensated by the National Emergency Fund since 1997. Most concern seismic events, but also damage resulting from extreme weather events. The excel sheet provides a large amount of payments, underscoring the fact that the Italian government indeed pays substantial amounts, but it is also clear that in nearly all particular cases the amounts are several tens of millions of euros (with a few exceptions). This once again highlights our point.⁵⁵

The Netherlands also constitute a very interesting case. Before 1998 the Netherlands had no structural compensation regime and victims had to rely on ad hoc compensation. In 1998 the WTS, an Act on compensation of damage in the event of catastrophes and large accidents, was adopted. The goal of this WTS was to offer a more structural solution to compensation of victims of catastrophes instead of ad hoc responses. There are two ways of compensation under the WTS. There is a right to compensation for damage in case of fresh water flooding or earthquakes that are considered a catastrophe or a large accident in the sense set out in the Act. However, Article 3 of the WTS provides that it can also be declared applicable through a Royal Decree which can come into being only if the government considers the incident a catastrophe or a large accident. The Parliamentary Proceedings make clear that such an accident at least requires that many

⁵¹ For a further discussion of the compensation for victims of disasters in Italy see Monti and Chiaves (2006, pp. 169-192).

⁵² Monti and Chiaves (2006, p. 169).

⁵³ Monti and Chiaves (2006, p. 170).

⁵⁴ Ibidem.

⁵⁵ See <http://www.protezionecivile.gov.it/icms>.

governmental organizations and services of various disciplines must have intervened in a coordinated way and that the accident has endangered the health of many persons and caused substantial damage.⁵⁶ In other words, the damage has to be catastrophic. Article 4(3) of the WTS stipulates that the victim is not entitled to compensation when the damage was reasonably insurable or when the victim was able to obtain compensation from another source.

Since its creation in 1998 the WTS has only been applied five times:⁵⁷ it was applied twice in case of heavy rain (in 1998), twice in case of flooding of the river Maas (2003 and 2011) and once for the dike break at Wilnis already referred to above (in 2003). Since heavy rain did not constitute a formal flood in the sense of Article 1 of the WTS, the WTS needed to be declared applicable by Royal Decree.⁵⁸ The WTS has been criticized for the fact that it applies merely in cases of heavy rainfall and flooding, but not in cases of serious man-made disasters resulting in major personal injuries such as the fireworks accident in Enschede in 2000 and a fire in a café in Volendam on New Year's Eve (2000-2001). Both cases led to substantial personal injury. In the latter cases it was not the WTS that intervened, but again it was the government who used tax payers money to provide compensation.⁵⁹

The following amounts were paid under the WTS:

1. Heavy rainfall 1998	€ 147.209.966
2. Heavy rainfall 1998	€ 115.268.597
3. Flooding Maas 2003	€ 3.691.642
4. Dike break Wilnis 2003	€ 2.159.738
5. Flooding Maas 2011	€ 1.115.647

Again, even those few cases illustrate the point that compensation is awarded via the WTS only when the damage is high. Note, however, that also outside of the WTS substantial amounts are paid to victims when the number of victims and/or the damage is high. In the case (mentioned above) of the explosion of the fireworks factory in Enschede a total amount of approximately 90 million guilders (€ 45 million) was paid by the Ministry of Economic Affairs to a foundation Financial Aid

⁵⁶ Documents of the Second Chamber of Representatives 1996-1997, 25 159 N° 3, 4-5.

⁵⁷ See email of Mr. G.W. Knops of the Ministry of the Environment of 24 March 2017.

⁵⁸ Bruggeman, Faure and Haritz (2011, p. 776).

⁵⁹ Ibidem.

Fireworks Castastrophe⁶⁰ and in the case of Volendam the central government made a total amount of € 30,1 million available for the victims.⁶¹

4.2. The difficulty to incentivize public authorities

We have seen that under comparative negligence, the victim only has perverse incentives if the government cannot be incentivized to take care. The question arises how realistic this is. For the sake of comparison, we start with a situation in which there is no public authority liability.

