

Insurance for Financial Crisis?*

Michael Faure

and

Klaus Heine

METRO, Maastricht University
PO Box 616, 6200 MD Maastricht, The
Netherlands



RILE, Erasmus University Rotterdam
PO Box 1738, 3000 DR Rotterdam, The
Netherlands



09-05-2011

* The authors are grateful to Liu Jing (Maastricht) for useful research assistance and to Marina Jodogne for editorial assistance. We are equally grateful to the participants in the joint meeting of the European Association of Law and Economics (EALE) and the Geneva Association for the Study of Risk and Insurance (Innsbruck, 25 February 2011), to participants in a seminar at the East China University of Political Science and Law (Shanghai, 14 March 2011), in a seminar at the Jiangxi University of Finance and Economics (Nanchang, 18 March 2011) and at the Maastricht European Institute for Transnational Legal Research (METRO) on 4 May 2011 for useful comments and suggestions. Especially useful comments were provided to us by Dirk Heremans, Paul Kleindorfer, Alessio Paces and Roberto Pardolesi.

Table of contents

| | | |
|------|--|----|
| 1. | Introduction..... | 3 |
| 2. | The problem..... | 4 |
| 2.1. | Bail-out flawed... .. | 4 |
| 2.2. | ... but intervention unavoidable?..... | 5 |
| 2.3. | Why not insurance for financial crisis?..... | 6 |
| 2.4. | A conditional support..... | 8 |
| 3. | Insurance for catastrophes | 11 |
| 3.1. | Theory | 11 |
| 3.2. | Examples | 12 |
| 3.3. | Lessons..... | 13 |
| 4. | Export insurance | 15 |
| 4.1. | Theory | 15 |
| 4.2. | Example..... | 16 |
| 4.3. | Lesson | 16 |
| 5. | Proposal | 17 |
| 5.1. | A structural approach..... | 17 |
| 5.2. | A multi-layered approach..... | 18 |
| 5.3. | Specific aspects..... | 21 |
| 5.4. | Further challenges..... | 24 |
| 6. | Concluding remarks | 29 |
| | List of References | 31 |

1. Introduction

The recent financial crisis has led to substantial interventions of governments in financial markets. Especially large financial institutions that were in danger of collapsing were more or less generously supported by national governments, because it was held that the failure of large banks could lead to so-called systemic risks as a result of which the entire financial system could collapse (for a kaleidic overview see Paces 2010).

There has been a lot of debate on this “bailing out” of financial institutions, especially since it seemed that it were more particularly the larger financial institutions that benefited from these state interventions. “Too big to fail” may make some economic sense since the risk of systemic failure is obviously greater with larger financial institutions. However, the use of tax payers’ money to support financial institutions has been controversially disputed as providing perverse incentives to investors and managers of financial institutions.

This intervention of governments, providing financial help in crisis situations, has received a lot of attention due to the financial crisis but is as such not new. In many countries, governments also generously intervene to provide compensation to victims of a variety of natural or technological catastrophes.¹ Governments have intervened generously in all kind of different forms to provide compensation to victims of catastrophes. In some cases, *ex post* direct compensation is paid to victims; in other cases, the government acts as re-insurer of last resort (e.g. as far as terrorism is concerned) to deal with uninsurability of catastrophic risks.

With the financial crisis, the amount of subsidies provided by government has increased considerably. To some extent, the financial crisis could be considered as comparable to a natural catastrophe in the sense that a quick intervention by government is necessary. Therefore, a goal of this contribution is to address whether there is an integrative legal and economic framework to analyse this type of financial intervention by governments in crisis situations.

¹ For a comparative perspective, see Faure and Hartlief (2006).

We will more particularly argue that the economic approach towards compensation of victims in case of natural catastrophes can also provide an important contribution to the interventions of a government during the financial crisis. It is more particularly striking that in case of natural catastrophes to an important (and increasing) extent, still a large whole is played by insurance. We argue that also for risks emerging from the financial crisis, insurance may provide an attractive solution.

The remainder of our paper is set up as follows: first, we simply ask the question why there would not be an insurance against financial crisis and we sketch the conditions under which this would be feasible (2). Next, we sketch the insurance for catastrophes, where also government intervenes, but to a relatively limited extent (3). Then, we present the example of export insurance also as a case where government steps in into crisis situations to support insurance markets (4). This leads us to a proposal for a structural multi-layered approach whereby insurance could play a role in case of financial crisis and the role of government would be reduced to the one of a re-insurer of last resort (5). We end the contribution with a few concluding remarks (6).

