CATASTROPHIC RISKS AND FIRST-PARTY INSURANCE

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ABSTRACT

Although the insurance industry demonstrates a growing concern about the severe rise in losses from natural disasters, only about one third of all potential victims have in fact purchased first-party catastrophe insurance. Although first-party insurance has several advantages, we find that there is indeed actually no demand for and supply of first-party insurance against natural catastrophes. Therefore, the central question we examine from a behavioral law and economics perspective is why so little use is made of the possibilities of first-party insurance and why first-party insurance can constitute a viable alternative to government compensation. Further, we consider whether compulsory first-party disaster coverage may be a solution. To conclude, we consider under which circumstances the further introduction of first-party catastrophe insurance should be applauded as a means to encourage potential victims to take control over their compensatory means while also benefiting from preventative incentives.

I. INTRODUCTION

The scope and frequency of catastrophes, natural or technological, is increasing. Moreover, recent studies suggest that global warming has resulted in the intensification of floods, draughts, tropical cyclones and
destructive hurricanes, one example being Katrina in the United States.\footnote{One of the expected effects of global warming is, as predicted by theory and modeling, an increase in hurricane intensity. This is not to say that there is consensus among scientists regarding the correlation between hurricane activity and climate change. See Alicia Rivera, *Katrina y Rita son hijos del azar. Entrevista con Kerry A. Emanuel, científico del MIT y experto en huracanes*, EL PAÍS, Sept. 25, 2005 (Colom.); Quirin Schiermeier, *Hurricane link to climate change is hazy*, 437 NATURE, Sept. 22, 2005 at 461 available at http://www.nature.com/nature/journal/v437/n7058/pdf/437461a.pdf. See generally reports from the Intergovernmental Panel on Climate Change, available at http://www.ipcc.ch/ipccreports/assessments-reports.htm; NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW xvi, 3 (Cambridge University Press 2008) (2007); P.J. Webster et al., *Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment*, 309 SCIENCE, Sept. 16, 2005 at 1844; Johnny C.L. Chan et al., *Comment on “Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment”*, 311 SCIENCE, Mar. 24, 2006 at 1713b; P.J. Webster et al., *Response to Comment on “Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment”*, 311 SCIENCE, Mar. 24, 2006 at 1713c.} Further, earthquakes and floods are being covered more frequently in the media, which emphasizes the number of victims who lost their lives, their home and their family members, as well as the survivors remaining in the devastated areas. Apart from natural catastrophes, man-made disasters are also on the rise as the unavoidable price of technological progress and as a consequence of the so-called terrorism era. Depending upon the specific characteristics of the country, natural disasters such as earthquakes, hurricanes, volcanic eruptions, may be more common than technological disasters such as fires or explosions. Nevertheless, catastrophes threaten all countries. This is especially true for risks regarding weather conditions, like exceptional rainfall and flooding. The rise of catastrophes generates an increasing number of victims, who require assistance and compensation for their losses.

Various perspectives regarding compensation for catastrophe victims exist. Often the insurance industry is included, to some extent, as part of the proposed compensation scheme. Thus, a great deal of attention is increasingly paid to the role of insurance in providing compensation for victims of catastrophes. A key consideration in utilizing insurance as a compensatory tool turns on how catastrophe is defined in the insurance policies. Though the everyday meaning of catastrophe or disaster may seem clear, developing a formal definition can be much more difficult. In some cases, catastrophe is defined statutorily. Such statutes typically define an event as a catastrophe based upon its scale and the damage incurred both in terms of property as well as loss of life. These definitions are necessary to determine the obligations of public authorities as well as
the amount of financing required. When financial loss is the focal point, the number of victims is usually the most important factor. It is this financial aspect of catastrophes that result in a large number of victims that will be the focus of this paper.²

It may be interesting to provide some more concrete facts and figures. The following charts show the increasing number of catastrophic events and of victims from 1970 until 2007.

² Because of the large number of victims, the financial effect of catastrophes can be distinguished from the example of traffic accidents. The total number of victims on a yearly basis in traffic can be large as well, but that is usually not considered “catastrophic”. For a criticism, see Ulrich Magnus, Germany, in FINANCIAL COMPENSATION FOR VICTIMS OF CATASTROPHES: A COMPARATIVE LEGAL APPROACH, 119 (Michael Faure et al. eds., Springer-Verlag/Wien 2006) who argues that it is strange to qualify the flooding of the Elbe where only a few people died as a catastrophe, whereas all the hundreds of victims dying yearly in traffic accidents are apparently not considered “catastrophic”.

Focusing only on natural catastrophes, the following figure again demonstrates a marked increase in occurrences:

\[ Id \text{ at 6 fig.2.} \]
In 2007, more than 21,500 people lost their lives, due to approximately 335 natural catastrophes and man-made disasters. The corresponding property damage totaled more than $ 70 billion, of which about one third, $ 27.6 billion was covered by insurance. Of the latter amount, $ 23.3 billion was attributable to natural catastrophes, while the remaining $ 4.3 billion was due to major man-made disasters. This insurance coverage is represented in the following figure:

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7 Id.
Swiss Re, Sigma: Natural catastrophes and man-made disasters in 2007: high losses in Europe, 7 fig.3 (2008).

These figures demonstrate surprisingly low levels of insurance coverage, most notably for geophysical, climatological and hydrological events. Accordingly, the figures raise the question of whether first-party insurance can play a greater and more influential role in the compensation of catastrophe victims. This question is particularly relevant, especially in Western society, where insurance techniques are broadly developed. Therefore, this paper only focuses on catastrophe insurance coverage for potential victims and does not address man-made or technological disasters for which a person, group, or company may be liable as tortfeasors. Consequently, third party liability insurance, which is available for possible tortfeasors, is not discussed. Moreover, most natural catastrophes do not involve a third party who can be held liable as many natural catastrophes are considered “acts of God.” The only potential liable party in case of natural catastrophes is the government (e.g. for failure to warn or to take adequate measures in case of e.g. flooding). Cases of government liability for natural catastrophes are, however, rare. Hence, the role of third party insurance plays a limited role in natural catastrophes and accordingly, this paper focuses solely on first-party insurance.

As noted this paper will address the use of first party insurance in Western societies, where insurance techniques are well developed but have not fully been utilized as a response to catastrophic losses. Instead, there seems to be a preference for either no compensatory solution or for government provided compensation. Indeed, empirical evidence, discussed below, demonstrates that even where first-party insurance is widely available, potential victims only use it to a limited extent. This of course raises the question whether catastrophic risks have specific features that make the problem difficult to treat.

Addressing the role of first-party insurance is also interesting in light of governments’ increasing attempts to provide financial solutions when the number of catastrophe victims is high.¹¹ These types of government funding are, however, heavily criticized in current law and economics

¹¹ Hirshleifer can be regarded as one of the first to address this issue. He had the insight that providing compensation after the occurrence of a disaster is so politically attractive that the government will invariably find it impossible to resist. See Jack Hirshleifer, War Damage Insurance, 35 THE REV. OF ECON & STAT. 144, 146-47 (1953), reprinted in 9 CONN. INS. L.J.1 (2002). See also Peter Siegelman, A New Old Look at Terrorism Insurance: Jack Hirshleifer’s War Damage Insurance After Fifty Years, 9 CONN. INS. L.J. 19 (2002).
The question therefore arises whether first-party insurance can constitute a viable alternative to government compensation. First-party insurance is indeed only one of the many approaches regarding compensation for catastrophe victims. It is intriguing to analyze this particular solution from an economic perspective: on the one hand we can rely on the broad law and economics literature on liability and insurance, and on the other hand on literature on the demand for insurance protection against catastrophes. This traditional law and economics literature starts from the assumption that the human race consists of all rational human beings. However, cognitive psychology research regarding patterns of human decision-making illustrates deviation from the pure rational thinking model. In other words, human behavioral patterns provide added and essential analyses that complement the traditional law and economics perspectives. Moreover, a comparative analysis will be adopted as well, by inter alia focusing on solutions adopted by various (Western) countries.

Of course, this analysis is mostly applicable in societies where well-organized insurance markets exist. Thus, the question can be asked why disaster insurance, in these countries and societies, are relatively

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13 Of course, the main sources of pressure on the government concerning catastrophes are probably other than the mere claim for the loss of some definite goods. People indeed usually prefer not being flooded at all over being flooded and compensated, which is fully consistent with the common assumption that compensation, as a matter of fact, is always insufficient to put the victim back to her utility level prior to the catastrophe.


17 For a more general comparative approach to the financial compensation for victims of catastrophes, see Michael Faure & Ton Hartlieb, Financial Compensation for Victims of Catastrophes (Springer 2006).
First-party disaster insurance, however, is not a viable alternative in many developing countries where either insurance markets are underdeveloped or consumers lack resources to pay a premium \textit{ex ante}.\footnote{As was the case in the Netherlands, for example, supply of disaster insurance was lacking due to a cartel agreement not to provide coverage.}

The remainder of this paper is structured as follows: first, we will address the potential of first-party insurance in covering catastrophic losses (Section II). Second, the question arises whether prospective victims actually seek \textit{ex ante} protection through first-party insurance coverage (Section III). Next, after considering the demand side of the equation this paper will discuss the supply side of first-party insurance coverage (Section IV). Then the paper will critically review the phenomenon of compulsory disaster coverage as a reaction to the lack of both supply and demand (Section V). Lastly, concrete examples from France and Belgium will be used to analyze the theoretical solutions put forth (Section VI). The paper concludes with a few final remarks (Section VII).

II. FIRST-PARTY INSURANCE

First-party insurance is a system whereby insurance coverage is provided and compensation is awarded directly by the insurer to the victim. It is thus the prospective victim himself who buys this type of insurance coverage, with the eye on possible future harm and corresponding damages. The underlying principle in first-party insurance is that the insurance company – in principle – pays as soon as damage occurs, provided that it can be proven that the particular damage is an insured risk.