4.2.1. Incentives without public authority liability

Do public authorities have an incentive to prevent careless behaviour without the threat of liability? One may argue that the political consequences of harmful behaviour on the government can serve as a deterrent. If costs are externalized on citizens, this may affect their voting behaviour. In reality however, the political consequences of cost externalization may be limited. Voters may not act as an effective check on liability for several reasons: accidents may happen infrequently, voters will often be ill-informed about them, and even if well-informed, voters probably view the problem of uncompensated injuries caused by the state not as important as other issues. Also, the costs of uncompensated injuries may disproportionately fall upon poorer segments of the population with limited political power. In other words, the cost externalization strategy of the government may end up undetected, or at least unpunished by the voters.⁶²

4.2.2. Incentives with public authority liability

Economic analysis traditionally assumes utility maximizing individuals and profit maximizing firms. These assumptions are crucial to make predictions about how private entities respond to the incentives created by liability. Public authorities however, unlike corporations, do not maximize profits.⁶³ As a result public authorities may also lack the market discipline which is imposed on private injurers and traditional incentive mechanisms may therefore not work.⁶⁴ If profit

⁶⁰ Faure and Hartlief (2006, p. 220).

⁶¹ Faure and Hartlief (2006, p. 221).

⁶² See Kramer and Sykes (1987, p. 279).

⁶³ Schäfer (2012); Van den Bergh and Schäfer (1998, 2000); Van den Bergh (2010). For a comparative law and economics analysis of public authority liability see Markesinis, Auby, Coester-Waltjen and Deakin (1999).

⁶⁴ Levinson (2000, p. 345); Spitzer (1977, p. 515).

maximization is not the goal of a public authority it is less clear what objective functions public authorities strive for.⁶⁵ The question to what extent imposing liability will provide incentives, e.g. to prevent harmful behaviour, is of course crucially linked to the functions the particular agent strives for.⁶⁶ Schäfer (2012) states that the behaviour of public authorities should be analyzed via the incentives of their main actors, in first instance politicians. Their main concern is not profit maximization, but re-election as a result of which they would tend to benefit interest groups that support their re-election.

While public authorities are indeed quite different than individual actors, concluding that public authority liability may *never* have any deterrent effect is probably a too strong conclusion. In the end, some government entity must pay the costs created by liability. This entity will often face a budget constraint, and will not like to waste resources. According to some (e.g. Kramer and Sykes, 1987), a hard budget constraint may lead bureaucracies to respond to liability with behaviour *approximating* cost minimization, which would lead them to adopt cost-effective measures to economize on liability.⁶⁷ According to this line of thought, the government (or more accurately, its officials) can be motivated by the desire to provide public services at minimum cost, since many officials confront demands for both increased levels of public services and lower taxes. This would make it more likely for officials to explore all opportunities for cost reduction. Taking reasonable preventive measures to reduce the burdens of liability would be one such opportunity. While we agree that in some cases liability may affect the behaviour of government officials through its political consequences, nothing guarantees that the political ranking of potential projects a government makes will be the same as (or even close to) a social ranking of potential projects. Liability diverts government funds and leaves political officials with fewer resources to satisfy the demands of their constituencies.⁶⁸ Governments may then respond to liability with measures to avoid it that are “politically cost-effective”, though not necessarily “economically cost-effective”.⁶⁹ And although it’s not unrealistic to expect a positive correlation between political and economic cost-effectiveness, the exact relation between them is unclear.⁷⁰ A situation in which liability could be effective is one in which the following conditions are cumulatively fulfilled: the cost of preventive measures is relatively low, the costs of potential injuries fall disproportionately upon segments of

⁶⁵ See Posner and Sykes (2007, p. 87).

⁶⁶ Dari-Mattiacci, Garoupa and Gomez-Pomar (2010, p. 16).

⁶⁷ Unfortunately, there is no empirical data available to support this thesis.

⁶⁸ See Dari-Mattiacci, Garoupa and Gomez-Pomar (2010, p. 16).

⁶⁹ See Posner and Sykes (2007, p. 89).

