

Financial compensation in case of catastrophes: a European law and economics perspective

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Financial Compensation for Victims of Catastrophes: A Law and Economics Perspective

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This article examines the various approaches legislators may use to compensate victims of catastrophes. Traditional law and economics of insurance literature, with respect to government relief and insurance solutions towards financial compensation, is used to analyze (highly diverging) approaches in Europe and the United States. First, the importance of liability (insurance) is discussed in cases where a liable injurer can be identified; second, the possibilities of first-party insurance are examined, whereby various regulatory solutions (particularly the French model of providing mandatory coverage for catastrophes) is critically discussed. The (first-party) insurance solution is compared with public intervention, and a distinction is made between ad hoc government relief on an ex-post basis and structural compensation funds. The solutions applied and discussed in many countries are critically analyzed for their ability to provide adequate compensation at low costs and their effects on incentives for prevention and for developing private (insurance) solutions.

INTRODUCTION

Catastrophes, whether natural or technological, strike many countries. Natural disasters are, of course, as old as man's existence; and technological disasters have increased as the apparently unavoidable price of technological progress. Some countries, depending upon their specific characteristics, more frequently face (various types of) natural disasters (e.g., earthquakes,

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hurricanes, volcanoes), whereas others have more problems with technological disasters (e.g., great fires, explosions). Nevertheless, all countries, it seems, face threats of natural disaster, especially in the form of severe weather, such as excessive rainfall and flooding.

Through legislation and regulation, legislators are increasingly involved in preventing catastrophic financial loss, which disasters often bring. Laws are passed with the aim of reducing the likelihood of technological disasters, and regulations are created to compensate victims after disasters occur. The latter aspect is the focus of this article. Victims no longer accept the old saying "the loss lies where it falls," and they expect to be compensated for their losses in case of a disaster. Where no tortfeasor is (easily) at hand that can be held liable, and when no insurance coverage is available, victims often turn to the government for some form of compensation. Given the multitude of persons that can be affected by a catastrophe, governments may be inclined to respond to this request. Their responses raise many interesting legal and economic questions.

Generally, one can understand the interest of elected officials in this issue: a catastrophe can draw media attention and can affect many citizens. Although it may make little difference to the individual victim whether few or many others are affected, the individual's chances of special (financial) compensation by the government are greater where many victims are involved.

Although many legal systems have at some point addressed disaster-related issues (e.g., compensation for losses from natural disasters, such as flooding), two events in September of 2001 have brought disaster compensation into the active political discourse. The first was the series of events in the United States on September 11. The second, an event covered widely in Europe, was the explosion in the Grande Paroisse AZF factory in Toulouse, France, ten days later that killed thirty people and injured ten thousand. More recently, the devastating consequences of hurricane Katrina have reinvigorated the debates on a comprehensive compensation for victims of catastrophes (see Daniels, Kettl, & Kunreuther 2006).

In general, there are four different legislative approaches in relation to financial compensation for catastrophes (see Faure & Hartlief 2006; Linnerooth-Bayer, Löfstedt, & Sjöstedt 2001):

1. Rely on liability law and social security already in place (e.g., in European legal systems) and implement no further regulatory measures. In such cases, governments may provide additional compensation for victims, in some cases on an ad hoc basis. This approach is often followed in Germany, Italy, and Sweden.
2. Mandate, by regulation, that first-party insurance coverage be extended to include natural disasters. This approach is used in France and will soon be used in Belgium as a result of a recent legislative intervention. It is also being discussed in both Germany and Italy.

3. Create a compensation fund for victims that would provide partial (but, unlike tort law, typically not full) compensation. Such a disaster fund exists, *inter alia*, in Belgium as a result of the Disaster Act 1976 and also in Austria.
4. Develop public-private partnerships whereby the state intervenes to facilitate private insurance. This model is largely applied in the United Kingdom and in the United States.

These approaches are quite diverging (see Linnerooth-Bayer, Löfstedt, & Sjöstedt 2001; OECD 2005), and it is thus interesting to analyze them using relevant economic literature (see e.g., the contributions in Froot 1999; Zeckhauser 1996). Efficiencies of the various solutions, for example, may be analyzed using the general insights found in this literature. In this respect, one can rely, on the one hand, on the broad law and economics literature on the law and economics of liability and insurance (e.g., Shavell 1987) and, on the other, on literature concerning the demand for insurance protection against catastrophes (Kunreuther 1987, 1996; Schoemaker & Kunreuther 1979; Epstein 1996). More recently, some authors have addressed the law and economics of compensation after catastrophes in relation to flood insurance (Endres, Ohl, & Rundshagen 2003; Schwarze & Wagner 2004). However, most insights can be gained from the application of the general principles of economics of liability and insurance to the case of catastrophes, and that is precisely what this article attempts to do. I will therefore sketch what, in the literature, are viewed as efficient financial solutions for catastrophic damage and then compare these with actual practice in a few countries.

Of course, one may wonder why the compensation of disaster victims is addressed from an economic perspective at all. Indeed, from an economic perspective, compensation of victims is, as such, not a goal of the legal system but rather welfare maximization through the minimization of accident costs. The question of how victims of catastrophes can be provided with appropriate compensation is, in that strict sense, not interesting from an economic perspective (Posner 2003: 167–77). However, given that politicians tend to look for financial solutions in order to compensate victims,¹ law and economics can be a useful tool in indicating how a form of compensation can be provided at the lowest possible (administrative) costs and without unnecessary side effects (as far as affecting incentives for prevention is concerned) or negative distributional consequences (Posner 2004).

This article is divided into five sections. Section I demonstrates that, whenever possible, a system should include incentives for preventing catastrophes by making optimal use (where possible) of liability (insurance). Section II shows that where liability (insurance) cannot provide compensation (e.g., in case of many natural disasters), first-party insurance may do so, but the question arises whether additional government intervention is needed to make first-party insurance work adequately. Section III shows that first-party insurance may (especially when the amounts of compensation are very high) not always provide an adequate solution; in those cases, the question arises

of whether a role for government intervention should exist and, if so, what that role should be. A distinction is drawn between structural funds and ad hoc solutions. Section IV shows that, as an alternative to the options discussed, government may intervene to facilitate market solutions. Section V brings the article to a close with a few concluding remarks.

The aim of this article is not to provide a final answer to all questions related to the financial compensation after catastrophes, but to examine mechanisms for compensating victims of disaster, and the economic consequences for each one. In addition to providing an overview of available legal and regulatory avenues, the article considers solutions and developments in several legal systems. The fact is, however, that the situation in many legal systems is today still developing, and may be highly complex.² For these reasons, reference is only made to solutions in a limited number of countries as illustrations of various techniques that can be used. Accordingly, the solutions are outlined in general terms, without specific details. We turn now to Section I.