2. The problem

2.1. Bail-out flawed...

After the financial crisis financial institutions were on a large scale ‘bailed out’ by national governments via a variety of different techniques. This bailing out gave rise to substantial criticism in the literature which can be summarized as follows: the injection of money into banks and other financial intermediaries took place on an *ad hoc* basis to avoid financial contagion and systemic risks of the financial sector. These forms of state aid not only had an *ad hoc* character, but were also provided in a rather random manner: some financial institutions received (through various techniques) financial support whereas others did not and went bankrupt. It were especially the larger financial institutions that benefited from state aid. ‘Too big to fail’ was the concept often heard in that respect. In addition to being problematic from a distributional perspective (using tax payers money to support shareholders of some

larger financial institutions, whereas smaller one could go bankrupt) this *ex post* compensation system could also give rise to moral hazard. Being aware that they were ‘too big to fail’ anyway, the foresight of state aid in case of financial crisis may give managers of large financial institutions wrong incentives to invest in riskier enterprises, thus reaping potential benefits (in case the enterprise succeeds) and being able to shift the risks (in case of failure) to the tax payers (see Okamoto 2009).

Moreover, in the current system (of bailing out) not only financial institutions are protected, but also depositors. Via the so-called deposit guarantee system, their investments in saving accounts are protected until currently 100,000 € (European Directive 2009/14), at least in Europe. Still, this system which was supposed to prevent bankrupts, could not prevent the financial crises and moreover, provides negative incentives to depositors as far as the monitoring of financial institutions is concerned (see Dijkstra and Faure 2011, Groeneveld 2009).

2.2. ... *but intervention unavoidable?*

Notwithstanding the criticism that has been formulated on bail-outs come form of government intervention in case of financial crisis may be unavoidable. It is related to the concept of a so-called systemic risk. This is referred to as the possibility that one firm’s failure (like of course the well-known case of Lehman Brothers) will result in broad damages to the economy as a whole (Schwarcz 2008 and Anabtawi and Schwarcz 2010). To some extent a government intervention in case of financial crisis may therefore be unavoidable (so Levitin 2011). The question, however, arises whether this government intervention in case of financial crisis should take the form of the current *ad hoc* bail-out or whether more structural solutions (inter alia to avoid random interventions) would not be more desirable. From the perspective of our paper the question especially arises whether it would not be advisable to primarily look at other solutions to cover uncertain risk than government intervention. The solution that then comes to mind is the classic instrument of insurance.²

² See for an excellent overview of the working of insurance and conditions of insurability the contributions in Dionne (2000).

2.3. *Why not insurance for financial crisis?*

The traditional instrument to protect risk averse individuals and enterprises against risk is insurance. Also corporations use insurance on a large scale and for a variety of reasons. Indeed, the literature has indicated that risk aversion is not the main reason why publically held corporation seek insurance. After all, stockholders can effectively eliminate risk through diversification. However, the market conditions in which insurance operates provide an important tool to manage corporate risks (MacMinn and Garven 2000). More particularly for corporations the major advantage of insurance is that it can be seen as a tool to reduce transaction costs (so Skogh 1989). Why would it then theoretically be impossible to insure against financial crisis? A variety of reasons can be advanced which would make a financial crisis an uninsurable risk. A first problem that may arise is the predictability of the risk. Insurance, also for systemic risks, is possible to the extent that risks remain predictable (Faure and Hartlief 2003, 84-85). It supposes that actuarially fair information is available (preferably via statistics) on which the insurer can base his calculus of the likelihood that the insured event will occur. Factual and legal uncertainties may endanger this ex ante predictability.³ Financial crisis may for obvious reasons be problematic in that respect for the simple reason that reliable statistics to predict such a crisis may be lacking.

A second problem relates to the fact that the insured risk has to be exogenous in the sense that the insured himself cannot influence the risk. Endogeneity may be a serious problem to the extent that it will usually not be the financial crisis as such that will the subject of insurance, but the risk that e.g. a financial institution will run into financial difficulties as a result of the crisis. The risk of endogeneity will hence pop up in case it is impossible to determine whether business failure (of the financial institution) occurred as a result of the crisis or rather because of other causes (such as risky investments or mismanagement). For that reason traditionally it was held that the enterprise risk itself is in principle not insurable. The main reason advanced for refusing to insure the enterprise risk would be that this risk would not be predictable and that hence an actuarially fair premium could not be calculated. The economic

³ Monti rightly points out that both factual and legal uncertainty could endanger predictability of risky events (Monti 2001).

success of an enterprise could indeed be influenced by a lot of complex elements that may also mutually influence each other. Enterprise risks could also be related to general characteristics of business cycles, as a result of which there would not be an independent risk.⁴ From a societal perspective a full insurance of the enterprise risk may also have the disadvantage that (as a result of control exercised by the insurer) (potentially risky) innovations would not take place any longer.