\footnote{The insurance market for catastrophic risk in the Caribbean Region, for example, remains a thin market characterized by high prices and low transfer of risks. Philippe Auffret, \textit{Catastrophe Insurance Market in the Caribbean Region: Market Failures and Recommendations for Public Sector Intervention} (The World Bank, Policy Research Working Paper 2963, January 2003) offers an overview of the existing market failures, followed by recommendations for public sector interventions. See also, John D. Pollner, \textit{MANAGING CATASTROPHIC DISASTER RISKS USING ALTERNATIVE RISK FINANCING AND POOLED INSURANCE STRUCTURES} (World Bank 2001). Non-life (i.e. property/casualty) insurance penetration rates were (and still are) low in those countries affected by the Asian tsunami in 2004. In Indonesia, for example, just $8 per capita was spent on non-life insurance in 2003.}
covered by the insurance policy. Contrary to third party insurance, payment by the insurance company occurs irrespective of whether there is liability.20

Accordingly, insurance protection trends away from tort law and third party insurance and towards insurance schemes whereby victims *ex ante* seek coverage on a first-party basis where possible. For example, in the area of environmental insurance there is a movement toward environmental damage insurance operating as a form of first party insurance.21 There is a similar movement toward first-party insurance in some legal systems in medical malpractice insurance22 and when compensating traffic accident victims.23 The benefits of various first-party insurance schemes are accordingly being used to address a range of societal issues. Indeed, Priest suggested that the shift towards first-party insurance would have been an appropriate remedy to the American insurance crisis that occurred in the eighties.24 Priest reasoned that:

[I]n comparison to first-party insurance, third party tort law insurance provides coverage in excessive amounts, in a manner that substantially restricts risk segregation, and at costs that far exceed the costs of first-party insurance. For both consumer and provider risk pools, these differences will increase the correlation of risks within existing pools and, as a consequence, increase the extent of adverse selection, leading to the breakdown of the pools.25

Other commentators, such as Bishop and Epstein, also favor first-party insurance.26 It has particularly been argued that first-party insurance

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25 *Id.* at 1552-53.
schemes have the advantage of low administrative costs as well as the ability to better adapt premiums and policy conditions to specific risks. The latter enables first party insurance to engage in easy risk differentiation, which is advantageous for insurers. Under this arrangement it is possible for the insurer to assess ex ante the risk and consequently damage that a particular victim would suffer. This ex ante analysis is not available with third party insurance because assessment of risk is to a third party not known at the time of contracting and potential liability that may or may not follow. Lower administrative costs are due to the fact that under a first-party insurance policy the insurer covers the risk of damage to a particular victim or a particular site. It is therefore much easier for the insured to signal particular circumstances, which may influence the risk to the insurer. The reason for the trend away from third party insurance and towards first-party coverage thus becomes clear.

First-party insurances can be divided into two main groups: (1) insurance, which compensates for personal injuries; and (2) insurance, which takes the form of coverage for specific property damage. The schemes, which focus on personal injury compensation usually, do not vary coverage based on the source of the injury, i.e. whether the cause was a catastrophe or not. Accordingly, it takes the form of generalized accident insurance coverage. As a result, coverage depends on the specific costs that a victim would incur as a result of an accident, such as lost income, coverage of (additional) medical expenses, and in some cases even pain and suffering. Most European countries cover a majority of personal

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27 Indeed, one will not spend time nor money looking for a liable tortfeasor and bringing liability claims. Richard Epstein, Simple Rules for a Complex World 31 (Harvard University Press 1996).
29 See Bishop, supra note 26, at 246.
31 See Bishop, supra note 26, at 249.
32 Id.
33 Elizabeth Medaglia et al., The ‘Concurrent Cause’ Theory: Inapplicable to Environmental Liability Coverage Disputes, 30 Tort & Ins. L.J. 823, 829 (Spring 1995).
34 Id. at 829-30.
35 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. See also The French GAV® Accident
injury expenses through a social security system. Consequently, well-informed potential victims can purchase additional or complimentary coverage according to their individual degree of risk aversion and corresponding need for insurance.

The second type of first-party insurance schemes applies (only) to property damage, for example housing insurance. In many countries, however, first-party insurance for property damage excludes damages caused by a natural disaster. In the Netherlands, for example, property damage caused by flooding is excluded. Therefore, this paper analyzes the demand for disaster coverage (Section III), whether competitive insurance markets are supplying such coverage (Section IV) and whether regulatory intervention is necessary to provide access to disaster insurance (Section V). Lastly, this paper will look at general legal practices surrounding the issue (Section VI).

III. DEMAND FOR FIRST-PARTY INSURANCE AGAINST NATURAL DISASTERS

A. THE DECISION TO PURCHASE FIRST-PARTY INSURANCE: EXPECTED UTILITY HYPOTHESIS

The first issue that arises is whether there is demand by the public for coverage against damage caused by catastrophes. According to the expected utility model, an individual is assumed to behave as if he engaged in a detailed analysis of the costs and benefits associated with the purchase of an insurance policy. As a result, a potential victim residing in a hazard-prone area will voluntarily purchase first-party insurance if he perceives the benefits of insurance to outweigh the costs.


This assumes that competitive insurance markets offer applicable policies.


Id.

This utilitarian approach on insurance has, among others, been described by Nobel Prize winner Kenneth J. Arrow. See generally, Kenneth Arrow, Uncertainty and the Welfare Economics of Medical Care: Reply (The Implications of Transaction Costs and Adjustment Lags), 55 AM. ECON. REV. 154 (1963); Kenneth Arrow, The Economics of Moral Hazard: Further Comment, 58 AM. ECON. REV. 537 (1968).
premium to be sufficiently low in comparison to the risks (and if he is convinced that ex post governmental disaster relief will not be forthcoming).\textsuperscript{41}

Doherty and others, however argue that financial considerations are only one of the reasons why homeowners would purchase first-party insurance.\textsuperscript{42} Decisions regarding the purchase of insurance coverage may also be driven by emotion-related goals (either worry or regret), the need to satisfy legal or other official requirements, the need to satisfy social and/or cognitive norms, and the need to maintain a relationship with a trusted agent/advisor.\textsuperscript{43} Indeed, regarding the emotion-related goals, there is a growing literature on how emotional goals impact individuals’ decision making regarding risk.\textsuperscript{44} Three main emotional goals pertaining to catastrophe coverage are: (1) reduction of anxiety (i.e. peace of mind); (2) avoidance of anticipated regret\textsuperscript{45}; and (3) disappointment.\textsuperscript{46} Thus, reasons for purchasing insurance are complicated and take into account an individual’s need to feel justified and avoid anxiety. Sunstein also indicated that people focus on the unpleasantness of the outcome rather than on its probability when they have strong sentimental attachment to the catastrophe.\textsuperscript{47} Moreover, Hsee and Kunreuther found that individuals are willing to pay higher premiums for the same amount of coverage for objects they love than for ordinary non-sentimental property.\textsuperscript{48} Further, regarding the need to satisfy social and/or cognitive norms, there is

\textsuperscript{41} Kunreuther and Pauly adhere to the expected utility theory to explain the failure of individuals to purchase insurance against low-probability large-loss events, but agree that implicit or explicit costs discovering the true probability of these events may inhibit insurance purchase. See Howard Kunreuther & Mark Pauly, Neglecting Disaster: Why Don’t People Insure Against Large Losses?, 28 J. RISK & UNCERTAINTY 5 (2004).

\textsuperscript{42} Neil A. Doherty et al., Managing Large-Scale Risks in a New Era of Catastrophes 137 (Wharton Risk Management and Decision Processes Center in conjunction with the Georgia State University and the Insurance Information Institute March 2008).

\textsuperscript{43} Id. at 137-38.

\textsuperscript{44} George F. Loewenstein et al., Risk as Feelings, 127 PSYCHOL. BULL. 267 (2001).


\textsuperscript{46} See David E. Bell, Disappointment in Decision Making Under Uncertainty, 33 OPERATIONS RES. 1 (1985).

\textsuperscript{47} Cass R. Sunstein, Terrorism and Probability Neglect, 26 J. RISK & UNCERTAINTY 121, 122 (2003).

empirical evidence that the purchase of insurance is based on knowledge of what friends and neighbors have done. Additionally, the decision to purchase insurance can be influenced by the pursuit of happiness. One can argue that an *ex post* injury will make victims seek *ex ante* protection. Human and economic decisions thus reflect and contribute to human happiness.

Whether potential victims need insurance for losses resulting from a particular catastrophe will to a large extent depend on whether they can rely on other sources, such as government, to provide compensation or not. For example, in Europe most potential victims will not have a large incentive to purchase insurance against the risks of personal injury. This is because coverage is mainly provided by a social security system. If, however, there is not an alternative source of compensation, it is logical that there would be an increased demand for coverage against personal and property loss generally and specifically that caused by catastrophe.

### B. Examples

Contrary to our expectations, empirical evidence, reported *inter alia* by both Kunreuther and Zeckhauser, amongst others, suggests that there is generally no adequate interest in and thus no demand for voluntary insurance protecting against natural catastrophes. Consequently, this evidence suggests that most homeowners do not buy adequate levels of insurance coverage.

One example concerns the financial compensation system for natural catastrophes utilized in Germany generally, and specifically existing

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49 For more on the importance of friends and neighbors in providing information, see Mark A. Satterthwaite, *Consumer Information, Equilibrium Industry Price, and the Number of Sellers*, 10 BELL J. ECON. 483 (1979).


52 *Id.*


insurance arrangements. As a general rule, most first-party insurance policies exclude catastrophic risks which result from natural disasters such as floods and earthquakes. Coverage therefore depends on the specific terms of the respective insurance policy. In practice, only a small percentage of German citizens have catastrophe insurance coverage: only about 50% of those households hit by the 2002 Elbe flooding were insured against the risk of property damage caused by natural resources. Endres, Ohl & Rundshagen have recently held that this lack of adequate insurance coverage may be the result of a lacking demand because of a lack of risk aversion. Although this last topic should be subject of further empirical research, they already stress that it is too easily accepted (at the policy level) that there is risk aversion, whereby this may not always be the case. Especially since the lack in demand could just as easily be explained by the lack of flood insurances on the German market.