I. LIABILITY AND INSURANCE

A. IMPORTANCE

The mandate for liability and insurance is clear: where a liable tortfeasor can be identified, tort law should be used to provide him with adequate incentives for prevention. This is the standard result of economic analysis in tort law (see, e.g., Shavell 1980). Some have therefore qualified tort law as the primary reaction to catastrophic personal injuries (Landes & Posner 1984). If the tortfeasor can be made to compensate for the damage he caused by the disaster, the goal of efficient prevention will be reached (meaning that the tortfeasors will take efficient preventive measures) and corrective justice is achieved, since the costs are borne by the one who created the risk.

In cases of disaster, however, the question arises whether tort law even applies, and if so, whether negligence or a strict liability rule should be followed. The availability of tort law will largely depend upon the cause of the catastrophe. Since natural disasters are often deemed “act[s] of God,” the only applicable theory is often the failure to take adequate preventive measures or to give adequate warnings (e.g., in cases of flooding), and often the only liable party is the government.³ Beyond this partial governmental responsibility, the scope of liability law will be very limited. The situation is different, however, in cases of technological disaster, where the damage may be more directly attributable to causes that are “man made.”⁴

Several arguments have been formulated in the economic literature that a strict liability rule is appropriate in case of ultrahazardous activities (such as running a nuclear power plant or a petrochemical company) that can be located as the precise source of a given technological disaster.⁵ However, the literature equally indicates that strict liability is efficient only if the

insolvency problem can be cured; if not, it may lead to underdeterrence (Landes & Posner 1984; Faure & Grimeaud 2003: 35–36). Hence, from an economic perspective, strict liability should be introduced only if solvency can be guaranteed. This follows from the economic literature on the so-called “judgment-proof” problem, which indicates that insolvency of the tortfeasor will lead to underdeterrence (Shavell 1986). Therefore, it has been held that compulsory liability insurance should be introduced in cases where the potential loss caused by the disaster may exceed the injurers’ assets (Kunreuther & Freeman 2001). There is thus a fairly strong economic argument in favor of a duty to purchase financial coverage, since the magnitude of the damage caused as a result of a disaster can greatly outweigh the assets of the individual tortfeasor.

B. THE LAW

Where victims suffer harm as a result of a catastrophe, most of the personal injury damage will be covered (although not completely) in European legal systems through social security (Magnus 2003). Victims will therefore use tort law only for the part of personal injury damage that has not been compensated through social security (usually pain and suffering and the income loss that is not covered under social security). Moreover, property damage is usually not covered under social security, although victims may have purchased first-party insurance. In Europe, tort law is therefore often used by subrogated (social) insurers who have first provided compensation to the victim. To the extent that these social security carriers use tort law effectively against injurers, adequate incentives can still be provided. Nevertheless, given the high costs of these recourse actions there is a tendency by (social) insurers in some countries not to use these rights of redress against injurers. That may lead to underdeterrence.

The extent to which tort law can effectively be used by accident victims (or their insurers) seems to play (at least implicitly) an important role in many legal systems, at least where one examines the general structure of the law concerning financial compensation in the wake of catastrophes. Most legal systems make a clear distinction between natural disasters and technological catastrophes.⁶ Given the different role of tort law in both cases, this makes a lot of sense. Indeed, as indicated, in cases of natural disaster, tort law will (with the exception of government liability) usually play a very limited role, which is why in such cases other solutions are developed. In case of technological disaster, liability law may well be the primary system, given that these are usually man-made.

As far as tort law is concerned, one can also—notwithstanding clear differences—notice a tendency in many European legal systems to introduce strict liability for technological risks.⁷ This seems to comply with the economic model. Nevertheless, there are important differences that remain.⁸

In addition, one can note an increasing tendency to impose obligations upon potential injurers to seek financial coverage, although important differences

also apply. For example, compulsory environmental liability insurance exists effectively only in Germany and Sweden.⁹ Compulsory liability insurance for the risk of fire in public places, such as night clubs and restaurants, exists in Belgium but not in the Netherlands. This led a Belgian commentator to the conclusion that were the tragic fire to have taken place in a bar in Volendam (the Netherlands) on New Years Eve in 2000 in Belgium, victims would have been compensated largely through the compulsory liability regime (Van Schoubroeck 2002).

In sum, these mandatory solvency guarantees could be used at a much greater level to guarantee that the potential tortfeasor who causes the technological disaster can also meet his financial obligations (see also Faure & Hartlief 2003: 211–19). For instance, in the Netherlands, following the explosion of a fireworks factory in Enschede on 13 May 2000 that caused nineteen deaths and one hundred fifty injuries, the question was whether the licensee of such a factory should not be under the obligation to purchase some form of financial coverage, which was not the case when the explosion occurred (Hartlief 2003: 58–59).

However, even where solvency guarantees can be introduced to a larger extent and where the amounts of mandatory coverage can be increased, this will still not guarantee full compensation (and thus full deterrence) in all cases. This is, of course, the case where the catastrophe has not been caused by an identifiable injurer (mostly the case with natural disasters). Even when a liable injurer is fully (compulsorily) insured, the available amounts may still be insufficient to provide full coverage for damage caused by a technological disaster. Moreover, a negligence rule may provide *ex ante* deterrence, but if the injurer followed the due care required from him, there is no liability and hence no compensation *ex post*. Therefore, other solutions should be looked for to achieve both deterrence and (if this is a political desire) compensation for victims. As far as prevention is concerned, safety regulation is, in the law and economics literature, the logical reply to the inadequacy of tort law (Shavell 1984a, 1984b, 1987: 277–90). Thus, one can find in several European countries regulatory interventions that are aimed at the prevention of catastrophes by imposing all kinds of regulatory duties and introducing licensing systems for risky activities. Discussion of such preventative regulatory measures is, however, beyond the scope of an article focused on victim compensation. We therefore turn next to an approach for compensating victims when liability (insurance) fails.

II. FIRST-PARTY INSURANCE

A. POTENTIAL

The merits of various first-party insurance schemes have been well described in the economic literature. It has particularly been argued that first-party

insurance schemes have the advantage that they allow a much better adaptation of the premium and policy condition to the risk and thus a better risk differentiation than is the case with liability insurance. This point has been, in particular, advanced by Priest (1987).¹⁰ Thus, through a control of moral hazard by the insurer (i.e., increasing the premium for bad risks), risky activities (building a house on a flood plain) could be avoided. Many other law and economics scholars have highlighted the advantages of first-party insurance as well (Bishop 1983; Epstein 1985, 1995). Moreover, it is possible to see in various areas an increasing tendency to move away from third-party liability insurance towards first-party or direct insurance schemes.¹¹

It therefore comes as no surprise that many potential victims of disasters also seek coverage through first-party insurances. These can take the form of either generalized accident insurance coverage (in case of personal injury), or they can cover specific property damage. In most legal systems, the general accident insurance coverage provides coverage for specific costs that a victim would incur as a result of an accident. Depending upon the policy, this can be lost income, coverage of (additional) medical expenses, and, in some cases, pain and suffering.¹² These policies, which focus on personal injury compensation, do not usually make a distinction as to whether the source of the accident is a catastrophe or not. Hence, well-informed potential victims can purchase coverage according to their own degree of risk aversion and corresponding demand for insurance, assuming that competitive insurance markets offer those policies.