The main reason why insuring enterprise risk is considered problematic is of course linked to the well-known problems of moral hazard and adverse selection. Already in 1963 Arrow pointed out in his well-known paper on uncertainty and the welfare economics of medical care that the demand itself for medical care will change under influence of insurance. Not only will insurance increase the demand for risky activities; insurance will be particularly attractive for those who need it most. That is of course precisely the problem of adverse selection, identified by Arrow (1963). The main problem both with moral hazard and adverse selection is the information asymmetry between the insurer and the enterprise (compare Akerlof 1970). If insurers would not be able to distinguish whether the enterprise risk would be exogenous (caused by a financial crisis) or endogenous (e.g. caused by mismanagement) incurable moral hazard would make the risk uninsurable.⁵

The fifth and final reason why damage resulting from a financial crisis may not be insurable is simply that the damage resulting from a financial crisis may largely outweigh the possibilities of commercial insurers and even reinsurers. Hence, capacity may simply be lacking to cover this type of catastrophic financial risk.⁶

After now having sketched the potential difficulties in using insurance as a mechanism to cover for damage caused by financial crisis we will now ask the question whether the problems we identified are indeed really incurable.

⁴ See the interesting contribution of Gosner (2002) from before the financial crisis.

⁵ See further on moral hazard Winter (2000) and on adverse selection Dionne, Doherty and Vonbaron (2000).

⁶ See on capacity as a condition for insurability of systemic risks Faure and Hartlief (2003, 88-106).

2.4. *A conditional support*

We believe that the problems identified in the previous section should by all means be taken seriously. There are, however, remedies available as a result of which they are not necessarily incurable. As a starting point we should state that using insurance to cope with risks caused by a financial crisis may not be as odd as perhaps thought at first blush. After all, in recent years insurance companies have become very inventive in order to insure a variety of risks which are also part of the enterprise risk. Moreover, within this process insurance companies themselves have increasingly used financial instruments to cope with particular risks. Typical in this respect is the increasing use of capital markets to cover insured risks, also referred to as securitisation or alternative risk transfer.⁷

The use of these financial instruments (in fact using capital markets) by insurance companies was praised (before the financial crisis) *inter alia* because these alternative risk financing instruments would have more flexibility and would minimize the total risk costs (Zech 2001, 71-75). Interestingly empirical evidence shows that, contrary to what one would think, the financial instruments used as means of alternative risk transfer have not done badly during the financial crisis and hence the use of these instruments has subsequently not reduced (Bruggeman 2011). This shows that increasingly financial instruments are also used as tools of insurance, as a result of which the border between insurance and financial instruments has become less clear. In fact the question we would like to address is the reverse of using financial instruments for insurance, but rather looking at the possibilities of using insurance for financial institutions. We believe it can be argued that notwithstanding the problems mentioned above there are potential remedies as well.

Looking first at the issue of predictability: admittedly, financial crises may technically be difficult to predict. However, the sub prime mortgage crisis was certainly not the first global financial crisis. In addition, with the emergence of this crisis additional information has become available to make better estimates of the likelihood of future financial crises. Moreover, the literature has equally indicated that a lack of reliable

⁷ See on this securitisation Müller (2002) and see on alternative risk transfer Wagner (1998) and Smith, Canelo and Di Dio (1997) as well as Zech (1998).

statistics does not necessarily make a risk uninsurable. Kunreuther, Hogarth and Mezaros (1993) have argued that insurers can respond to this so-called 'insurer ambiguity' by charging a risk premium to account for the uncertainty following from the 'hard-to-predict' nature of an event. Problems may only occur when insurers charge high additional risk premiums to deal with insurer ambiguity, whereas the enterprise would not recognize the uncertainty and hence have no willingness to pay the additional risk premium. The lack of information on the side of insured may result in an unwillingness to pay. This may, however, change, if more information on risks becomes available or an increasing awareness of risks becomes apparent (Faure and Hartlief 2003, 86-87). In that respect the recent financial crisis in fact only adds to the insurability of the risk by providing more actuarial information to both insurers and potential insured.