There are examples of this in the American market as well. Indeed, although the United States has several (government supported) initiatives to stimulate natural hazard insurance, relatively little progress has been made. The standard U.S. homeowners’ insurance policy offered by private insurance carriers is an “all risk” policy and therefore covers damage to a home by fire, windstorms, hail, riots and explosions. Flood and earthquake damage receive, however, different treatment. Coverage for flood damage due to rising water is explicitly excluded in homeowners’ insurance policies, but coverage for these losses is voluntarily available through the federal government’s National Flood Insurance Program (NFIP). Earthquake coverage on the other hand can be a separate policy or an endorsement to the homeowners or renters policy and is voluntarily available from most insurance companies. In California, it is also available through the California Earthquake Authority. Although U.S. citizens are

55 Magnus, supra note 2, at 129.
58 See generally Dwight M. Jaffee & Thomas Russell, Behavioral Models of Insurance: The Case of the California Earthquake Authority 1-2 (Feb. 19, 2000) (
not obliged to purchase homeowners insurance by law, the process of obtaining a mortgage often requires it. In addition, the Flood disaster Protection Act of 1973 and the National Flood Insurance Reform Act of 1994 mandate the purchase of flood insurance as a condition for federal or federally-related financial mortgages for acquisition and or construction of buildings in Special Flood Hazard Areas.\textsuperscript{59} In general, there is however substantial evidence that most individuals in flood-prone areas do not voluntarily purchase insurance despite highly subsidized rates.\textsuperscript{60} For example, less than 3,000 out of 21,000 flood-prone communities entered the NFIP during its first four years of operation (since 1968) and less than 275,000 homeowners voluntarily bought an insurance policy.\textsuperscript{61} Only through excessive publicity and information campaigns has knowledge of flood risks among the population increased. By 1992, a conservative estimate of coverage suggests that less than 20 percent of the homes located in the floodplain were covered by flood insurance.\textsuperscript{62} The Federal Insurance Administration estimates that as of 1997 about 27 percent of households living in high-risk flood areas had insurance.\textsuperscript{63} This is consistent with the findings of a study where FEMA examined 1549 disaster relief applications from victims of the 1998 flood in Northern Vermont. There, almost 84 percent of Northern Vermonters residing in the Special Flood Hazard Areas did not have flood insurance coverage at the time; 45 percent of whom were required to purchase it.\textsuperscript{64}

The famous example of hurricane Katrina also deserves our attention as well. The victims of Katrina complained, rather vociferously, that the received compensation was substantially less than the actual costs of repairing or rebuilding their destroyed houses.\textsuperscript{65} Even those covered who suffered large losses from rising water were only able to recover a portion of their losses because the maximum coverage limit on residential
buildings (not including contents) under NFIP was $250,000 and these homeowners did not purchase excess flood coverage from private carriers. However, this is not to suggest that the coverage itself was inadequate rather as we have seen repeatedly people were not purchasing necessary coverage. In the Louisiana parishes affected by Katrina the percentage of homeowners with flood insurance ranged from 57.7 percent in St. Bernard’s parish to 7.3 percent in Tangipahoa parish. Only 40 percent of the residents in New Orleans had flood insurance, although they were eligible to purchase such a policy through the NFIP. The Economist reported similar numbers: in Mississippi’s coastal areas, less than one in five households had flood insurance and in New Orleans it was less than fifty percent.

Even in less recent history, very few people had acquired coverage prior to flooding caused by tropical storm Agnes. Agnes wreaked havoc on many areas in the Northeastern United States in June 1972. Again, a number of the communities in the affected regions qualified for the federal government’s subsidized National Flood Insurance Program but had not taken advantage of it. In fact, only 1,580 claims – totaling $5 million – were paid under this Program. Consequently Congress responded to the plight of the (uninsured) victims with liberal relief through its Small Business Administration Disaster loan program.

Another example is the Northridge Earthquake in California in 1994 which caused more than $19.6 billion (in 2007 dollars) in insured losses. Immediately after this catastrophic event, a high number of citizens decided to buy first-party disaster insurance, as a reaction to the suffered damages. Soon, however, this reactionary behavior dissipated and Californians began

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66 Id. at 186.
67 Id. at 175 ; See Pham, supra note 57, at 640.
68 See Kunreuther, Mitigating Disaster, supra note 16, at 175.
71 Id.
72 Id.
to let those policies lapse or cancelled them. Indeed, eight years after the creation of the California Earthquake Authority, the acquisition rate of coverage has decreased from thirty to seventeen percent.

The empirical evidence, however, does not clearly support a pure lack of demand for the lack or inadequacies of catastrophe insurance. A recent study by the Wharton Risk Management and Decision Processes Center reports that after Florida went through several flooding episodes in 2004, people effectively purchased more flood insurance. They found that in 2000 there were 973,444 flood insurance policies in place versus 1,143,844 in 2005 (which represents a 17% increase, while the costs of flood insurance remained virtually the same between 2000 and 2005). The authors indicate several explanations for these changes. First, regret: people living in devastated areas, who had coverage, wished they had purchased the better and larger policies that would have provided more adequate coverage. Second, flood insurance began to look like a sound financial investment. Third, the floods were a vivid experience not only for those affected but also for their neighbors and family members who were not directly affected by property loss. As loss due to flooding became a reality in these people’s lives purchasing flood insurance seemed more appealing and more purposeful.

Therefore, even though there is some evidence of serious under demand for catastrophe insurance, there are also cases (like in the Florida example) where (at least in the short term) the insurance purchase has increased. It is unclear whether these policies purchased in Florida in 2005 (after the 2004 flooding) will be maintained after a few flood-free years. The example of the California earthquake indeed illustrates that once the memory of the disaster is forgotten, a large quantity of the new insurance coverages were cancelled.

76 See DOHERTY ET. AL., supra note 42, at 109.
77 Id.
78 Id.
Economics and behavioral law provide insight into several phenomena which may explain this lack of catastrophe insurance demand. A low demand may be caused by problems on the supply side as well, more particularly if premiums would be inefficiently high either as a result of distorted estimations of probabilities by insurers or as a result of high loading. These problems on the supply side will be discussed separately in the next section. For now, focus will be on the reasons why, even if catastrophe coverage is offered at actuarially fair premiums in competitive markets, demand for coverage remains low.

First, it seems that those with a higher perceived vulnerability to future catastrophic losses are more likely to acquire first-party insurance than those who believe that a catastrophe is unlikely to affect their home or their community. Slovic concluded that a perceived probability of loss was a critical factor in triggering the purchase of catastrophe insurance. Potential victims who do not purchase coverage do not deem the risk of loss to be sufficient to require such protection. They tend to take an “it will not happen to me” attitude.

Perceived vulnerability, however, constitutes a problem in the case of low-probability high-consequence events like natural disasters. Overwhelming evidence from psychologists and behavioral law and economics indicates that those events are systematically misjudged. Experiments showed that the “affect heuristic” is a large factor in this misconception. As a consequence, the characteristic most correlative to perceived risk was fear, i.e. the degree to which a hazard evoked feelings of dread. Risk perception is thus highly dependent upon intuitive and

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79 The price of homeowners insurance is, of course, a primary area of interest in order to purchase insurance coverage. Indeed, in the aftermath of the 2005 hurricane season in the United States, a number of insurers implemented significant rate increases to reflect the higher degree of risk and increased cost of reinsurance. The average premium in the state of Florida increased from $723 at the start of 2002 to $1,465 in the first quarter of 2007. Id. at 77-78 We can evidently assume that demand for first-party insurance is influenced by the rating of the insurance coverage against natural catastrophes.


81 Baruch Fischhoff et. al., How Safe is Safe Enough? A Psychometric Study of Attitudes Towards Technological Risks and Benefits, 9 Pol’y Sci. 127 (1978). The authors also found that perceived risk declines as perceived benefit increases. Both conclusions were later confirmed by many other authors. See, e.g., Ali S. Alhakami & Paul Slovic, A
experimental thinking, guided by emotional and affective processes. The affect heuristic further suggests that, if a general affective view guides perceptions of risk and benefit, providing information about benefit should change the perception of risk. These ‘heuristics and biases’ thus may explain why only those who are directly affected by the risk demand insurance, whereas others who are exposed to the risk as well may wrongly estimate their exposure. This analysis fits into classic information deficiencies which lead to an under demand for catastrophe insurance. Apart from the mentioned affect heuristic, other behavioral attitudes may also explain the misjudgment of exposure and consequently need. Experimental studies have observed behavior contrary to the expected utility theory. Consequently, Kahneman and Tversky proposed an alternative theory, called “prospect theory.” Under prospect theory, an insurance policy that covers fire but not flood can be presented either as full protection against the specific risk of fire or as a reduction in the overall probability of property loss. Prospect theory predicts that the policy will appear more attractive in the former perspective, in which it offers unconditional protection against a restricted set of problems. The two authors further found empirically that low probability events generally are overweighted and high ones generally underweighted in policies. Risk-averse people hence will, both under utility theory as under prospect theory, prefer insurance against low-probability high-loss events rather than against high-probability low-loss events. This seems, at first, contrary to the above analysis. By taking into account, however, the “probability threshold,” which says that potential victims ignore those events for which the probability of a loss is too low to constitute a threat, the theory in fact

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83 Id. at 315.
86 See generally id.
87 See id. at 287.
88 Id. at 281-83.
89 See id. at 287; Kunreuther, supra note 70, at 112.
supports the lack of demand we have seen. This suggests that if the chances of an event are sufficiently low, people do not even reflect on its consequences. Potential victims thus have a tendency to insure only if they feel the probability of a disaster is high enough that they will suffer damage and accordingly receive a return on their investment in the policy. More research, however, is needed to establish a solid theory regarding the perceived risks of natural hazards.

Another alternative to utility theory, “bounded rationality,” was introduced by Simon. This concept asserts that the cognitive limitations of the potential victim, the decision-maker, force him to construct a simplified model of the world. A person thus does not strive for maximization of his utility but for some satisfactory level of achievement. Potential victims consequently are too limited in their cognitive capacity to adjust to natural hazards via insurance. Therefore, an individual will neglect to purchase insurance because his knowledge of the subject is limited – not because he has studied the matter carefully and concluded that the cost-benefit ratio is unattractive. Potential victims must consequently be made graphically aware of the potential losses from the disaster before considering the purchase of insurance coverage.

Finally, other theories emphasizing people’s limited capabilities of judging the probabilities of natural hazards include, inter alia, “the gambler’s fallacy” (or “negative recency effect”), which means that people have a very poor conception of randomness and thus e.g. expect that a flood which occurred in year x will not occur again in year x+1, and the “availability heuristic,” as proposed by Kahneman and Tversky, according to which the frequency of some event is estimated by judging

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90 See Kahneman and Tversky, supra note 86, at 282-8355.
91 Kunreuther, supra note 70, at 109.
92 Id.
94 See Kunreuther, supra note 70, at 109.
95 See ROBERT W. KATES, HAZARD AND CHOICE PERCEPTION IN FLOOD PLAIN MANAGEMENT (University of Chicago 1962). For an experimental study on the effect of experience, see Slovic et al., Risk as Analysis and Risk as Feelings, supra note 84.
how easy it is to recall other instances of this type. The availability heuristic implies that past experience may be necessary to raise an individual’s awareness of the risks and prompt the purchase of insurance. So, while the financial losses could be significant should an event within the range of 1-in-50 to 1-in-500 occur, the great majority of people will not purchase insurance because they have never been exposed to the consequences of such an event. Evidence in these low probability cases suggests that many individuals do not use an expected utility model such as the one characterized above to determine how much insurance coverage to purchase.