Until recently, this was not the case in many European legal systems, as far as the coverage for property damage was concerned. Many of these policies contained (at least in some countries) exclusions for property damage caused by a natural disaster. This finding merits some further attention. The question particularly arises as to whether there is a demand for these disaster insurances (II.B), whether they are actually supplied (II.C) and whether there would be reason for regulatory intervention (II.D). Some examples are discussed as well (II.E).

B. DEMAND?

A first question that inevitably arises is whether there is a demand by the public for coverage against damage caused by catastrophes. Firstly, one should distinguish in this respect between personal injury damage and property damage. One could imagine that potential victims would be averse to the risks of personal injury; or, one can at least argue that *ex post* personal injury will make victims unhappy, which may explain a need for seeking *ex ante* protection.¹³ On the other hand, they will probably not have much incentive to purchase additional first-party insurance, at least in systems where personal injury is largely covered through the social security system. As mentioned, this is largely the case in Europe.

The latter is not the case for property damage. One would expect a larger demand for coverage against property damage, especially property damage

caused by catastrophes. The differences between the European legal systems in that respect seem to be quite large. In Germany, for example, the recent flooding of the Elbe in 2002 revealed that only a very small percentage of victims had insurance coverage (Magnus 2005). This corresponds to the finding that there is generally no adequate demand for these types of flood insurance (Kunreuther 1996; Zeckhauser 1996: 135) or for earthquake insurance (Kunreuther, Doherty, & Kleffner 1992). Moreover, in the wake of hurricane Katrina, only a low percentage of house owners had flood insurance.¹⁴ The lack of adequate insurance coverage for damage caused by flooding is not a problem of a lack of supply but of a lack of demand (Nell 2002). Endres, Ohl, & Rundshagen (2003) have recently held that the lack of adequate insurance coverage may be the result of a lack of demand, which stems from the lack of aversion to these flooding risks. Several phenomena may explain the low demand:

Firstly, there is overwhelming evidence from psychologists and behavioral law and economics indicating that low-probability events, such as the risks of natural hazards, are systematically misjudged (Slovic 2000). Experiments showed a too limited adjustment to natural hazards as a result of *inter alia* bounded rationality (for a summary, see Slovic 2000: 1–50) and because of “probability neglect”: we ignore low-probability, high-damage events (Sunstein 2002: 50–52). Moreover, American research shows that individuals tend to take an “it will not happen to me attitude” (Kunreuther 1996: 175; Epstein 1996: 293; Zeckhauser 1996: 115).

Secondly, psychological experiments show that people may *ex ante* prefer uncertain losses, rather than the certain loss incurred by paying the premium (Kahnemann & Tversky 1979; Slovic et al. 1977). Kunreuther demonstrated this more particularly in regards to the decision to purchase insurance against the risk of flooding (Kunreuther 1978; Schoemaker & Kunreuther 1979). Insurance is considered an investment. People prefer to insure against high-probability, low-damage events, since this gives them a good chance of a monetary return (Slovic 2000: 62–71). The problem according to this literature is that *ex ante* the potential victim (a house owner) is confronted with the certain loss of a premium, whereby the expected damage in case of flooding can only be estimated and therefore constitutes an uncertain loss. There is, in other words, a low expectation of a return on the “investment” during a lifetime, and hence there is low demand.

The lack of demand postulated above suggests that this is also the case in Europe (Schwarze & Wagner 2004). Endres, Ohl, and Rundshagen rightly indicate that whether there is risk aversion against disasters, such as flooding, should be the subject of further empirical research. In any case, they stress the point that it is too easily accepted (at the policy level) that there is risk aversion where this may not always be the case. In the case of the flooding of the Elbe, the lack of demand could be explained by the lack of supply of flood insurance on the German market. Note that the available empirical research in this domain indicates that the low demand is caused by two distinct

phenomena: the psychological inability to process certain information on risks of catastrophes and the simple unwillingness to obtain insurance coverage.

Other literature indicates that a low demand for disaster coverage should not come as a surprise, since victims count on *ex post* government relief (Epstein 1996; Harrington 2000). This provision makes it harder for markets to function, and market failure becomes a self-fulfilling prophecy as a result of misguided regulation (see Epstein 1996: 305).

C. SUPPLY

Even though it is questionable whether there is a high demand for the insurance of the consequences of catastrophes, such as a flood, there are definitely problems on the supply side as well. Insurers fear catastrophic losses given the uncertainties of the risk and the potential damage involved (Kunreuther 1996: 178–80; Kleindorfer & Kunreuther 1999; OECD 2005; Gollier 2005). For example, in the 1950s in the Netherlands, the Dutch insurers' association issued a so-called "binding decision" on all of its members prohibiting them from insuring flood and earthquake risks (the latter being relatively small in the Netherlands except for the area around Southern Limburg). Their argument was that these risks were technically not insurable, and therefore all its members should refrain from covering them. The arguments concerning the uninsurability seem highly doubtful, but they clearly violate competition law. At the time, European Commission Regulation 3932/92 of 21 December 1992 exempted many cartel agreements in the insurance world from the prohibition under the old article 85, section 3 of the Treaty Establishing The European Community, provided that certain strict conditions were met.¹⁵ This exemption was heavily criticized by law and economics scholars, who argued that competition policy should be fully applied to insurance markets as well (Faure & Van den Bergh 1995).

The binding decisions not to insure flood and earthquake risks not only limit supply (they effectively exclude it as a result of a cartel agreement), but they also violate the conditions of Regulation 3932/92. Consideration 8, preceding the exemption, states that standard policy conditions may not contain any systematic exclusion of specific types of risk without providing for the express possibility of including that cover by agreement. This is repeated in article 7(1)(a) of the exemption. The European Commission also issued a report to the European Parliament and to the Council on 12 May 1999 on the functioning of exemption Regulation 3932/92 (COM 1999). In this report, the Commission explicitly discusses these so-called binding decisions. The report states that as a result of the questions raised by the Commission, the Dutch Association of Insurers decided to bring its binding decision into line with article 7(1)(a), by converting it into a nonbinding recommendation, leaving each insurer free to extend cover to flood risks.¹⁶ This Dutch example shows that a lack of supply of insurance coverage may be the result of anticompetitive behavior by insurers who mutually agree not to cover particular catastrophic risks.¹⁷

At the policy level, this shows that the first condition for insurability of catastrophic risks is a competitive insurance market that offers a variety of differentiated insurance policies in response to a corresponding demand. Instead of direct government intervention, the first reaction of government should therefore be to guarantee an adequate competition policy with respect to insurance markets. Without this, uninsurability may, as the Dutch example shows, simply be the result of a cartel agreement.¹⁸

However, there can be many problems in the supply of insurance for catastrophic risks. These relate to the “difficult to predict” the nature of the catastrophe (Gollier 2005). Insurer ambiguity may thus limit insurability (see Kunreuther, Hogarth, & Meszaros 1993). In addition, the magnitude of the damage of a given catastrophe may outweigh the capacity of the private insurance market, even if the possibilities of co- and reinsurance are taken into account (see Faure & Hartlief 2003: 88–94; OECD 2005). Also, in some cases insurers may impose very restrictive exclusions (or charge high premiums), for example, to someone living in an area subject to earthquakes or hurricanes. This may effectively reduce the availability of catastrophe insurance.