⁷⁰ Posner and Sykes (2007, p. 90).

the population with limited political power⁷¹, and the probability that not taking these preventive measures will result in substantial losses *in the near future* is high⁷². In the context of disasters however, given that liability procedures may only have effect years after the politician was in office, a finding of liability *ex post* may not affect incentives *ex ante* very much.⁷³ The political consequences of liability can thus be limited due to timing distortions.⁷⁴ Losses may be revealed only after years, and trials or settlement negotiations may take a long time. In such cases, the political cost may not be paid by the elected official who took the decision ending in the tort payment, but by a later entrant into office.⁷⁵

Furthermore, governments do not necessarily face hard budget constraints. While we have argued above that liability may have some incentivizing effect on governments in some situations, this is less likely to be so if governments can simply pay liability losses with increased taxes, spreading the loss over millions of tax payers.⁷⁶ Also, due to internal budgetary reasons, liability costs are not always directly or proportionally charged to the responsible department, so that they don't face direct economic incentives to limit their exposure to liability. Many commentators believe that if agency budgets were charged for payment, departments and agencies would respond more to the threat of liability *ex ante* by internalizing the costs of their negligent behaviour.^{77 78} This could mean that public authority liability may work better for municipalities than for central governments. The logic is that in a municipality the citizens may more directly be confronted with the

⁷¹ If costs would fall on segments of the population with substantial political power, pure political incentives would most likely lead to the adoption of preventive measures and liability wouldn't add much pressure.

⁷² Which would mean that the politicians currently in office would have less financial resources to satisfy the demands of groups with more political power.

⁷³ It is related to the well-known Nimtof-syndrom (not in my term of office).

⁷⁴ See also Dari-Mattiacci, Garoupa and Gomez-Pomar (2010, p. 16).

⁷⁵ We must stress however that this may be mitigated due to the presence of bureaucrats, who often have a longer time perspective than elected officials. The most commonly applied rational choice model of bureaucratic behaviour assumes that a bureaucrat will seek to maximize the size of her agency's budget (See Niskanen (1971, pp. 36-42)). The reason is that the size of an agency's budget is likely to correlate positively with some goods that bureaucrats may value such as their own compensation and perquisites, prospects for career advancement and prestige). They may thus have an incentive to take reasonable precautions in order to reduce the burdens of liability, even though they are not directly politically accountable and even though elected officials may have little control over the actions of these bureaucrats (in terms of selection, promotion, operation).

⁷⁶ In that case, politicians in office do not have to worry about the risk that they won't be able to satisfy the demands of groups with substantial political power, even if liability losses would be quite large.

⁷⁷ Schuck (1983, p. 104); Emery and Maazel (2000, pp. 596-600).

⁷⁸ Fougere (2010) examines who pays the liability costs of state correctional agencies in 15 US states. He finds that states use a variety of approaches to paying claims against their agencies — ranging from a state-wide judgment fund to charging the agency budget. The author hypothesizes that if a more direct source of money damages impacts cost internalization and promotes better policy at the agency, then cases filed against them should be fewer in number because victims should have less cause to sue. He finds indeed that there are significantly fewer filings in the "Budget" states than in other states. As the author acknowledges however, the use of filings as a proxy for *ex ante* cost internalization is rough and most probably imperfect. Many other factors influence filing rates. Fougere (2010).

consequences of municipal liability (in the form of increased municipal taxes). At the municipal level monitoring by citizens is also easier and therefore also the reaction in case of a finding of liability of a municipal authority. Since the link between citizens and the state is much more remote, the same monitoring and incentive effects may not be present to the same extent in case of liability of the state for actions of state agencies. There's an important caveat however. The law may stipulate that local governments that are unable to balance their books will be bailed out by the central government. In that case, local governments do not face a hard budget constraint because they expect a higher level of government to support it in case of financial distress. A soft budget constraint will weaken a local government's incentive to avoid excessive risk taking. Note however that the central government may have several mechanisms in place to limit this problem (e.g. vertical financial supervision, the prospect that the municipality will be under forced administration in case of a bailout etc.).

4.3. Comparative negligence

The doctrine of comparative negligence reduces the compensation which the victim of a wrong obtains where the victim was partly to blame for her or his own damage. A judge who has made a finding of comparative negligence must assess the respective shares of responsibility for the damage as two percentages that add up to 100 percent. The shares of responsibility are determined by reference to the comparative blameworthiness of the parties and the relative causative potency of their faulty conduct.