A second argument explaining the limited interest in voluntary first-party insurance is the knowledge of potential victims that the state or the government will provide them with ex post disaster assistance irrespective of insurance coverage. The intuitive appeal of this argument is clear: if victims could count on state-provided ex post compensation after disasters, then their incentives to purchase first-party insurance coverage may be diminished. It refers to the argument made by Hirshleifer that in the absence of insurance, the government may find it difficult to resist the political pressure to provide compensation. This is the so-called “Samaritan’s dilemma.” Why pay for this coverage via insurance premiums if the government would provide compensation regardless? The empirical evidence concerning this argument, however, provides little clarity. Kunreuther found that “there does not appear to be any evidence suggesting that individuals refuse to purchase property insurance because they feel that they will be bailed out by the government should they suffer

97 However, availability is also affected by recent events, emotional saliency and other subtle factors, which may be unrelated to actual frequency. Id. at 11-12. Gambler’s fallacy and the availability heuristic are therefore not necessarily contradictory.
99 Id.
100 Id. at 105.
102 See Hirshleifer supra note 11, at 146; Siegelman, supra note 11, at 21.
104 Kaplow, supra note 12, at 172-73.
Nevertheless, a recent comparative overview of compensation systems in a variety of European countries showed that in countries where state compensation was generously (and almost automatically) provided after a disaster (such as Germany or Italy), the degree of insurance coverage was low, whereas in countries where the state takes a principal attitude of not providing any compensation after a disaster (like in the United Kingdom), the degree of insurance coverage was substantially higher. This anecdotal evidence indicates that there is some relationship, tenuous or not, between government provided compensation and the willingness of potential victims to obtain insurance coverage.

Third, psychological experiments show that people may prefer uncertain losses rather than the certain loss of paying the premium. Kunreuther discussed this concept concerning decisions to purchase insurance against the risk of flooding. Insurance is an investment. People prefer to insure against high-probability, low-damage events since a monetary return is more likely. The problem, according to this literature, is that with ex ante, the potential victim (like a house owner) is confronted with the certain loss of a premium, whereby the expected damage in the 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 a low demand with catastrophe insurance. Consequently, potential victims who did buy first-party insurance against the risk of catastrophic losses and did not experience losses that allowed them to make claims will, within a few years, cancel their insurance coverage or allow it to lapse. This reasoning can be correlated to the emotional goals mentioned earlier of peace of mind and anxiety avoidance. A similar line of reasoning applies to those who are underinsured. If one is underinsured at the time of a catastrophe, the losses are not, generally, large enough to provide incentives to buy an insurance

107 Kahneman & Tversky, supra note 85, at 268-69.
108 Schoemaker & Kunreuther, supra note 16, at 610.
109 Id.
111 Howard Kunreuther et al., A Behavioral Model of the Adoption of Protective Activities, 6 J. Econ. Behav. & Org. 1,4 (1985).
policy. This is because once a catastrophe has happened, people consider it unlikely that a similar disaster will affect them in the future.\footnote{Slovic et al., \textit{Preference for Insuring Against Probable Small Losses}, supra note 84, at 252.}

Fourth, the lack of demand is attributed to ineffective information filtering, particularly with probabilistic information regarding catastrophes. Slovic and Monahan demonstrated that risk assessments in terms of relative frequency (“of every 100 neighbors similar to you, 10 are estimated to suffer catastrophic damages”) created more frightening images of catastrophic events than statistically represented frequencies (“neighbors similar to you are estimated to have a 10% chance of suffering catastrophic damages”).\footnote{Paul Slovic et al., \textit{Violence Risk Assessment and Risk Communication: The Effects of Using Actual Cases, Providing Instructions, and Employing Probability vs. Frequency Formats}, 24 \textit{Law. & Hum. Behav.} 271, 272, 291 (2000).} Moreover, according to Dake, people have “worldviews,” which influence individual judgments and actions.\footnote{Karl Dake, \textit{Orienting Dispositions in the Perception of Risk: an Analysis of Contemporary Worldviews and Cultural Biases}, 22 \textit{J. Cross-Cultural Psychol.} 61, 62 (1991).} Consequently, the available information has little effect on individuals’ attitudes towards ‘normal’ hazards, as they are part of who we are and of how we see the world.\footnote{Slovic, \textit{The Perception of Risk}, supra note 80, at xxxiv.}

Fifth, some families also face budget constraints which limit their interest and/or ability to voluntarily purchase adequate insurance coverage in case of a major loss. Such behavior is likely in areas where property values have increased rapidly. An increase in premium will typically then cause people to buy less insurance due to budgetary constraints. In contrast to the expected utility model where the demand for insurance depends on the premium relative to the expected loss,\footnote{Christian Gollier, \textit{Some Aspects Of The Economics Of Catastrophe Risk Insurance}, \textit{in Catastrophic Risks and Insurance} 13, 15-17 (2005).} demand under this scenario depends only on the premium for a given amount of coverage.

Therefore, numerous reasons explain the failure of potential victims to purchase first-party insurance coverage and correspondingly necessary protection against catastrophic losses. One final remark should still be made: low demand for insurance coverage is often confused with adverse selection.\footnote{Harrington, supra note 101, at 41.} For example, suppose that the only parties who wish to buy flood insurance are those with material exposure to damage. Low-risk parties thus may rationally decide not to insure. Regardless of this being...
true, it would not imply adverse selection. Adverse selection after all requires asymmetric information: insurers must be unable to identify high-risk buyers. Generally, it is hard to see how insured could have an informational advantage over insurers in predicting catastrophes. The reverse is more likely to be true. Insured might, however, know their own potential loss better than insurers do, but that could be solved through inspection measures imposed by the insurer. The fact that adverse selection is not a serious problem is also confirmed in recent studies concerning hurricane insurance. Indeed, there is no evidence that those at risk have an informational advantage over the insurer. In fact, the opposite might be true: if insurance companies spend a lot of resources estimating the risk (which they do today) they might gain an informational advantage over their policyholders who cannot afford or do not want to do such research. In recent years, there has been growing literature on the impact of insurers’ knowledge advantage regarding risks. Research in this field reveals that insurers might want to exploit this reverse information asymmetry, which results in low risk agents being optimally covered, while high risks are not. Low insurance demand even for high-risk parties can then simply stem from the high cost of coverage, the availability of alternative compensation mechanisms or from any of the other above mentioned reasons.

IV. SUPPLY OF FIRST-PARTY DISASTER INSURANCE

A. CORRELATION, UNCERTAINTY AND LIMITED CAPACITY

Even though it is – as just indicated – questionable whether there is a high demand for catastrophe insurance, there are definitely problems on the supply side. A number of insurers exclude coverage for property damage

119 Id.
120 See Henriet, supra note 118, at 5-6.
121 See DOHERTY, supra note 42, at 148.
122 See Henriet, supra note 118, at 6.
123 Id. at 6, 8.
caused by (natural) catastrophes and argue that those losses are uninsurable. The three principal reasons for this attitude are the fear of catastrophic losses, the uncertainty of the risk, and the lack of insurance capacity.125

First, natural hazards normally occur within one specified area and are highly correlative. Past disasters indicate that a significant number of (especially non-geographically diverse) insurance companies became insolvent as a result of such catastrophic losses. Consequently, property insurance became increasingly difficult to obtain in hazard-prone areas.

Second, the absence of historical data and the present imperfect scientific knowledge contributes to the supply deficiencies of first party catastrophe coverage.126 However, this point needs to put into perspective due to the new insights into catastrophe modeling.127 The lack of predictability regarding both the probability of an extreme event occurring and of the outcomes of such an event results in ambiguity. This ambiguity may lead to uninsurability of a specific catastrophic event or in a specific hazard-prone area.128 Insurers can, however, take account of this uncertainty regarding the probability of catastrophic damage by charging a so-called risk premium.129 Nevertheless, two problems still exist: (1) a higher insurance premium can in turn decrease demand for insurance against catastrophic risks; and (2) insurance regulation might limit insurers’ ability to apply high premiums to catastrophic risks.130 Regulated rates are in fact a major problem in some countries and may be, in certain high-risk areas, the main obstacle to an effective voluntary insurance market for

125 See Kunreuther, Mitigating Disaster Losses Through Insurance, supra note 16, at 178-79; See Gollier, supra note 116, at 28.
126 See MICHAEL FAURE & TON HARTLIEF, INSURANCE AND EXPANDING SYSTEMATIC RISKS 84-85 (OECD 2003).
129 Howard Kunreuther et al., Ambiguity and Underwriter Decision Processes, 26 J. ECON. BEHAV. & ORG. 337, 338 (1995). Doherty et al. recently found that, under a 1-year contract, mean annual premiums are 25 percent higher when the probability of the event is ambiguous than when it is given precisely. Under the 20-year contract, aversion to ambiguity is even stronger. See supra, note 42,at 147. The source of the uncertainty does not affect the insurers, contrary to Cabantous’ beliefs. Laure Cabantous, Ambiguity Aversion in the Field of Insurance: Insurers’ Attitude to Imprecise and Conflicting Probability Estimates, 62 THEORY & DECISION 219, 220, 235 (2007).
catastrophic risks. Therefore, these additional risk premiums are rarely charged in practice. Gollier adds that an insurability problem may occur only if insurers are systematically more ambiguity-averse than consumers.\textsuperscript{131}

Third, insurance companies need sufficient financial reserves to cover the particular catastrophic risk.\textsuperscript{132} In many cases, however, and especially with catastrophic events, the expected loss may exceed the capacity of the individual insurer. The insurer can use various traditional insurance techniques to cope with this capacity problem, such as co-insurance, reinsurance, pooling of capacity by insurers, and alternative risk transfer (ART) mechanisms.\textsuperscript{133} As a consequence, the supply of insurance is largely conditioned by the price and availability of reinsurance and other alternative risk transfer mechanisms. For the most part, investors who supply capital for the insurance companies control this price since they want to realize a profitable rate of return. Even these solutions, however, have their limits.

### B. LIMITS OF REINSURANCE AND ART

Reinsurance helps insurance companies underwrite large risks, limits liability on specific risks, increases capacity, and shares liability when claims overwhelm the primary insurer’s resources.\textsuperscript{134} In reinsurance transactions, one or more insurers (the reinsurers) agree, for a premium, to indemnify a primary insurer against all or part of the loss that that primary insurer may sustain under its policies.\textsuperscript{135} The contractual and business relationships between insurers and reinsurers facilitate relatively low transaction costs. However, in the case of extremely large or multiple catastrophic events, insurers might not have purchased sufficient reinsurance, or reinsurance providers might not have sufficient capital to

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\textsuperscript{131} See Gollier, supra note 116, at 24.

\textsuperscript{132} Doherty accurately draws the attention upon the fact that the importance of capital as a requisite to secure an adequate rate of return is often not fully understood. After all, the capital needed by the insurance firm to be able to cope with catastrophic losses must be high enough to cover 1) the expected claims costs and other expenses, and 2) the costs of allocating risk capital to underwrite this risk. See Doherty, supra note 42, at 149.

\textsuperscript{133} See Faure & Hartlieb, supra note 126, at 88-97.

\textsuperscript{134} Matthew Rodermund, Four Points of Confusion about Reinsurance: Comment, 32 J. Risk & Ins. 133, 134 (1965).