C. COMPULSORY INSURANCE?

The economic rationale behind compulsory (liability) insurance was the externality argument: in the absence of adequate insurance, injurers could (through their insolvency) externalize risk. As was indicated in Section I.A, that may be an argument in favor of compulsory liability insurance. However, the argument for compulsory liability insurance is not particularly convincing in the case of first-party insurance, where one can argue that victims that are not adequately insured for personal injury can then call extensively on the healthcare system and thus “externalize” that risk. Yet, given that most European legal systems provide (through social security) wide coverage for healthcare (precisely through mandatory healthcare insurances), it is difficult to see why that should be supplemented with an additional compulsory accident insurance. The same is true for the property damage that victims may suffer as a result of a (natural) disaster. While the absence of insurance may lead to additional calls from victims on government relief (and as a result of political pressure caused through a large number involved they may succeed), there is no direct issue of externalization of their harm.

The second traditional economic argument in favor of compulsory insurance is that of information problems. This assumes that citizens are not averse to the risk of large damage as a consequence of catastrophes, and would be willing to pay a premium to have that risk removed from them, but simply do not purchase insurance because they lack information on the probability and magnitude of the risk and/or on the availability of insurance. Given the result of psychological experiments, it could be argued that because of imperfect information, individuals are not fully informed

about their own preferences (Kaplow & Shavell 2001: 1332). Regulation would then be the classic remedy to cure an information deficiency (see generally Schwartz & Wilde 1979).

This could constitute an argument in favor of compulsory (first-party) insurance for property damage caused by natural disasters, where empirical evidence showed that victims greatly underestimated these risks and would, being well informed, demand insurance (Kunreuther 1968). Or one could take into account the results of happiness research and argue that people might experience higher life satisfaction or subjective well-being if *ex ante* arrangements guaranteeing financial compensation after disasters could be made.¹⁹ Support for a regulatory duty to insure against disasters, in addition to voluntary housing insurances (such as is the case in France), can also be drawn from behavioral experiments that show that where disaster insurance is sold along with insurance against likely losses (like housing insurance) at a reasonable extra cost, this will lead to more people taking out insurance against low-probability loss (see Slovic et al. 2000: 60–61 and 70–71).²⁰ Thus, this literature concludes that if it is in society's best interest for people to insure themselves against unlikely calamities, then adding protection against a small but likely loss might help accomplish this purpose.

There are, however, drawbacks to such a duty:

First, the limited empirical evidence available that was discussed in Section II.B showed that it is not only the lack of information on risk that causes the low demand for insurance, but rather bounded rationality linked to the idea that “it will not happen to me” (Kunreuther 1996: 175), combined with the unwillingness to pay a premium for an unlikely hazard. The question thus arises whether forcing people to take out disaster coverage should not be considered as paternalistic.

Second, if, on the contrary, one assumes that potential victims are poorly informed as to their potential exposure to disasters and the benefits of first-party insurance, regulatory intervention should instead focus on mandatory disclosure of such information to potential victims rather than mandatory coverage. Again, this is supported by behavioral experiments, which show that graphic presentations may—to some extent—increase the perceived risk of that hazard (Slovic, Kunreuther, & White 2000: 15; Slovic 2000: 70–71).

Third, if a duty to purchase “disaster coverage” were to be introduced for all victims, those who do not run any risk may be at a disadvantage. Taking the example of flood insurance, one can imagine that a person living in a house close to a river might desire flood insurance, where someone living in a twentieth-floor apartment far from a river will not. A generalized duty to purchase insurance coverage would therefore force all individuals to take insurance coverage, even where they run no risk at all. This could thus create inefficiencies and lead to a cross subsidization, whereby those who run no risk contribute to the premiums of those who may actually benefit from the

insurance coverage. A more efficient (and fairer) solution may therefore be that compulsory coverage (e.g., for flood risks) is limited to those individuals who actually are exposed to the particular risk.

It is sometimes held that compulsory insurance for disasters may be necessary to avoid the risk of adverse selection, meaning that only the bad risks would purchase insurance coverage. Thus, it has been held that in order to make the risk insurable, good risks should also be covered and thus disaster insurance (for instance, for flooding) should be made compulsory.²¹ This is indeed a crucial issue that merits some further attention in relation to the insurability of the disaster risk. The remedy against adverse selection is, of course, a pooling of risks, whereby the insurer should have both good and bad risks (Schwarze & Wagner 2004). However, it seems wrong to suggest that disaster risk is only insurable if everyone, even those who run no risk at all, is forced to purchase insurance coverage. Adverse selection can also be avoided if only those who are exposed to the risk are forced to take the mandatory coverage (Priest 1996: 225–26). Within the group that is actually exposed to risk (and presumably has a demand for insurance), an adequate differentiation of risks and premiums, as a remedy to adverse selection, is possible.

Fourth, economists always warn that introducing a duty to insure may be efficient only if sufficient competition on the particular insurance market exists. Where this is not the case, the introduction of a duty to insure creates a dependency, as a result of which the (concentrated) insurance market can de facto decide the conditions at which to sell its product. Obviously, in a monopolistic market compulsory insurance will create inefficiencies.²² Further, even if mandatory coverage is introduced, sufficient room should be left for competition. Hence, the additional premium for the disaster coverage should not be fixed by law but should be the result of competition in this respect between insurers.

Fifth, some particular catastrophic risks may be so “new” that insurance markets may not yet have developed an insurance to cover them. If a differentiated supply of insurance policies is limited, one could again question whether it makes sense to introduce mandatory insurance, if such coverage could only be found to a limited extent (or without sufficient competition) on private insurance markets.

D. EXAMPLES

The most well-known example of mandatory first-party insurance is probably the French model, according to which all individuals who have taken out first-party property damage insurance policies have to pay a supplementary premium for a mandatory coverage for natural disasters. Thus, France does not have a generalized duty to insure but a compulsory complementary coverage on (voluntary) property damage contracts. However, those property damage policies are widespread, and all individuals who purchase such a

policy have to pay for the additional coverage for natural disasters.²³ This system is apparently accepted in France, because the risk of cross-subsidization may be small: France seems to be confronted with many types of natural disasters. This means that if one is (as inhabitant of an apartment on the twelfth floor) not exposed to the risk of flooding, one may be at risk from other natural disasters, such as earthquakes or heavy storms.²⁴

Belgium has moved to a similar model: Belgium has had a compensation fund for disasters since 1976; as a result of a legislative change in May 2003, a compulsory flood coverage has been introduced in addition to the voluntary property damage insurance contracts. The Belgian model appears at first to ape the French system, but the major difference is that this mandatory supplementary coverage applies only for specific risk areas. This thus avoids a negative redistribution, as those who are not exposed to the risk are not forced to take out the coverage.²⁵ Recently, this system was again changed, and Belgium now follows the French model of mandatory disaster coverage. In Belgium the disaster coverage applies to voluntary fire insurances.²⁶ In Italy and Germany, legislative initiatives looking at some form of mandatory coverage against damage caused by disasters are currently under discussion (Faure 2006: 442–44).