In our model, perverse incentives are more likely as the share of the harm the victim obtains in compensation when both the government and the victim took insufficient care increases. Recent empirical research in England and Wales shows that for a variety of tort cases the most popular discounts are fractions commonly used in everyday life: one-half, one-third, one-quarter. Judges use the full spectrum of discounts, but discounts at the higher end are relatively infrequent. The average discount is significantly smaller than 50 percent (40.5 percent).⁷⁹

The finding that defendants on average bear a larger fraction of the harm than victims could mean two things. First, it could be that the blameworthiness or the causative potency of the defendant's faulty conduct is larger on average. Second, there could be a bias against (some types

⁷⁹ Goudkamp and Nolan (2016).

of) defendants in the tort system. Indeed, both archival analyses and mock jury experimentation find that in similar cases, corporations and governments are treated differently from individuals.⁸⁰

As a consequence the corrective features of a comparative negligence defense may largely fail, also in the particular case of disasters. We indicated that either *ex post* recovery via solidarity payments or *ex post* public authority liability may create perverse incentives for victims to increase damages. The hypothesis we examined is whether using public authority liability rather than *ex post* solidarity payments would be preferred given that theoretically a tort system (under public authority liability) could correct the victims' perverse incentives via a comparative negligence defense, whereas that is not possible in case of solidarity payments. However, in practice there is a large reluctance on the side of the judiciary to fully apply the comparative negligence defense, i.e. to effectively reduce the compensation due to the victim, taking into account the victims' contribution to the disaster or to the damage. If that is, as we argued here, indeed the case, then public authority liability (with a comparative negligence defense), also due to the elements previously discussed and the element we discuss in the next section, may not be able to effectively counter the victims' perverse incentives.

4.4. The problem of negative expected value suits and low-value positive expected value suits

In the solidarity system, the perverse incentive of the victim to take no care would not exist if he or she was compensated for relatively low levels of harm as well. At first sight, under a system of comparative negligence, victims will not have such a perverse incentive because they will be compensated also for relatively low levels of harm when the government fails to take care. However, the fact that litigation is costly affects the viability of suits with low levels of harm much more than suits with larger levels of harm. When victims suffered a relatively small loss, their suit will often have a negative expected value, leaving the victim empty-handed, just like in the solidarity system. And even if the suit has positive expected value, the expected value may be quite low due to the cost of litigation. Consequently, also settlement offers may be considerably lower than the harm suffered.

Of course, several legal rules and market based instruments exist which can mitigate the problem that a meritorious but negative expected value suit is not filed or that a meritorious suit obtains a settlement offer much lower than the expected judgment. A first example concerns (public) legal aid and (private) legal expenses insurance. However, in many countries only a relatively small

⁸⁰ MacCoun (1993).

percentage of the population is covered by legal aid or legal expenses insurance.⁸¹ A second example concerns contingency fees. Under such fees, lawyers are not paid when they lose the case, and receive a fraction of the award when they win the case. However, two remarks are in order. When the costs of pursuing a claim are large compared to the amount at stake, it will generally not be in a lawyer's interest to take the case on a contingency fee basis. Second, especially in civil law countries, contingency fees are often prohibited.⁸² A third example concerns fee shifting. In theory, when the losing party at trial needs to reimburse the legal fees of the winning party, one can expect that a larger amount of strong, low-value claims will be filed. However, in many countries,⁸³ fee shifting is only partial, leaving the winning party with a still relatively large fraction of uncompensated legal fees. Second, a plaintiff with a strong case may still be deterred from filing a lawsuit if the defendant's legal expenditures at trial are relatively large. Given that a plaintiff can never be entirely sure that (s)he will win at trial, in such a case there's a possibility that (s)he will end up paying a large amount of legal fees.⁸⁴

5. Conclusion

The existing economic literature related to the compensation for victims of disasters indicates that ex post compensation by the government is problematic as it has a perverse effect on the incentives for prevention. These incentives may be diluted since victims will count on government intervention. Moreover, the ex post government intervention may equally dilute incentives to insure. In this paper we discussed an additional problem. Victims may have an interest in a relatively large harm precisely to guarantee the solidarity payment from the government, given that governments are typically more likely to intervene when the harm of a disaster is relatively large. This may further dilute the incentive of victims to invest in prevention.