\textsuperscript{135} Reinsurance is thus generally indemnity-based, since the insurer is compensated for part or all of his losses from insured claims. Id. at 133-34.
meet their existing obligations.  In any event, after a catastrophic loss, reinsurance capacity may be diminished and reinsurers might limit availability of future catastrophic reinsurance coverage. In contrast, after a catastrophic event, the demand of potential victims only increases. This simultaneous occurrence of shrinking supply and rising demand naturally leads to a sharp increase in reinsurance pricing. High reinsurance prices induce investment in the reinsurance business (e.g. new reinsurance companies may be formed, investors may be willing to purchase new tranches of equity issued by existing reinsurers). This, in turn, increases the supply of catastrophe coverage and causes prices to stabilize again. Additionally, if no major catastrophe occurs in a close time frame to another, reinsurers offer premiums at prices below expected loss and costs, while primary insurers have excess supply of capital and are therefore capable of supporting new risk exposures. In order to win or retain market share, reinsurers lower their underwriting criteria and may accept marginal risks or liberalize policy conditions. This ushers in a period of low premium rates. Reinsurance is thus clearly influenced by price cycles, which are particularly pronounced in catastrophe insurance. Given the cyclic nature of the reinsurance market, investors have incentives to look for alternative capital sources to add financial capacity. After all, these instruments have the ability to absorb the effects of a hard market and to manage complex or difficult risk exposures, which are often hard to insure in the traditional insurance market. The emergence of catastrophe bonds, catastrophe derivatives, sidecars, and industry loss warranties, already complement the catastrophe reinsurance market. Therefore, many more alternative capital sources are being developed. Nevertheless, capital market instruments should be characterized as a supplement, rather than an

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137 Reinsurance markets experience regular cycles driven by supply of, and demand for, insurance protection. These cycles are heavily related to both insurance loss experience and general investment market experience. Reinsurance then will be in a ‘hard market’ or in a ‘soft market’. A hard market occurs when supply of risk capacity declines. A soft market occurs when the supply of risk capacity expands. See Erik Banks, Catastrophic Risk: Analysis and Management 98-101 (2005); see also Peter Zimmerli, Swiss Re, Natural Catastrophes and Reinsurance 44 (2003), available at http://www.ct.gov/cid/lib/cid/app4_natcaten2006.pdf (last visited November 4, 2008).

alternative, to catastrophe (re)insurance, especially since most of these tools are still in their infancy.\textsuperscript{139}

C. LIMITS OF POOLING

There are also negatives regarding the pooling capacity of insurers. One risk is that pooling may lead to welfare losses as a result of cartel agreements. For example, in the Netherlands during the 1950s, 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 a relatively small risk in the Netherlands with the exception of the area around Southern Limburg). Their argument was that these risks were technically not insurable since the flooding and earthquake risks were uncertain in their nature and hence, difficult to calculate. Moreover, these types of insurance would only be attractive to high-risk individuals (e.g. those living in flood prone areas) and this would result in incurable adverse selection. As a consequence, it was determined that the members of the Dutch Insurers’ Association should all refrain from covering these risks.

The arguments concerning the uninsurability seemed highly doubtful, but the Association’s binding decisions also clearly violated competition law. At the time European Commission Regulation 3932/92 of December 21, 1992\textsuperscript{140} exempted many cartel agreements in the insurance world from the prohibition under the old article 85(3) of the EC Treaty.\textsuperscript{141} The Regulation provided that certain strict conditions were met. Law and economics scholars, who argued that competition policy should be fully applied to insurance markets, heavily criticized this exemption.\textsuperscript{142}

\textsuperscript{140} 1992 O.J. (L 398) 7-14, \textit{available at} http://eur-lex.europa.eu/RECH_celex.do (enter Cylex number 31992R3932) (last visited October 22, 2008).
\textsuperscript{141} Pursuant to old Article 85 (3) of the EC Treaty, agreements, decisions by associations of undertakings and concerted practices in the insurance sector which seek cooperation with respect to: (a) the establishment of common risk-premium tariffs based on collectively ascertained statistics or on the number of claims; (b) the establishment of standard policy conditions; (c) the common coverage of certain types of risks; or (d) the establishment of common rules on the testing and acceptance of security devices, shall not be prohibited as incompatible with the common market. EC Treaty art. 85 (as in effect 1985) (now article 81), \textit{available at} http://ec.europa.eu/comm/competition/legislation/treaties/ec/art81_en.html (last visited October 22, 2008).
binding decisions not to insure flood and earthquake risks not only clearly limited supply (it effectively excludes it as a result of a cartel agreement), but it also violated the conditions of Regulation 3932/92. Consideration 8, preceding the Regulation, 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 coverage 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 May 12, 1999 concerning the functioning of the exemption in Regulation No. 3932/92. In this report, the Commission explicitly discusses these binding decisions. The report states that as a result of the questions asked by the Commission, the Dutch Association of Insurers decided to bring its binding decision in line with Article 7.1, Subsection a, by simply converting it into a non-binding recommendation, which left each insurer free to extend coverage to flood risks. This example demonstrates that a minimal supply of insurance coverage may well be the result of anti-competitive behavior by insurers, who mutually agree not to cover particular catastrophic risks.

At a policy level, this demonstrates that a necessary condition of insuring catastrophic risks is a competitive insurance market that offers a wide variety of differentiated insurance policies and responds to the demand of the market. Instead of direct government intervention, government should guarantee an adequate competition policy with respect

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143 Consideration 8:

Standard policy conditions may in particular not contain any systematic exclusion of specific types of risk without providing for the express possibility of including that cover by agreement and may not provide for the contractual relationship with the policyholder to be maintained for an excessive period or go beyond the initial object to the policy. This is without prejudice to obligations arising from Community or national law.


144 Report from the Commission to the Council and the European Parliament on the operation of Commission Regulation No 3932/92 concerning the application of Article 81 (ex-Article 85), paragraph 3, of the Treaty to certain categories of agreements, decisions and concerted practices in the field of insurance, COM 1999, 192 final.
to insurance markets. Otherwise uninsurability may, as the Dutch example shows, simply be the result of a cartel agreement.\textsuperscript{145}

Therefore, as long as insurers are able to estimate the frequency and magnitude of potential catastrophic losses, catastrophic first-party insurance is and should be available. Due to problems of ambiguity, adverse selection, moral hazard, and highly correlated losses, insurance companies will want to charge a risk premium that considerably exceeds the expected loss. This premium can, however, be so high that there would be very little demand for coverage at that rate. In such cases, the insurer will not want to invest the time and money necessary to develop the product. If the insurer is convinced that there is sufficient demand, he will try to raise sufficient capacity to survive possible catastrophic losses.

V. COMPULSORY DISASTER COVERAGE?

A. CORRECTING MARKET FAILURE?

The question of whether compulsory first-party disaster coverage could solve the above mentioned problems regarding the lack of demand and/or supply at the insurance market has often been addressed. With compulsory first-party insurance, we refer to both first-party insurances against natural disasters that potential victims have to take in all countries where these are available on the insurance market, and to regulatory interventions, as a result of which voluntary coverage is mandatorily extended to include natural disasters. The latter refers more specifically to a duty on persons who voluntarily subscribed a property insurance policy to purchase a catastrophe extension. A distinction between both types of compulsory first-party insurance will only be made where necessary.

The classic economic rationale behind compulsory liability insurance is the externality argument: in the absence of adequate insurance, injurers could, through their insolvency, externalize risk. That indeed may be an argument in favor of compulsory liability insurance, but it is not very

\textsuperscript{145} We do not argue, however, that competition necessarily provides better results than (state) monopolies. See Winand Emons, \textit{Imperfect Tests and Natural Insurance Monopolies}, 49 J. Industrial Econ. 247, 247-48 (2001) (empirical researched showed that under specific circumstances, particularly when insurers are unable to differentiate risks adequately, a natural monopoly with one (state) insurer may provide better results than a competitive environment); see also Thomas Von Ungern-Sternberg, \textit{The Limits of Competition: Housing Insurance in Switzerland}, 40 European Eur.. Econ. Rev. 1111 (1996).
convincing in the case of first-party insurance. An argument could still be made that the victims who would not be adequately insured for personal injury would then extensively call upon the healthcare system and thus “externalize” that risk. However, given the fact that most European legal systems provide, through social security, wide coverage for healthcare (precisely through mandatory healthcare insurances), one cannot 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. Of course, the absence of insurance may lead those victims to make additional calls for government relief (and as a result to political pressure caused through the large number involved), but there is as such no direct issue of externalization of their harm. Of course, an argument in favor of compulsory insurance could be made if the disaster were to occur in a country (e.g. a developing country) where no social security system existed and the disaster did not merely cause property damage, but also personal injury. This increase in personal injury would then lead to an increasing call on state provided health care services. However, this would instead be an argument in favor of a compulsory social security system rather than for a mandatory insurance system merely focused on damage caused by disasters. However, an argument could be made that the availability of mandatory disaster insurance would reduce the pressure to provide government bailouts. This again is based on Hirshleifer’s argument that, in the absence of insurance, governments may not be able to resist the political pressure to compensate. Compulsory insurance could thus be seen as a way of reducing pressure on the government.

The second traditional economic argument in favor of compulsory insurance would be the presence of information problems. Indeed, compulsory insurance may improve all agents’ welfare due to the problem of asymmetric information. This argument has been demonstrated by Charles A. Wilson, A Model of Insurance Markets with Incomplete Information, 16 J. ECON. THEORY 167 (1977) and Bev G. Dahlby, Adverse Selection and Pareto Improvements through Compulsory Insurance, 37 PUB. CHOICE 547, 547 (1981).

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146 See generally Hirshleifer, supra note 11, at 146. See also Siegelman, supra note 11.
underestimation of the risk would, in that case, lead to the wrongful decision of the potential victim not to buy first-party insurance.

In other words, this would assume that citizens are averse against 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 e.g. on the probability and magnitude of the risk and/or on the availability of insurance. Also, given the result of psychological experiments it could easily be argued that, because of imperfect information, individuals are not fully informed about their own preferences. Regulation would then be the classic remedy to cure an information deficiency: the legislator could remedy the information problem by introducing a general duty to insure. Information problems thus could constitute an argument in favor of compulsory first-party insurance. An example of this would be for property damage caused as a result of natural disasters if empirical evidence showed that victims would greatly underestimate these risks and would, being well informed, definitely have a demand for insurance.

Alternatively, one could again take into account the results of happiness research and argue that people might experience a higher life satisfaction or subjective well-being if ex ante arrangements could be made guaranteeing financial compensation after disasters. Whether that is the case is of course an empirical question. A weakness is that, as we showed above, behavioral research seems to indicate that it is not poor information that causes the low demand, but rather a lack of willingness to insure against probability events. Moreover, if there were really poor information, the remedy could consist of a mandatory disclosure of information to the public rather than in making insurance compulsory.