Note, moreover, that in France, as a result of the explosion in Toulouse on 21 September 2001, a legislative change was enacted in July 2003 that ensures that victims now also have additional compulsory coverage for damage caused by technological risks (such as the explosion in Toulouse). The benefit of this change is, however, debated (also in France). It is not so clear why a mandatory coverage for victims was introduced²⁷ for technological disasters, when a liable wrongdoer can be identified, where the introduction of solvency guarantees on the side of the wrongdoer, such as compulsory liability insurance, could have been examined instead.

E. OUTLOOK

In sum, there seems a clear tendency in many European legal systems towards some form of compulsory coverage of the consequences of disasters on a first-party basis. This tendency is now also followed in the United States. After hurricane Katrina, a model of Comprehensive Natural Disaster Insurance, similar to the French model, was proposed by Kunreuther (2006). This mandatory coverage can be criticized from an economic perspective, since it is not sure that there is in all cases an effective demand for such coverage. However, this problem can at least be reduced (see the example of the legislative change in Belgium in May 2003) if the duty to obtain coverage is limited to those individuals actually exposed to the risk. This enables an adequate risk differentiation and avoids forcing people to purchase coverage for which they have no demand. It can also avoid a negative redistribution. The cost of identifying those groups that are especially exposed to the risk and to whom the mandatory coverage should thus apply may only be

prohibitive in a (small) number of cases. If the administrative costs of this differentiation are higher than the benefits, a generalized mandatory coverage (like in France) may be warranted.

Even though these regulatory interventions can be questioned from an economic perspective, one should realize that politicians will (given the high number of voters involved) always have the tendency to provide some form of compensation where a large number of victims are affected by a disaster. In that respect, the solution of some form of mandatory coverage for those who actually run the risk seems—as will be indicated in Section IV—better than ad hoc or structural fund solutions, whereby public means are randomly used to compensate victims (cf. Priest 1996; Kaplow 1991). First-party insurance at least guarantees that victims pay themselves for the compensation they will afterwards obtain. Moreover, through an adequate risk differentiation, first-party insurance may have some preventive effects.²⁸ Thus, the mandatory coverage for disaster risks, whereby the government relies on the insurance market to provide coverage, seems a better regulatory solution. Government relief programs have been insufficiently able to provide the same level of incentives for prevention (Priest 1996; Epstein 1996: 297) that risk differentiation under insurance does. If government compensation is available, people may be encouraged to (re)build in dangerous areas. Insurance can exclude this through risk differentiation.

Behavioral law and economics also provides support for mandatory coverage for low-probability, high-damage events (like natural hazards) being included in one “package” with higher-probability events. All of this, however, assumes that coverage can be made available via competitive insurance markets. If that condition is not met, making insurance compulsory would be a bad policy option. In this respect, a problem arises with the French/Belgian solution from the angle of competition law: here, those who voluntarily purchased property damage contracts are also forced to take the mandatory coverage for disaster insurance. This so-called tie-in agreement, forcing a consumer to buy a specific service/product together with another product, may well violate the conditions of the exemption agreement concerning the application of competition law to insurance markets.²⁹ On the other hand, an outright duty on all citizens to purchase disaster insurance may be hard to enforce. In addition, the regulatory fixing of the additional premiums for the disaster coverage (as is the case in France) may seriously restrict compensation. This is thus an issue that merits further research.

Where such a system of mandatory coverage for disaster losses is in place, one could assume that this should be able to provide adequate compensation. However, that may not always be the case where losses are extremely large. The amount of damage caused can sometimes be so high so as to outweigh the means of an individual insurer or of the national insurance market altogether. The question then arises as to whether additional public intervention is warranted.

III. GOVERNMENT PROVIDED COMPENSATION

A. FUNDS OR AD HOC?

Government intervention in cases of financial compensation after catastrophes can take different forms. The most modest form is, in addition to providing regulation for the prevention of disasters, to impose, where warranted, a duty to purchase (third-party or first-party) insurance coverage. This intervention is less modest where the government provides direct compensation to the victims of catastrophes, for example via a fund. Another alternative for the government would be to engage in facilitative strategies, for example acting as reinsurer for the larger risks.³⁰ Where the government simply provides compensation through the public purse, the question arises first of all whether a structural arrangement should be put in place or whether ad hoc solutions should be preferred, whereby the government decides in each case, depending upon the size of the catastrophe, whether public funds will be made available or not. In this respect, the economic and legal approach seems to differ. Economic literature, e.g., Gron & Sykes (2002), argues that a structural fund may provide the wrong signal to the market. If market participants are aware that when a catastrophe occurs, the financial consequences will be covered through government intervention, this will provide them with little incentive to develop financial solutions themselves. In addition, Endres, Ohl, and Rundshagen indicate that compensation by the state dilutes any incentive to “self insure” by the victim or to take preventive measures in the framework of an effective risk management. Those who can be certain that they will be compensated by the state are better advised to keep the insurance premium in their pocket and free ride on the state, so they hold (Endres, Ohl, & Rundshagen 2003: 290).³¹ If the state simply provides full compensation *ex post*, this will dilute any *ex ante* preventive effect that one would normally expect with differentiated insurance premiums.³² In the words of Gollier: “Solidarity kills market insurance” (2005: 25).

Lawyers, on the other hand, stress that the ad hoc solutions create legal uncertainty. For one catastrophe an ad hoc solution may be introduced but for another not (Huls 2002). German scholars, for instance, hold that the German legislator provided very generous compensation for the victims of flooding through the so-called *Flutopferhilfesolidaritätsgesetz* after the 2002 Elbe-flooding (up to 8,1 billion €!), but that this, on the other hand, creates a great inequality vis-à-vis other victims of catastrophes (or other accidents!) where this ad hoc generosity does not apply (Magnus 2006; cf. also Zeckhauser 1996: 114). The disadvantage is not only the possible violation of the equality principle in applying ad hoc solutions (Bloembergen 1992) but also that the procedures, amounts of compensation, etc., will be different for every ad hoc case. Lawyers therefore plead, in the interest of victims, for a uniform and structural arrangement, so that victims know whether they

are entitled to compensation after a catastrophe or not.³³ However, it is precisely that certainty that economists would like to avoid, of course, since it dilutes any incentive to develop adequate market solutions. Schwarze & Wagner (2004) indicate that here one discovers the crucial difference between the economic and the European legal approach: law and economics suggests denying all help to individuals living in risky areas in order to provide them with an incentive to develop insurance solution themselves (Epstein 1996), whereas this strategy would probably be incompatible with the concept of the welfare state, as this applies to most EU-member states (Schwarze & Wagner 2004).