We addressed the question whether it is possible to counter these perverse incentives through public authority liability. We have argued that theoretically this is certainly the case. With public authority liability, suits can also be brought when the harm was relatively low since there's no particular threshold under liability law. And if victims would have underinvested in prevention, this could be corrected via the comparative negligence defense. However, we argued that reality may be much more complex. In countries where solidarity payments are used (such as in the Netherlands, Belgium, Italy and Germany), these payments are most often used when the harm is relatively large.

⁸¹ De Mot, Depoorter and Faure (2016).

⁸² See Faure, Fernhout and Philippsen (2010).

⁸³ E.g. Belgium and the Netherlands.

⁸⁴ For an overview of the economics of fee shifting, see Katz and Sanchirico 2011.

From a political economy perspective, this is also understandable: only when the harm is large and therefore a large number of voters is affected can politicians reap substantial benefits from solidarity payments. We also highlighted that the incentive effects of public authority liability may be relatively low. In practice judges very often do not apply the comparative negligence defense to the full extent. For individual victims a public authority liability lawsuit may also have a negative expected value or a relatively low positive expected value. As a result the potentially perverse incentives of victims are not guaranteed to be corrected through public authority liability. Our paper may provide support for what has often been argued in the literature,⁸⁵ namely that the only effective solution for compensating victims of disasters which keeps incentives intact is the introduction of a comprehensive insurance coverage accompanied with a reinsurance of catastrophic risk by the government.

⁸⁵ In fact already by Kunreuther in 1968.

References

- Bier, V. (2006) 'Hurricane Katrina as a Bureaucratic Nightmare', in R.J. Daniels, D.F. Kettl and H. Kunreuther (eds), *On Risk and Disaster: Lessons from Hurricane Katrina*, Philadelphia: University of Pennsylvania Press, pp. 243-254.
- Bruggeman, V. (2010) *Compensating catastrophe victims. A comparative law and economics approach*, Alphen aan den Rijn: Wolters Kluwer.
- Bruggeman, V., Faure, M.G. and Haritz, M. (2011) 'Remodelling Reparation. Changes in the Compensation of Victims of Natural Catastrophes in Belgium and the Netherlands', *Disasters* 35(4): 766-788.
- Bruggeman, V., Faure, M.G. and Heldt, T. (2012) 'Insurance Against Catastrophe: Government Stimulation of Insurance Markets for Catastrophic Events', *Duke Environmental Law & Policy Forum* XXIII(1): 185-241.
- Cannarsa, M., Lafay, F. and Moréteau, O. (2006) 'France', in M.G. Faure and T. Hartlief (eds), *Financial compensation for victims of catastrophe. A comparative legal approach*, Vienna: Springer, pp. 81-118.
- Coate, S. (1995) 'Altruism, the Samaritan's Dilemma, and the Government Transfer Policy', *American Economic Review* 85: 46-57.
- Dari-Mattiacci, G. and Faure, M.G. (2015) 'The Economics of Disaster Relief', *Law & Policy* 37(3): 180-208.
- Dari-Mattiacci, G., Garoupa, N. and Gomez-Pomar, F. (2010) 'State Liability', *European Review of Private Law* 18: 773-811.