A third rationale for compulsory insurance is behavioral. Individuals may, as was shown above, underinsure because they are overconfident. In that situation, compulsory insurance does not harm unbiased agents because they want to be insured, and should be imposed on overconfident individuals for their own benefit. However, Sandroni and Squintani found that the asymmetric-information rationale and the behavioral rationale for compulsory insurance do not reinforce each other. After all, compulsory insurance ceases to improve all agents’ welfare when there is a significant

148 See Kaplow and Shavell, supra note 128, at 1332-33.
150 See Sandroni, supra note 147, at 1994.
fraction of overconfident agents because it makes low-risk agents worse off. As a result, behavioral biases may weaken asymmetric-information rationales for government intervention in the insurance sector because they may turn policies beneficial to all insured into wealth transfers between the insured. High-risk citizens benefit from compulsory insurance because they obtain insurance coverage at lower prices. Compulsory insurance also benefits low-risk citizens because it relaxes the incentive compatibility constraint. However, when the economy has a significant fraction of overconfident agents, the incentive compatibility constraint no longer binds. Compulsory insurance then becomes a transfer of wealth from low-risk to high-risk agents. The previously-referenced study by Sandroni and Squintani hence shows that one has to be very careful with introducing mandatory insurance to off-set information deficiencies resulting from behavioral shortcomings. Sandroni and Squintani show that in particular circumstances (in the presence of overconfident consumers) such a regulatory mechanism may lead to a decrease in social welfare.

B. MANDATORY ADDITIONAL COVERAGE?

Slovic, Fischhoff, and others, wondered if, as people prefer to insure against high-probability low-loss events, they would also insure against unlikely disasters if such insurance were sold at a reasonable extra cost along with insurance against likely losses. Their behavioral experiments showed that adding protection against a small but likely loss might help accomplish the purpose of also being insured against low-probability losses. A compound insurance will thus lead to more people being insured against catastrophic losses.

At the side of the insurers, such a comprehensive insurance policy also has several advantages. After all, it is likely that the chances that an insurer will become insolvent are reduced due to a larger premium base and the diversification of risks across a wider area. Moreover, if the extra premium to be paid for the mandatory additional coverage would be based on risk, then the policyholder would be charged only for the hazard that he faces. One would need to highlight this idea of all-hazards coverage to the general public, who may otherwise feel that they are paying for risks that

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151 See Paul Slovic et al., supra note 84, 246.
152 An all-hazards insurance policy moreover avoids discussions between the insurer and the insured. For example, a serious amount of disputes arises after a hurricane, namely whether the losses were caused by water or by wind.
they do not face. To conclude, support for a regulatory duty to insure against disasters, in addition to voluntary housing insurances (like this is the case in France) can be received from behavioral experiments.

However, here we should recall that recent studies showed that one has to be very careful with regulatory interventions (like mandatory insurance) to cure behavioral shortcomings since, in particular market situations (more particularly in the presence of overconfident consumers), this may lead to a reduction in welfare. Thus, whether such a compound insurance will have beneficial effects may well depend upon the particular market and is largely an empirical matter.

C. DRAWBACKS

However, there are various drawbacks to a duty to purchase first-party insurance against (natural) catastrophes.

First, let’s turn back to the basic principles of insurance as developed by the expected utility theory on insurance. One of the most important benefits of insurance is that it removes the risk from risk-averse persons and thus increases their utility. Are those benefits now large enough to warrant the introduction of compulsory insurance? A problem with this argument is that the degree of risk aversion varies. The introduction of a generalized duty to insure might be inefficient in as far as it forces some people that would normally not have a demand for insurance to purchase insurance. Insurance does not increase these people’s expected utility. A generalized duty to insure might therefore create a social loss. This means that the simple fact that insurance increases utility can as such not justify the introduction of a duty to insure, as long as it is assumed that all individuals are informed about the risk to which they are exposed and the availability of insurance.

This argument also rather paternalistically assumes that insurance is under all circumstances beneficial to potential victims. The argument neglects the fact that the insured has to pay a price to have the risk removed from him. This price will unavoidably be a lot higher than the actuarially fair premium, as insurer’s ambiguity increases the price with a risk

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premium. For some potential victims this premium will still be attractive, but for others it may not.

Compulsory insurance generally neglects the fact that the demand for insurance may vary according to the individual risk situation (and financial possibility) of every possible victim. Of course one could rebut that, as shown above individuals often do not buy insurance for reasons that are not consistent with standard economic theory.\textsuperscript{155} There are indeed behavioral shortcomings that are a main argument advanced in favor of comprehensive disaster insurance. Still, the danger exists that behavioral shortcomings are then used as an argument for a regulatory intervention, the effects of which on social welfare are not always clear.

A second drawback is not related to the insights of the utilitarian approach. This drawback relates to the fact that it is not only the lack of information on the risk that causes the low demand for insurance, but a bounded rationality linked to the idea that “it will not happen to me,” combined with the unwillingness to pay the premium for a highly unlikely hazard. The question thus arises whether forcing people to take out disaster coverage should not be considered as a paternalistic intervention which would have unclear effects on social welfare.

Third, if, to the contrary, one would assume that potential victims are poorly informed on their potential exposure to disasters and on the benefits of first-party insurance, then a regulatory intervention should aim at a mandatory disclosure of such information to potential victims rather than at a 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.\textsuperscript{156}

A fourth disadvantage relates to cross-subsidization. A general duty to purchase disaster coverage may be disadvantageous for those victims who do not run any risk. Take the example of flood insurance: one can imagine that a person living in a house close to a river might have a demand for flood insurance, but the same is probably not true for someone living in an apartment in a city on the 20th floor. A generalized duty to purchase insurance coverage would therefore force all individuals to take insurance coverage, even those that run no risk at all and therefore have no demand for insurance. This could thus create inefficiencies and lead to cross-subsidization or negative redistribution whereby those who run no risk

\textsuperscript{155} See \textit{supra} section III.

\textsuperscript{156} As already discussed above. See Slovic et al., \textit{supra} note 84.
would have to contribute to the premium of those who may actually benefit from the insurance coverage.\textsuperscript{157}

A more efficient (and fairer) solution may therefore be the one whereby the compulsory coverage (e.g. for flood risks) is limited to those individuals who actually are exposed to the particular risk. This result can of course be reached when risk-based premiums are used. The extra risk premium can in other words vary according to the individual risk situation of each insured. Moreover, if the premiums were based on risk, then insurance would provide information on ways that individuals could protect themselves against a disaster.\textsuperscript{158} However, it could be very costly to develop premiums, which would differentiate between types of structures and location. Additionally, the complexity of the rate schedule would be very confusing to the homeowner. There is also no easy way to make sure that the homeowner has met the standards upon which his premium is based. Thus, there would have to be a cost of checking reflected in the rate structure. If this cost were incorporated into the rates, then the premium might be considerably higher than the actuarial figure. It might then unnecessarily discourage some individuals and businesses from locating in a particular area where it might have been profitable for them to do so. Moreover, the question arises whether lower income residents would be able to pay these risk-based premiums and hence whether politicians would allow insurers to relate premiums to risk.\textsuperscript{159}

Fifth, compulsory insurance against disasters may be necessary to avoid the risk of adverse selection, wherein only bad risks purchase coverage. Thus, some argue that, in order to make the risk insurable, good risks should also be covered and disaster insurance (for instance, flooding insurance) made compulsory. As we have argued above, this argument is a bit odd given that the adverse selection problem is unlikely in the disaster insurance context. If the insured knew his potential loss exposures better than insurers, the insurer could easily impose inspection measures.\textsuperscript{160} But, the adverse selection argument is in fact wrongly presented by some

\begin{footnotes}
\item[157] See Harrington, supra note 101, at 41.
\item[159] See Doherty, supra note 42, at 137-38 (discussing other disadvantages of a risk-based premium in an all-hazards policy).
\item[160] See supra Part III.
\end{footnotes}
(e.g. Dutch) insurers, who suggest that disaster risk would only be insurable if everyone, even those who run no risk at all, were 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. Otherwise, people would be forced to pay for insurance that they do not need. Fortunately, within risk-prone groups, insurers can adequately differentiate risks and premiums, as a remedy to adverse selection. This is again an argument in favor of risk-based premiums.

Further, the second type of compulsory disaster insurance schemes involves a tie-in agreement, whereby a potential buyer of property insurance is forced to purchase insurance against catastrophic loss. Tie-in agreements limit competition because consumers cannot opt to include catastrophe insurance and because separate markets for both types of insurance cannot develop. Consequently, a compulsory catastrophe extension of first-party property insurance potentially generates effects that competition law tries to avoid. Introducing a duty to insure may only be efficient if sufficient competition on the particular insurance market exists. Obviously, in a monopolistic market compulsory insurance will create inefficiencies. Hence, the additional premium for the disaster coverage should not be fixed by law but should be the result of competition between insurers.

Of course, the concern about tying disaster coverage to ordinary insurance limiting competition assumes the development and existence of a full-blown disaster insurance market. This paper began by noting that people do not widely purchase first-party disaster insurance. Therefore, a large degree of competition is unlikely in current insurance markets offering disaster coverage. In that respect the tie-in argument may not be very strong in the early development of a market for disaster coverage.

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163 One can of course understand why some insurers advance this argument in policy discussions with the government. With mandatory insurance coverage for everyone (including those who incur no risk) insurers will have more insured individuals paying premiums, thereby increasing their income and reducing their overall risk exposure.
164 This argument confuses a lack supply with adverse selection.
Finally, some particular catastrophic risks may be so “new” that insurance markets may not yet have developed. One could question whether it makes sense to introduce mandatory insurance if coverage is limited (or not subject to sufficient competition) on private insurance markets.

D. COMPREHENSIVE INSURANCE OR THE PUBLIC PURSE?

Notwithstanding these objections, there is an important advantage to mandatory disaster insurance: if a comprehensive first-party insurance system exists, it will remove pressure on governments to provide disaster relief. Though politicians may always have the tendency to provide compensation when a large number of victims are affected by a disaster, randomly using public means to compensate disaster victims has been highly criticized. First-party insurance at least guarantees that victims pay themselves for the compensation they will afterwards obtain. And, with adequate risk differentiation, first-party insurance can have preventive effects which are usually absent in government relief programs. Indeed, insurance can encourage risk mitigation prior to a disaster through premium reductions and/or lower deductibles while providing financial assistance after a disaster through claim payments. If insurance is to play a central role in a hazard management program, then rates need to be based on risk so that those in disaster-prone areas are responsible for the losses after a disaster occurs.

A limitation of any government insurance program is that premiums are not likely to be risk-based because of political pressure to make coverage affordable to those residing in high-hazard areas. One way to encourage adoption of cost-effective mitigation measures is to have banks provide long-term mitigation loans that could be tied to the property. The bank holding the mortgage on the property could offer a home improvement loan with a payback period identical to the life of the mortgage.