This difficulty suggests again that it might be more advisable to look first for (mandatory) coverage of disasters through insurance, ultimately backed by reinsurance through the state (see Section IV). If that functions adequately, ad hoc or other structural solutions (with all of their difficulties) could be avoided. Indeed, the law and economics literature is generally not so enthusiastic concerning the use of compensation funds. Although the literature is rather scarce in this respect,³⁴ it is usually claimed that there are few reasons why, if both insurance and funds were, in theory, available, a compensation fund would provide better protection against insolvency than private insurance markets. Insurance, so it is generally held (see especially Priest 1996; Kaplow 1991), better enables an adequate risk differentiation and risk spreading, and if insurance markets are competitive, insurers can be assumed to be better able to deal with classic insurance problems, such as moral hazard and adverse selection than the administrators of a compensation fund.³⁵ Government-provided compensation therefore should only come into the picture if insurance is not able to provide coverage for certain risks. Yet, as indicated earlier, the preferred solution would be first to examine whether the functioning of insurance markets could be facilitated.

Of course, in practice, the real difference between structural and ad hoc solutions can be small. For instance, in Italy, *ex post* compensation is formally ad hoc (there is no disaster fund), but, de facto, the government always provides compensation after a disaster so that potential victims equally count on it and adapt their behavior accordingly. In those cases, the same problems will arise as with structural funds.

B. COMPENSATION FUNDS: ECONOMIC PREREQUISITES

Although it follows from the above that in economic analysis of law there is little enthusiasm for compensation funds (and a preference for insurance), a few indications could be given on how such a fund should be shaped, if instituted at all.

First of all, it seems important that a fund should have a subsidiary character, meaning that whenever other solutions are available (tort law or insurance), victims should be forced to use these first. Thus, at least some

guarantee can be given that incentives for victims to look for other solutions will be maintained and that they will not merely free ride on the fund. Obviously such a “subsidiary character” will be more important where a third party can be held liable (as with technological disasters) than where no liable party can be indicated (in the case of natural disasters). Moreover, the mere existence of the fund can, as was rightly indicated by Epstein (1996), dilute the incentives to develop insurance solutions. Therefore, the requirement that if insurance is available, this must be used first may not mean a lot in practice, where structural funds exist. Indeed, why should the potential victim pay a premium for insurance coverage if there is certainty of an *ex post* payment through the public purse?

Second, if nevertheless a payment is made through a compensation fund, that fund should be subrogated in the rights of the victim against potentially liable third parties. Indeed, it may be that for political reasons (or out of sympathy for the victim), the fund manager does not consider it reasonable to expect the victim first to use the liability system.³⁶ If in those cases, compensation is paid notwithstanding the potential of a claim in tort, the fund should be subrogated in the rights of the victim in order to provide adequate incentives for prevention for the wrongdoer.

Third, as far as the financing of the fund is concerned, this should ideally be organized in such a way that those who contributed to the risk also finance the compensation fund. With technological disasters, this idea might still (partially) be realized, for example, through a tax on risky activities. However, in many cases of catastrophes, there are no identifiable wrongdoers or contributors to the risk. In those cases, it is merely a political question as to whether one wishes to allow potential victims to partially pay for their compensation themselves, or whether one prefers a national solidarity solution through the public purse. For instance, in cases of flooding (assuming that one rejects an insurance solution), one could imagine that a potential compensation fund would be financed by those who are particularly exposed to the risk of flooding. That may well be the better solution from a distributional perspective. However, as we indicated above, people may have different views on that. Some will consider it a matter of national solidarity that victims of (natural) disasters are compensated, and, in that case, they will require financing of the fund through the public purse, meaning that the consequences are redistributed via all taxpayers.

Finally, in order to keep at least some incentives with potential catastrophe victims, it seems important that the compensation fund does not provide full coverage so that victims themselves are still partially exposed to the risks. This is—as well-known—one of the classic remedies against moral hazard (Shavell 1979). This could be reached either by applying a deductible or by applying standardized forms of compensation (which are usually lower than full compensation). However, as was indicated in Section II.E, insurers are generally better able to control moral hazard than a government-operated fund (Priest 1996; Zeckhauser 1996, note 34).

C. EXAMPLES

As indicated in the introduction, the experiences with compensation funds for catastrophes are quite diverse. Countries like Germany, Italy, the Netherlands, and Sweden have no structural compensation fund but usually work with (rather generous) ad hoc solutions (see Faure & Hartlief 2006). These ad hoc solutions show all of the disadvantages indicated by lawyers. For instance, in the Netherlands, ad hoc compensation funds were established following an infection by legionella, after a fire in a bar in Volendam, and in the wake of the explosion at a fireworks factory in Deventer. Although there are some similarities, the procedures and amounts awarded differ. In Italy, very generous ad hoc compensation is provided, to the tune of an average €3.5–4 billion per year, to indemnify damage caused by catastrophic events (Monti & Chiaves 2006). In Germany, a specific fund was established following the disastrous flooding of the Elbe in 2002, which paid out €8.1 billion in compensation. Formally, the fund had a subsidiary character, meaning that other possible compensation mechanisms should have been activated first. However, victims of the flooding in (former East) Germany seemed to possess very little first-party insurance coverage, so that generous (but standardized) compensation was instead awarded through the fund.

France, interestingly enough, has no compensation fund for natural disasters. There, the system of mandatory additional coverage on the voluntary property insurance, combined with reinsurance by the state, has apparently removed the need for an additional compensation fund. France merely has a (very generous) compensation fund for victims of terrorism.³⁷

Belgium has had a fund solution since 1976, which applies a deductible and has standardized (limited) amounts. The fund is completely financed through the public purse, but the amounts paid out during its twenty-five years of existence are relatively modest (as, for example, compared with the amounts paid out in Germany after the Elbe flooding in 2002). It is nevertheless interesting to stress that the role of this general compensation fund in Belgium was drastically changed in May 2003, and Belgium turned to the French solution of an additional mandatory coverage on voluntary insurance policies. It thus seems that one of the few countries in which a compensation fund for catastrophes existed in Western Europe has recently undertaken a revision, whereby insurance seems to be the preferred solution for the today. Another European country that has a structural compensation fund is Austria. However, the Austrian fund only covers a relatively limited part of the damage.

IV. FACILITATIVE STRATEGIES

Instead of providing direct compensation, the government could also play another role in the provision of financial compensation to victims of

catastrophes. Where the failure of insurance markets is largely seen as a supply problem (see Section III.C), the government may intervene actively to facilitate the functioning of the private insurance market. This could take various forms. In some cases, the government may act as insurer of last resort; in other cases, the government could provide reinsurance in cases where capacity on the traditional reinsurance market is lacking.

A. CRITICISMS

Although at first sight a facilitative strategy seems more appealing than direct compensation by the government, both economists and legal scholars seem to be relatively critical towards this model. Chicago law and economics scholars Gron & Sykes (2002) are fairly critical as far as a role for government as reinsurer is concerned. They argue that it would be unjust for the government to provide (re)insurance at a lower price than the market price. This would also give the market the wrong signal as far as stimulating insurability is concerned. They are—remarkably—in favor of ad hoc solutions, whereby compensation is provided to accident victims on an *ex post* basis. This at least avoids the situation where market participants are aware that the government will anyway guarantee compensation. Further, Dutch lawyers Ammerlaan & Van Boom (2003) have been rather critical of the decision of the Dutch government to participate in reinsurance against terrorism. They argue that the premium that will be demanded is not the correct market premium. Moreover, they argue that it should not be the task of the state to provide private insurance. Damage caused as a result of terrorism, so they hold, should be financed through the public purse (*ibid.*).