- De Geest, G. (2012) 'Who should be immune from tort liability?', *Journal of Legal Studies* 41: 291.
- De Mot, J. and Faure, M.G. (2014) 'Public authority liability and the chilling effect', *Tort Law Review* 22: 120-133.
- De Mot, J., Depoorter, B. and Faure, M.G. (2016) 'The Multiplication Effect of Legal Insurance', *New York University Journal of Law and Business* 13(1): 1-31.
- Depoorter, B. (2006) 'Horizontal political externalities: the supply and demand of disaster management', *Duke Law Journal* 56: 101-125.
- Durant, I.C. (2006) 'Belgium', in M. Faure and T. Hartlief (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Vienna: Springer, pp. 37-79.
- Emery, R. and Maazel, I.M. (2000) 'Why Civil Rights Lawsuits Do Not Deter Police Misconduct: The Conundrum of Indemnification and a Proposed Solution', *Fordham Urban Law Journal* 28 FORDHAM URBAN L. J. 587-600.
- Epstein, R.A. (1996) 'Catastrophic responses to catastrophic risks', *Journal of Risk and Uncertainty* 12: 287-308.
- Faure, M.G. (2007) 'Financial compensation for victims of catastrophes: a law and economics perspective', *Law & Policy* 29(3): 339-367.
- Faure, M.G. (2013) 'Towards effective compensation for victims of natural catastrophes in developing countries', in M.G. Faure and A. Wibisana (eds), *Regulating disasters, climate change and environmental harm. Lessons from the Indonesian experience*, Cheltenham: Edward Elgar, pp. 243-276.
- Faure, M.G. (2016) 'In the aftermath of the disaster: liability and compensation mechanisms as tools to reduce disaster risks', *Stanford Journal of International Law* 52(1): 95-178.
- Faure, M.G. and Hartlief, T. (eds) (2006) *Financial compensation for victims of catastrophes: a comparative legal approach*, Vienna: Springer.
- Faure, M.G. and Hartlief, T. (2006) 'The Netherlands', in M. Faure and T. Hartlief (eds), *Financial compensation for victims of catastrophes: a comparative legal approach*, Vienna: Springer, pp. 195-226.
- Faure, M.G., Fernhout, F. and Philipsen, N. (2010), 'No cure no pay and contingency fees', in M. Tuil and L. Visscher (eds), *New Trends in Financing Civil Litigation in Europe. A Legal Empirical and Economic Analysis*, Cheltenham: Edward Elgar, pp. 33-56.
- Fougere, J.J. (2010) 'Paying for Prisoner Suits: How the Source of Damages Impacts State Correctional Agencies' Behavior', *Columbia Journal of Law and Social Problems* 43(3): 283-332.
- Gerrett, Th.A. and Sobel, R.S. (2003), 'The Political Economy of FEMA Disaster Payments', *Economic Inquiry* 41(3): 496-509.
- Giesen, I. and Keirse, A.L.M. (2011) 'The Netherlands', in H. Koziol and B.C. Steininger (eds), *European Tort Law 2010*, Berlin: De Gruyter, pp. 403-437.
- Goudkamp, J. and Nolan, D. (2016) 'Contributory Negligence in the Twenty-First Century: An Empirical Study of First Instance Decisions', *Modern Law Review* 79: 575-622.
- Kaplow, L. (1991) 'Incentives and government relief for risk', *Journal of Risk and Uncertainty* 4: 167-175.
- Katz, A.W. and Sanchirico, C. (2011) 'Fee Shifting in Litigation: Survey and Assessment', in Sanchirico, C., *Edward Elgar Encyclopedia of Law and Economics, Vol. X, Procedural Law and Economics*, Cheltenham: Edward Elgar.