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166 See Hirshleifer, supra note 11, at 145.
167 See Priest, supra note 12, at 221, 228; see also Kaplow, supra note 12, at 168.
168 See Epstein, supra note 12, at 296-97.
169 Kunreuther, supra note 64. See also Pierre Picard, Natural Disaster Insurance and the Equity – Efficiency Trade-Off, 75 J. RISK & INS. 17, 18 (2008).
170 See Kunreuther et al., Disaster Mitigation and Insurance: Learning from Katrina, supra note 105, at 221.
Nevertheless, government assistance in protection against natural disasters may not be optimal \textit{ex ante}, but it may be optimal \textit{ex post}. Suppose that an uninhabited area is likely to be affected by tropical storms, and that this risk is so high that it is not socially desirable from an \textit{ex ante} perspective for the population to settle there. The necessary protective assistance, which only the government can undertake, is too costly. The question then is what action the government would undertake if the area is in fact settled: either it assists settlers in constructing protective devices to limit losses in the event of a storm, or it refrains. When it is socially desirable to provide protection \textit{ex post}, there is a time consistency problem.\footnote{Finn E. Kydland & Edward C. Prescott, \textit{Rules Rather than Discretion: The Inconsistency of Optimal Plans}, 85 J. POL. ECON. 473, 473-74 (1977). The essence of the time consistency problem is as follows: a policy which economic policymakers regard as the best option in advance, when it can influence households’ and firms’ expectations about policy, will often not be implemented later on, when these expectations have already been formed and shaped private behavior. Economic policymakers will therefore revise their decision, so that the policy they ultimately conduct will be worse than if they had had less discretion in policy choice. This result does not hinge on policymakers being guided by objectives different than those of citizens at large; rather, the difference appears in the constraints on the economic policy problem at different points in time. (http://nobelprize.org/nobel_prizes/economics/ laureates/2004/public.html) Indeed, a time consistency problem can arise the moment the government has discretionary powers to pursue a policy. A credibility problem is threatening to exist when citizens realize that the government can make ex post a new consideration that can turn out differently than announced ex ante.} If the government can commit to not providing such assistance in the event the area is settled, the citizens will simply not settle there and the socially desirable outcome is attained. If, on the other hand, the government cannot commit, there will be settlement, since the citizens then know that they will receive assistance and protection, and a socially less desirable outcome is obtained.

In sum, from an \textit{ex ante} perspective, there are strong arguments in favor of a comprehensive disaster insurance program where disaster coverage is made mandatory in addition to insurance for more likely events, provided that premiums can sufficiently reflect risks.\footnote{There is an optimal trade-off to be respected since a too detailed differentiation of risks can be extremely costly. See FAURE, supra note 154, at 127.} Such an insurance program can avoid the negative redistribution resulting from government intervention, while still providing incentives for risk
mitigation. This conclusion is supported by law, economic scholarship, and most particularly in the many Kunreuther publications.\textsuperscript{173}

VI. EXAMPLES

One can now notice a European-wide tendency towards an increasing use of partially mandatory catastrophe insurance. This tendency can partly be explained by the fact that government-provided compensation is, because of increasing pressure on public budgets, losing popularity.\textsuperscript{174} Mandatory insurance is thus seen as a way to avoid “catastrophic responses to catastrophic risks” referring to the negative incentives for prevention and the development of insurance markets resulting from government-provided compensation.\textsuperscript{175} We will summarize the compulsory insurance programs in France and Belgium, which raise a set of points that suggest why such coverage may be a good idea and why it may not.\textsuperscript{176}

A. FRANCE

France is probably the most well known example of a country, which for many years has had compulsory first-party insurance against catastrophes.\textsuperscript{177} The French model indeed introduced mandatory first-party insurance, where all individuals whom have taken out first-party property damage insurance policies have to pay a supplementary premium for a mandatory coverage for natural disasters. Hence, France does not have a generalized duty to insure, but a compulsory complementary coverage on voluntary property damage contracts. However, those property damage


\textsuperscript{175} See Epstein, \textit{supra} note 12, at 296. For further examples see Faure & Hartlief, \textit{supra} note 17, at 406-15.

\textsuperscript{176} But further examples could be provided as well. See Faure & Hartlief \textit{supra} note 17.

policies are widespread and all individuals who purchase such a policy have to pay for the additional coverage for natural disasters.

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 presumably (as e.g. inhabitant of an apartment on the 12th floor) not exposed to the risk of flooding, one may be exposed to other natural disasters, such as earthquakes or heavy storms.

The system is financed with a fixed premium on property insurance contracts. The initial rate was 5.5% when the system started in 1982; it was raised to 9% the following year and to 12% in 2000. The insurer compensates, within three months as from the date of the submission of the estimate of damaged property or losses sustained, on the basis of the scheme when an event is declared a “natural catastrophe” through an administrative decision. The insured must bear a share of the loss (a so-called deductible or franchise), which is higher in municipalities that have not adopted a “prevention of risk plan.” This should provide incentives for the municipality and for the local population to adopt such a prevention plan or to move to safer places.178 Economic loss is not compensated in case of a natural catastrophe except where expressly provided for in the insurance policy.

Note, moreover, that in France, as a result of the explosion in Toulouse on 21 September 2001, a legislative change was effectuated in July 2003. As a result of this change, victims now also have additional compulsory coverage for damage caused by technological risks (such as the explosion in Toulouse). This system is financed by an additional premium of € 5 per year and per contract. On the basis of the € 50 million contracts existing in 2005, this means there is € 250 million in anticipation of the coverage of this risk.

That latter solution is, however, debated (also in France). It is not so clear why in this case of technological disasters, where a liable wrongdoer can be identified, a mandatory coverage for victims was introduced rather than examining the introduction of solvency guarantees on the side of the wrongdoer, such as compulsory liability insurance. Insurance coverage will be excluded in special areas recognized in a “prevention plan of

technological risks” as causing a serious risk to human life, for all buildings erected in this area after the plan has been published, and where a building is erected in violation of administrative rules.

Reinsurance is provided through the “Caisse Centrale de Réassurance,” (CCR) which is state-controlled. Half the premiums levied to cover the consequences of catastrophes go to the CCR, which will always cover half the damage insured. This way, the CCR is acting as a mutual fund, which balances the risk of catastrophes among all insurance companies. The CCR is itself covered by the State, which provides an unlimited guarantee.

Further, the French initiative in the field of reinsurance against risks of terrorism should be mentioned. In 2002, the French insurance companies and the companies authorized to carry on direct insurance business on French territory created a pool called GAREAT (“Gestion de l’assurance et de la reassurance des risques attentats et actes de terrorisme”). This pool was originally created for one year, but it was renewed in 2003 and it is still in force today. GAREAT reinsures damage to the property of enterprises, local authorities and large buildings caused by terrorist attacks where the insured capital exceeds € 6 million. Reinsurance is also provided by CCR, with unlimited State cover. The premium ceded to the pool is determined in relation to the premium currently charged for the natural catastrophe cover. Meanwhile, France accepted a new Terrorism Act in 2007. Prior to the new Terrorism Act, all property contracts were to include terrorism cover. Following the introduction of the new Act, only contracts with a fire guarantee must cover terrorism. Therefore, GAREAT will no longer accept risks where there is no fire guarantee.

B. BELGIUM

Belgium had a compensatory Disaster Fund since 1976. As a result of a legislative change in May 2003 compulsory flood coverage, in addition to the voluntary fire insurance contract, was introduced. It looks like the French system, but the major difference is that this mandatory supplementary coverage would only apply for specific flood-prone areas. This would hence avoid a negative redistribution because those who are not exposed to the risk are not forced to take out the coverage. Due to disagreement, however, regarding the demarcation of those risk areas, the act could not enter into force. Thus recently, the system has been changed again: since September 2005, the compulsory first-party coverage includes
not only flooding but natural catastrophes in general, regardless of whether the catastrophe happened in a risk area.\(^{179}\)

The Belgian legislature thus created the 17 September 2005 Act establishing a general solidarity between all citizens who have fire insurance coverage for the so-called simple risks – comprising 90 to 95% of the Belgian population – by introducing a mandatory extension to natural disaster coverage. The natural catastrophe insurance coverage comprises four perils: flooding, earthquake, the flowing over or the impoundment of public sewers, and landslide or subsidence. The insurer can investigate the natural hazard risk for every individual case and will adjust the extra premium accordingly. As a result, an inhabitant of the 10th floor of an apartment building in the centre of the city will normally pay a lower extra premium than the average premium increase, which is expected to be € 3 to 4 per € 25,000 insured. The final premium will hence differ in function of the real risk.

However, Colle found that insurers operate with two different systems: half of the insurance companies charge the same extra premium for all its insured, namely between € 2,60 and € 3,76 per € 25,000 insured good (plus a tax of 15.75%), while the other insurance companies vary their premiums according to the location of the ground, past damage, and deductibles.\(^{180}\) The maximum indexed deductible for the disaster coverage amounts to € 610 per claim. Further, every individual insurer has been given some limits regarding the monetary burden he can carry, since the disaster coverage concerns catastrophic risks, which can take extraordinary proportions. The ratio legis is to avoid the financial downfall of the insurance companies. The law sets up an intervention limit on the basis of a formula by event and by individual insurer according to his premium income for the coverage for fire as concerns the simple risks: € 8 million for earthquakes, decreased to € 3 million for other natural catastrophes. When this limit is attained, the Disaster Fund makes up the amount with a general upper limit of € 280 million (€ 700 million for earthquakes). In case these amounts would not be sufficient to compensate the victims, then the intervention of the Disaster Fund will be reduced in proportion.

Thus, to conclude, a public-private partnership has now been created in the Act of 17 September 2005: the government created the conditions under

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\(^{179}\) For this recent legislative change: see Philippe Colle, *De wet van 17 september 2005 betreffende de verzekering van natuurrampen*, 23 RECHTSKUNDIG WEEKBLAD, Feb. 4, 2006, at 881-885.

\(^{180}\) Colle as interviewed by Verhaeghe in *DE STANDAARD* (October 18, 2006).
which the natural catastrophe risk became insurable thanks to the solidarity between all the holders of a fire insurance agreement for simple risks, and the insurers will fully play their social role. Every family can insure itself against the direct damages to their goods which are a consequence of a natural catastrophe for a reasonable price and will receive full compensation, apart from the freely stipulated, but maximum franchise of € 610.