B. EXAMPLES

Notwithstanding these criticisms, there are many examples where states act as reinsurer or at least provide some guarantee of last resort. This phenomenon is, of course, not new. In the nuclear liability conventions of the 1960s, a compensation system consisting of various layers was introduced, whereby a part of the damage was to have been paid by the liable licensee of the nuclear power plant, a second layer by the state, and a third layer by all contracting parties.³⁸ After 11 September 2001, when airline risks became more difficult to insure, the U.S. federal government also guaranteed insurance coverage (see Abraham 2004). Similarly, in Germany, a reinsurance company called Extremus was established to cover the risk of terrorism, with a state guarantee for amounts above €3 billion and up to €10 billion. A similar model was recently also introduced in the Netherlands in reaction to 11 September 2001.³⁹ In the United Kingdom, as well, reinsurance for terrorism risk is provided through Pool Re (see Huber & Amodu 2006). The Dutch reinsurer relies heavily on intervention from the state through reinsurance, and the same is the case in the United Kingdom. France has

had the *Caisse Centrale Réassurance* (CCR) for many years, which provides reinsurance via the state and even provides for unlimited coverage (in reinsurance) for natural disasters and technological risks.⁴⁰

Particularly interesting private-public partnerships exist both in the United Kingdom and in the United States. For instance, in the United Kingdom, insurers concluded a gentlemen's agreement with the state in which they guaranteed the government that, for residential properties, they would not refuse to offer flood insurance (Huber & Amodu 2006). Similarly in the United States, highly interesting examples exist of (federal or state) government intervention to act as insurer of last resort or even as primary risk bearer. For instance, the California Earthquake Authority (CEA) assumes primary risk-bearing responsibility for the earthquake risk. The private insurer plays an exclusively administrative role, and the risk is taken over by the CEA. A similar model has been developed within the National Flood Insurance Program (NFIP) (for details, see Rabin & Bratis 2006).

C. OUTLOOK

The critical attitude of economists and some lawyers does thus not correspond with legal reality. The question indeed arises whether a model of reinsurance guaranteed by the state is as bad as suggested. Where capacity on the private insurance market is falling behind (which may indeed be the case where the amount of the damage resulting from a catastrophe is large), reinsurance by the state seems an adequate method to resolve the uninsurability.⁴¹ In such cases, the government supplements the market where insurance capacity fails. On the condition that the government charges an actuarially fair premium for its intervention, there seems to be virtually no objection to this. These are also the arguments advanced in the United States in favor of government intervention: without intervention, it might have been impossible for individuals to obtain insurance coverage; others argue that the flipside of this government intervention is that it distorts the normal functioning of insurance markets. The main argument in favor is that the government only temporarily intervenes to fill a gap that was created in private insurance coverage. Since governments do not provide coverage themselves but through insurance companies, a market is nonetheless created in which private insurers are able to compete (see Rabin & Bratis 2006).

Such type of intervention seems, moreover, preferable to collective solutions like funds sponsored through the public purse. Where the government acts as reinsurer, this at least has the advantage that a premium can be paid by those who actually cause or run the risk. This type of government intervention thus facilitates market solutions and avoids a negative redistribution. The argument by Gron & Sykes (2002) that ad hoc funds would be better than reinsurance is thus hardly convincing: it is particularly these ad hoc solutions on which victims can reliably count that may provide the wrong signal to market participants (see equally Epstein 1996; Kaplow 1991; Schwarze &

Wagner 2004). Of course, such a state intervention as reinsurer should still leave the freedom with the individual insurer to use the possibility of this state-reinsurance or not. A requirement to use state-provided reinsurance might again endanger competition on insurance markets.⁴²

Comparing once more the role of government as guarantor of a hand-out or facilitator, there are very few economic reasons for a compensation fund for catastrophes, provided that an insurance system can provide adequate coverage. Most economic literature also has serious doubts concerning the efficiency of fund solutions. That these exist is the result of politicians' desire to satisfy the demand of a large number of voters. Given those pressures, it might be preferable to work out insurance solutions before a disaster occurs, eventually combined with reinsurance by the state, since these still facilitate private market solutions (Epstein 1996). If, nevertheless, compensation funds seem (politically) unavoidable (either ad hoc or structural), it seems important to safeguard incentives of both potential injurers (if any) and victims. This can be done by applying insurance principles (Kunreuther 1996) through, on one level, the financing of the funds (primarily by responsible contributors) and, on another, by maintaining partial exposure of the beneficiary of the fund to risk (via deductibles and upper limits on compensation).

V. CONCLUDING REMARKS

This article illustrates that law and economics methodology can be used in a meaningful way to structure the policy debate on the reform of compensation mechanisms for victims of catastrophes. Economics can help in showing what the most effective instruments to guarantee such compensation might be. As Priest notes, however generous governments may be, they all face serious budget constraints. Applying insurance principles may thus serve to maximize government coverage to best achieve its humanitarian ends (Priest 1996, 235).

European politicians seem to have understood Priest's lesson, and they increasingly use (mandatory) disaster coverage on first-party insurances, backed up with reinsurance by the state, when compensation of disaster victims is politically warranted. Moreover, in American literature—and even more so after hurricane Katrina—suggestions and arguments were formulated in favor of a comprehensive Natural Disaster Insurance (Kunreuther 1968, 2006). The insurance model clearly has advantages over the simple application of fund-solutions, which only invite potential accident victims to free ride on the public purse (Kaplow 1991). Hence, also in Europe, legislators seem increasingly aware of the lessons of the appropriate literature in adopting insurance solutions as a means of avoiding “catastrophic responses to catastrophic risks” (Epstein 1996). Moreover, even though it may be difficult to fit compulsory insurance into the traditional economic approach, behavioral

law and economics provides strong arguments for a mandatory coverage for low-probability events, together with insurance for higher-probability events. That is precisely the model followed in France for natural hazards.

Nevertheless, the insurance solution is not available in all contexts. For areas that are prone to natural disasters, private insurance may be unavailable or, where it is available, may be subject to restrictive exclusions. In such cases, ad hoc compensation by the government may simply be unavoidable.

In addition, several questions remain and demand further research. One is whether mandatory coverage is compatible with competition law. For instance, the tie-in character of the mandatory coverage and the mandatory fixing of the premium for the disaster coverage (as in France) seem debatable from a competition perspective.

The question also arises whether it is possible to limit the duty to obtain mandatory coverage to risky areas (as was originally the plan in Belgium) or whether this differentiation leads to substantial administrative costs that may not outweigh the advantages. But more importantly, the experience in the United Kingdom and the United States with facilitative strategies also shows that it may not be necessary to introduce mandatory coverage to provide an adequate solution. The facilitative strategies aim at remedying problems on the supply side. Thus, a sufficient supply of disaster coverage can be guaranteed, and individuals can choose to make use of this disaster coverage or not.