- Kramer, L. & Sykes, A.O. (1987) 'Municipal liability under § 1983: a legal and economic analysis', *The Supreme Court Economic Review* 249-301.
- Kunreuther, H. (1968) 'The Case for Comprehensive Disaster Insurance', *Journal of Law and Economics* 11: 133-163.
- Kunreuther, H.C. (2006) 'Has the Time Come for Comprehensive Natural Disaster Insurance?', in R.J. Daniels, D.F. Kettl and H. Kunreuther (eds), *On Risk and Disaster: Lessons from Hurricane Katrina*, Philadelphia: University of Pennsylvania Press, pp. 172-202.
- Leonard, H.B. and Howitt, A. (2010) 'Acting in time against disasters: a comprehensive risk-management framework', in H. Kunreuther and M. Useen (eds), *Learning from catastrophes: strategies for reaction and response*, Saddle River: Pearson Prentice Hall, pp. 18-41.
- Levinson, D.L. (2000) 'Making government pay: markets, politics and the allocation of constitutional costs', *University of Chicago Law Review* 67: 345-420.
- Levitt, J.I. and Whitaker, M.C. (2009) *Hurricane Katrina: America's Unnatural Disaster*, Lincoln: University of Nebraska Press.
- MacCoun, R. (1993) 'Is There a "Deep-Pocket" Bias in the Tort System?' *RAND Institute for Civil Justice*, available via https://www.rand.org/content/dam/rand/pubs/issue_papers/2006/IP130.pdf.
- Magnus, U. (2006), 'Germany', in M. Faure and T. Hartlief (eds), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Vienna: Springer, pp. 119-144.
- Markesinis, B.S., Auby, J.B., Coester-Waltjen, D. and Deakin, S.F. (1999) *Tortious Liability of Statutory Bodies. A comparative and economic analysis of five English cases*, Hart: Oxford.
- Monti, A. and Chiaves, F.A. (2006), 'Italy', in M. Faure and T. Hartlief (eds), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Vienna: Springer/ECTIL, pp. 145-194.
- Niskanen, W.A. Jr. (1971) *Bureaucracy and Representative Government*, place: Transaction Publishers.
- O'Keefe, P., Westgate, K. and Wisner, B. (1976) 'Taking the Naturalness out of Natural Disasters', *Nature* 260: 566-567.
- Posner, E. and Sykes, A. (2007) 'An Economic Analysis of State and Individual Responsibility under International Law', *American Law and Economics Review* 9: 72.
- Priest, G. (1996) 'The Government, the Market and the Problem of Catastrophic Loss', *Journal of Risk and Uncertainty* 12: 219-237.
- Raschky, P.A. and Weck-Hannemann, H. (2007) 'Charity Hazard – A Real Hazard to Natural Disaster Insurance?', *Environmental Hazards* 7: 321-329.
- Schäfer, H.-B. (2012) 'Can Member State liability for the infringement of European law deter national legislators?', in Th. Eger and H.-B. Schäfer (eds), *Research Handbook of the Economics of European Union Law*, Cheltenham: Edward Elgar, pp. 82-94.
- Schleifstein, M. (2013) 'Federal Judge Dismisses Most of Remaining Katrina Damage Lawsuits' NOLA.com (Dec. 27, 2013, 5:03 PM), available at: http://www.nola.com/environment/index.ssf/2013/12/-federal_judge_dismisses_most_o.html.
- Shavell, S. (1987) *Economic analysis of accident law*, Cambridge: Harvard University Press.
- Schuck, P.H., *Suing Government: citizen remedies for official wrongs*, Yale University Press, 1983.
- Shughart II, W.F. (2006) 'Katrinanomics: The Politics and Economics of Disaster Relief', *Public Choice* 127: 33-41.
- Spitzer, M.L. (1977) 'An economic analysis of sovereign immunity in tort', *Southern California Law Review* 50: 515-548.
- Suggerman, S.D. (2007) 'Rules of government in compensating disaster victims', *Issues in Legal Scholarship* 6: 1-33.
- The Associated Press (2013) 'Judge Ends Katrina Flooding Lawsuits Against Feds' *USA Today* (Dec. 28, 2013, 5:57 PM), <http://www.usatoday.com/story/news/nation/2013/12/28/judge-ends-katrina-flooding-lawsuits-against-feds/4233217/>.
- Townsend, F.F. *The White House, the federal response to hurricane Katrina: lessons learned*.
- Van den Bergh, R. (2010) 'Francovich and its Aftermath: Member State liability for breaches of European law from an economic perspective', in M. Poirares Maduro and L. Azoulai (eds), *The past and future of EU law. The classics of EU law revisited on the 50th anniversary of the Rome Treaty*, Oxford: Hart Publishing, pp. 423-430.
- Van den Bergh, R. and Schäfer, H.-B. (1998) 'Liability of Member States for infringement of the EC Treaty: economic arguments in favor of a rule of obvious negligence', *European Law Review* 552-567.

- Van den Bergh, R. and Schäfer, H.-B. (2000) 'Member States liability for infringement of the free movement of goods in the EC: an economic analysis', *Journal of Institutional and Theoretical Economics (JITE)* 156: 382-403.
- Van Nuffel, E. (1995) 'Financiële tegemoetkoming van de staat bij natuurrampen (algemene rampen) in België', in H. Cousy and H. Claassens (eds.), *Natuurrampen en verzekering*, Antwerp: Maklu, p. 47.
- Walters, J. and Kettl, D. (2006) 'The Katrina Breakdown', in R.J. Daniels, D.F. Kettl and H. Kunreuther (eds), *On Risk and Disaster: Lessons from Hurricane Katrina*, Philadelphia: University of Pennsylvania Press, pp. 255–261.
- Zeckhauser, R. (1996) 'The Economics of Catastrophes', *Journal of Risk and Uncertainty* 12: 134.