Further, the Belgian State created very recently a system of mandatory insurance against damage caused by terrorist attacks. The Act of 1 April 2007 extends the life insurance policy, hospitalization insurance policy, accident insurance policy and health insurance policy to mandatorily include terrorism cover – apart from the already existing compulsory coverage in the workers’ compensation insurance policy, the motor liability insurance policy and in the fire insurance policy for simple risks. Moreover, a Committee has been set up to judge whether concrete events can be considered to be terrorist actions and to decide on the amounts of compensation. The total compensated amount will be set for the first time after six months and a revision of this amount is possible every six months. The final decision with respect to this amount will be set after three years. The Act of 1 April 2007 guarantees the cover of terrorism claims during a calendar year up to a global annual limit of € 1 billion. Hereto, a solidarity-based pooling arrangement has been established, which is financed by the Belgian State, the insurers and reinsurers, and other legal persons who are active in the performance of duties. Participation at the Fund is not compulsory, but the liability of the participants is capped at € 1 billion, which will not be the case for possible non-participants. If no other agreement has been made between the Belgian State and the participants to the Fund or by the King, then the Fund will pay the first € 700 million to the victims of terrorism, while the Belgian government will pay a maximum of € 300 million. The part payable by the State should be considered as a reinsurance against which the government receives a reimbursement.

181 Of this € 700 million, the intention is for the insurers to keep the first € 300 million (this amount is not yet fixed – amounts from € 280 million up to € 350 million are mentioned) in retention and distribute this according to market share. The next € 400 million or so will be reinsured. See the thesis of Evy Nolman, entitled “Terrorisme: nieuwe uitdagingen voor de verzekeringswelde en de overheid” (2007) at the Economics Faculty of the Catholic University of Leuven, 30.
C. COMPARATIVE AND POLICY CONCLUSIONS ON FRANCE AND BELGIUM

The French system undoubtedly has the advantage that it provides comprehensive disaster insurance for a large part of the population, all of those who already have voluntarily purchased first-party property damage insurance. The problematic aspect is that all insured have to take the disaster coverage mandatorily. Theoretically, those who are never exposed to the risk of natural disasters may thus be forced to purchase coverage even though they have no demand. The seriousness of this danger of cross-subsidization depends on the extent to which some are forced into the system even though they have no risk at all. Belgium originally had a new Act adopted in 2003, which provided that the mandatory supplementary coverage would only apply for specific flood-prone areas. Hence, this would completely avoid any negative risk distribution since only those exposed to the risk would be forced to purchase the coverage. However, the political costs to identify those areas seemed so large that it was impossible to identify those risk zones as a result of which the Act remained a dead letter. The new 2005 Act has enlarged the coverage to include (in addition to flooding) also other risks, such as earthquake, damage due to flowing-over of public sewers and landslide. This enlargement may, like in the case of France, reduce the danger of cross-subsidization: even if an insured is not exposed to the risk of flooding he may be exposed to another covered natural disaster risk, such as e.g. earthquake.

However, a major difference between the French and the Belgian system is that premiums in France are fixed by the regulator, whereas in Belgium insurers fix the premiums on a risk-based basis. In France, premiums are not at all related to the risk and moreover, the regulatory intervention may limit competition. Competition is still possible as far as the basis, for example, housing insurance, is concerned. The Belgian system seems preferable to the extent that it incorporates risk-related premiums. However, the French system has also incorporated some incentives for prevention by providing that compensation will be lower if a community has adopted a “prevention of risk plan”. This should provide incentives to voters to demand the adoption of such a plan within their community.

182 See Van den Bergh & Faure, supra note 165, at 26-36.
In addition, in both countries, the governments largely intervene by providing reinsurace (in the case of France) and by intervening above certain limits (in the case of Belgium). Insurers don’t have to pay any contribution for this state intervention; as a result of this, it effectively constitutes a subsidy.\textsuperscript{183} This idea of states being able to intervene in providing intervention without market distortive effects certainly deserves more attention.

VII. SUMMARY AND CONCLUSIONS

In this paper, we merely dealt with one aspect of the compensation for victims of catastrophes. We more specifically addressed the question whether potential victims can and do purchase first-party insurance to obtain \textit{ex ante} protection against the damage they could be exposed to as a result of natural catastrophes. Of course, many other questions also related to catastrophe insurance could be tackled.\textsuperscript{184} Moreover, although our paper specifically focused on natural catastrophes, the results may have consequences for man-made disasters (like terrorism) as well, even though more difficulties might arise in that respect with the insurability of the terrorism risk. We therefore focused on the question of why, in the case of natural catastrophes (where often coverage is available on commercial insurance markets), victims often do not use the existing possibilities.

Indeed, a general finding as far as the use of first-party insurance by potential victims of catastrophes is concerned was that there is a remarkably low degree of coverage. This could be supported by examples from a flooding in Germany, but also by reference to the number of available first-party insurances. After earthquakes in California, and recently after Hurricane Katrina, it was again established that the number of insured victims was relatively low.

The question why victims seek so little \textit{ex ante} protection through first-party insurance has been addressed in the literature from various angles. The traditional neo-classic answer would be that victims apparently lack information on the catastrophe risk and that the lacking demand for catastrophe coverage is thus a classic example of market failure. However,\textsuperscript{185} At least as concerns the natural catastrophes; a reinsurance premium should indeed be paid in Belgium for state intervention in the terrorism risk.\textsuperscript{186} For instance, the scope of liability insurance on the side of liable operators might be addressed as well. However, since our focus was on natural catastrophes we assumed that liability insurance will mostly not play a role, except in the rather exceptional cases that public authorities can be held liable for failure to prevent natural catastrophes.
more recent literature resulting from psychological experiments in the field of behavioral law and economics showed that even in cases where victims were well informed, they did not seek coverage or only to a limited extent. The explanation by behavioral law and economics is that victims apparently have no demand for insurance against low-probability high-damage events. To some extent, it has to do with the well known “heuristics and biases” that decision-making concerning the purchase of insurance is subjected to. The most important problem in that respect is apparently the fact that many consider insurance as a type of investment and hence expect some return over a lifetime. With low-probability events, there is a large likelihood of merely paying a premium and never receiving any return.

A more difficult question is, however, whether these heuristics and biases are an argument at the policy level to introduce mandatory cover for catastrophic risks. The classic counterargument would be that such a paternalistic duty might be inefficient since people may be forced to purchase insurance coverage even if it does not match with their preferences. However, an alternative model (instead of outright mandatory cover for catastrophes), which is increasingly popular in many countries, is the introduction of a mandatory cover for natural catastrophes in addition to voluntarily purchased insurances, like e.g. a home insurance. This model, which has worked in France for a long time and which has been recently introduced in Belgium, seems to have various attractions. It offers victims at least some guarantee that ex post compensation will be available. This construction can moreover decrease the pressure for government relief. Law and economics scholars have often criticized government-provided compensation after catastrophes since it does not provide any incentives to those exposed to catastrophic risks to make efficient preventive efforts. Insurance is traditionally much better able to cope with this moral hazard problem.

Moreover, since potential victims pay ex ante for the protection they will receive, this model also has benefits compared to government relief in the sense that a negative redistribution from the general taxpayer towards particular victims exposed to catastrophic risks is avoided. The mandatory catastrophe cover in addition to voluntary insurances against more likely losses also received support from behavioral law and economics. The traditional disadvantage also with this construction is still that insurance

185 The model of comprehensive natural disaster insurance was also proposed by Kunreuther after Hurricane Katrina. See Kunreuther, supra note 64, at 176.
cover is forced upon some individuals who would perhaps have no demand for coverage. This problem can to some extent be limited if at least the additional duty to obtain catastrophe coverage is limited to those individuals who are actually exposed to the specific risk (e.g. those living in flood-prone areas). Thus, the cross subsidization inherent in a generalized duty could be avoided. However, the administrative costs of a differentiation between individuals exposed to natural catastrophes and those who are not may be high, taking also into account the fact that there may be considerable political costs involved with such a differentiation. The Belgian example showed that the political costs to introduce such a differentiated comprehensive insurance (limited to specific risk areas) were apparently too high.

This particular model of additional mandatory catastrophe coverage, supplementing voluntary housing insurances was first introduced in France, but seems to become increasingly popular in many other European countries as well. It was recently introduced in Belgium, is the subject of a bill in Italy and has been proposed in the literature in Germany as well. The most important motivation for these institutional arrangements is that this structural solution can take away some of the pressure on governments to provide \textit{ex post} relief to victims of catastrophes, the latter often being arbitrary and of course leading to cross-subsidization. However, we do not claim here that the Belgian or French solutions are necessarily the most efficient ones. One could also envisage other solutions whereby a combination of limited government funding and insurance would be introduced. It is beyond the scope of this paper to examine all of these alternative arrangements. Moreover, it should be repeated that the insurance solution of course is only possible within the institutional context of a country where a well functioning insurance market is available and where potential consumers have sufficient financial capacity to buy the insurance products that have been developed. In many developing countries, these conditions will often not be fulfilled and in those situations disaster insurance can of course not be the panacea for victims of catastrophes. Other mechanisms, like \textit{ex post} government compensation, will then still be necessary.

\footnote{We do not argue here that (mandatory) first-party insurance is generally more effective in providing compensation than government provided compensation since this was not the focus of this paper. However, generally law and economics scholars are very critical of government provided compensation. \textit{See, e.g.}, Kaplow, supra note 12; Priest, supra note 12; Epstein, supra note 12.}
In addition, there are many other problems related to the insurance against damage caused by catastrophes than merely the problems with demand discussed in this paper. As we briefly indicated, there may be serious problems on the supply side as well. Also in that respect, one can notice a variety of regulatory solutions whereby governments intervene to facilitate the functioning of insurance markets.187

Finally we would like to make a few recommendations as to what next steps can be taken to deal with the problem here discussed. First of all, natural catastrophe insurance, and especially flood and earthquake insurance, should be made more attractive by presenting information on the probability of a disaster on a different time interval than the traditional one-year period through normal channels to increase the concern of potential victims. Homeowners should moreover be better educated in order to see insurance as an investment with a big return. Homeowners insurance could further be expanded with flood and earthquake coverage so that this forms a package, with the extra premiums on the compulsory coverage reflecting the hazard risk of each individual. Second, the example of flooding insurance in the Netherlands 188 shows that government policy should also be addressed to stimulate insurers to provide attractive products for disaster coverage at actuarially fair prices. If insurers would collectively decide (like it was the case in the Netherlands) not to cover e.g. flooding and earthquake risks a de facto uninsurability is of course reached. Finally, it should be examined whether in case where problems on the supply side exist, government support can be provided (eventually at a temporary basis) to stimulate the development of efficient insurance markets. This type of government intervention, stimulating market solutions, may be preferred to the traditional ex post government relief which de facto only inhibits the development of market solutions to the compensation for victims of catastrophes.

187 These facilitative strategies have especially been developed in the United States, e.g. as far as earthquake and hurricane insurance is concerned. An interesting example is also provided by the California earthquake authority. For a detailed description of these models: see Rabin & Bratis, supra note 73, at 327-30.

188 See discussion supra section IV.