Although many questions remain, this article has shown that the rich law and economics literature in respect of disaster (insurance) can usefully inform the discussion of policy alternatives and thus enrich the policy debates on disaster relief.

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NOTES

1. Priest argues that many have the normative belief that providing disaster relief is one of the principal functions of government (Priest 1996: 235).
2. This is more particularly the case, *inter alia*, in France where different regimes exist for natural disasters and for technological catastrophes, with various first-party solutions, pooling, mandatory insurance and reinsurance through the state.

- To this complex system is then also added a specific compensation fund for victims of terrorism (see in this respect, *inter alia*, Moreteau & Lafay 2004).
3. The question of governmental responsibility was also raised after Hurricane Katrina. See Bier (2006) and Walters & Kettl (2006).
 4. Of course, to some extent, catastrophes are produced jointly by nature and humans (Zeckhauser 1996: 113).
 5. See, on the choice between negligence and strict liability for technological risks, among others, Schäfer & Schönenberger (2000); Endres & Staiger (1996); Monti (2001), and Pozzo (1996).
 6. This is more particularly the case in France, where different regulatory structures are in place for compensation after natural disasters than after technological catastrophes.
 7. For an overview, see the contributions in Koch & Koziol (2002).
 8. For instance, the French/Belgian systems go quite far in that respect by accepting a strict liability for damage caused by defective “things” (on the basis of article 1384, al. 1 of the Code Civil), whereas English law, for example, is far more restrictive in that respect (see von Bar 2000: 333–98).
 9. For an overview of the German system, see, *inter alia*, Richardson (2000), and for a description of the Swedish system, see Faure & Grimeaud (2003: 189–92).
 10. But was also criticized by Viscusi (1991).
 11. See for the area of environmental insurance, Faure (2002).
 12. This is more particularly the case in the French policy referred to as “Garantie contre les accidents de la vie.” This new insurance policy provides broad (first-party) compensation against accidents and compensates as if tort law were applicable, therefore including compensation for pain and suffering.
 13. See on the importance of happiness for economic analysis, Frey & Stutzer (2002, 2004).
 14. In Louisiana, the percentage of house owners with insurance ranged from 57.7 percent in St. Bernard’s to 7.3 percent in Tangipahoa. In Orleans, only 40 percent had flood insurance (Kunreuther 2006).
 15. For a comment on this exemption regulation, see Levie & Cousy (1994) and for a critical analysis Faure & Van den Bergh (1995).
 16. For further details, see Faure & Hartlief (2003: 222–25).
 17. This issue is now dealt with by Commission Regulation 358/2003 of 27 February 2003 on the application of article 31(3) of the treaty to certain categories of agreements, decisions, and concerted practices in the insurance sector, *Official Journal*, L53/8 of 28 February 2003.
 18. This is not to say that there may not be genuine problems with the supply of disaster insurance, but these are of course not remedied by a cartel agreement not to provide coverage.
 19. Frey & Stutzer (2002), and for a summary of recent research in this area, Frey & Stutzer (2004).
 20. It is equally held that compulsory insurance is a good example of a policy that can play a role in improving hazard perception (Slovic, Kunreuther, & White 2000: 25).
 21. This argument was, for instance, advanced in the Netherlands by the Dutch Insurers Association with respect to flood insurance. For details, see Faure & Hartlief (2002: 183–89).
 22. It has, for instance, in relation to environmental insurance, also been indicated that if one makes the availability of insurance coverage a prerequisite for the operation of an enterprise, insurance undertakings become the de facto licensors of the industry. This may be particularly problematic from a policy perspective if this happens on concentrated insurance markets (see Monti 2001: 65).

23. The supplementary coverage for disasters is financed through an additional premium of 12 percent on all property damage insurance contracts. See, for a description and critical analysis of this French model, also Schwarze & Wagner (2004) and Lafay, Cannarsa, & Moréteau (2006).
24. The same point is made by Schwarze & Wagner (2004): if previously distinct risks are pooled (like flood, windstorms, and hail), individual exposure to some risk would almost be guaranteed.
25. Through the charging of exposure-related premiums “cross-subsidization” between various areas could be reduced (Schwarze & Wagner 2004).
26. Act of 17 September 2005, *Moniteur Belge*, 11 October 2005. It seemed impossible to pursue the idea of limiting the mandatory coverage given the high (political) costs of identifying the special “risk areas” where the duty to insure would apply.
27. Again it concerns a mandatory supplementary coverage for damage caused by technological disasters on voluntary insurance contracts.
28. In the sphere of flood insurance, one can think of risk differentiation, whereby good risks would take adequate preventive measures and are rewarded with lower premiums and bad risks (those who chose to construct a house near to a river) are punished with a higher premium (see also Schwarze & Wagner 2004).
29. That was precisely one of the objections of the Italian competition authority against an Italian draft that provided for compulsory supplementary disaster coverage on the (voluntary) fire insurance. See on these problems from a competition perspective, Van den Bergh & Faure (2005).
30. See, on the demand for catastrophe reinsurance, Gron (1999) and Cutler/Zeckhauser (1999), as well as other contributions in Froot (1999).
31. A similar point that the incentives to insure against disaster losses will be diluted in case of government relief has often been made (Epstein 1996; Schwarze & Wagner 2004).
32. Kunreuther (1996: 177), however, points out that there is no empirical evidence that victims refuse insurance coverage because they count on *ex post* government relief. He therefore points at other reasons (discussed in Section II.B) for a lack of demand for disaster coverage.
33. See, for instance, also Ammerlaan & Van Boom (2003: 2336) and Schwarze & Wagner (2004): they argue that the concept of the welfare state essentially demands that anyone in serious difficulties be provided government assistance. That point may well justify social security systems (covering lost income and health care expenses), but it is highly questionable whether that also justifies public interventions for property damage.
34. An exception constitutes a few papers by Skogh (1982, 1989) and the American (critical) law and economics studies concerning superfunds (see, e.g., Revesz & Stewart 1995).
35. See, with an application to environmental insurance, Faure & Hartlief (1996) and, with respect to disaster insurance, Schwarze & Wagner (2004).
36. Using tort law to obtain compensation can indeed be very costly and take a long time.
37. It compensates for physical injury but does not have a subsidiary character: victims can directly call on the fund without first having to sue the terrorist in tort law. The fund is subrogated in the rights of the victim and can exercise redress against the terrorist.
38. For further details, see Faure (1995) and Trebilcock & Winter (1997).
39. *Nederlandse Herverzekeringsmaatschappij voor Terrorismeschade*.
40. For further information on this CCR, see <http://www.ccr.fr>.
41. This point of view is equally supported by Kunreuther (1992, 1996: 180–83), Harrington (2000), Schwarze & Wagner (2004).
42. That was another objection of the Italian competition authority against a bill that introduced compulsory disaster coverage with compulsory reinsurance.

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