The main issue is indeed the exogenous character of the risk. That problem, however, is strongly related to the information asymmetry and the resulting moral hazard problem. From the literature various tools are known to remedy the moral hazard problem (see Shavell 1979). If moral hazard can be adequately controlled the insured in fact behaves as if no insurance were available. The crucial question is hence, as also Von der Schulenburg noted (2002) whether more information can be made available to adequately control the moral hazard problem. Time and technologies to accurately assess risks are crucial in that respect. As far as financial crisis is concerned the key issue will of course be for insurers only to intervene when damage resulting from business failure was effectively caused by the financial crisis and not by causes which lay in the behaviour of the insured himself and hence could have been prevented (e.g. mismanagement). To the extent insurers invest in risk classification and risk management they will also be able to obtain information on whether the business failure resulted from an insured risk (financial crisis) or from an endogenous factor.⁸

To be clear: we do not suggest to make the enterprise risk as such insurable, but merely the damage resulting from a business failure following a financial crisis. However, increasingly the literature also now considers the enterprise risk as such

⁸ See on the importance of risk differentiation and classification Crocker and Snow (2000).

insurable (Gosner 2002, 7-8). Moreover, interestingly some insurance companies apparently provide insurance against bankruptcy resulting from sudden economic changes. The website of Cadia Insurance is interesting in that respect.⁹ The company claims to offer enterprises an insurance against bankruptcy in case of ‘sudden economic changes’. For a premium of \$ 30,000 an amount of \$ 1,000,000 would be insured. Of course the website mentions that the company makes the insurance ‘available only to companies after providing a comprehensive and transparent financial statement’ and that losses are excluded ‘that are the result of poor management’. As a payout requirement the website mentions ‘In the case of a client filing a claim for insurance against bankruptcy we will demand an official decision issued by a court, various documents which show how the company was managed and the reason for the bankruptcy’. Without judging the effectiveness of this business model it at least shows that the enterprise risk as such is apparently no longer considered uninsurable and that insurance companies take adequate measures to deal with problems of endogeneity and moral hazard in case of insurance against bankruptcy.

Probably the major problem still in the insurance of systemic risks generally may be the capacity issue. Although techniques such as pooling, co-insurance and reinsurance undoubtedly have increased the capacity of the traditional insurance market (Faure and Hartlief 2003, 88-90) the traditional problem with the insurance of risks of a catastrophic nature (such as a financial crisis) is that traditional insurance markets may lack the capacity to deal with those catastrophic risks (Froot 1999). At this point the question arises whether government could step in as a lender or reinsurer of last resort to support the functioning of insurance markets where they would otherwise (due to capacity problems) fail. We will now turn to two cases where such a role for government already exists, being in insurance of catastrophes and in export insurance.

⁹ <http://www.cadiainsurance.com/insurance-products/financial-products/insurance-against-bankruptcy>.

3. Insurance for catastrophes

3.1. Theory

Many law and economics scholars favour insurance solutions for catastrophic risks especially when compared to the alternative of government provided compensation. For example Epstein (1996) qualifies government intervention as a ‘catastrophic response to catastrophic risk’, meaning that it will dilute the incentives to develop insurance solutions. Also Priest (1996) and Kaplow (1991) have pointed at the advantages of insurance in dealing with catastrophic risk: insurance better enables an adequate risk differentiation and risk spreading and if insurance markets are competitive, insurers can be assumed to be better able to deal with classic insurance problems, such as moral hazard and adverse selection. A similar point has been made by Kunreuther who already since 1968 argues in favour of insurance solutions for disasters.

The argument in favour of government intervention is that without government support insurance coverage for disasters would simply not have developed (see Kunreuther 1996, 180-183; Harrington 2000 and Schwarze and Wagner 2004).

Reinsurance by the State can then be considered as an adequate method to resolve the uninsurability problem. A condition is of course that the government charges an actuarially fair premium for its intervention (Faure 2007, 358). This type of government intervention has, moreover, the advantage that *ex post* relief sponsored through the public purse can be avoided. Where the government acts as reinsurer, this at least has the advantage that a premium can be paid by those who actually cause or run the risk. It can thus facilitate market solutions, still provide incentives for prevention to potential victims and avoid a negative redistribution from tax payers to victims. Thus a State intervention as reinsurer may avoid the ‘catastrophic responses to catastrophic risks’ (Epstein 1996).¹⁰

¹⁰ See in this respect also Kunreuther and Pauly (2006, 113) (arguing that this government’s role in assisting the supply side allows avoiding the inefficiencies and inequities associated with disaster assistance).

Recently, Kunreuther and Michel-Kerjan also argued in favor of this type of government provided reinsurance. They argue that one advantage is that the government has the capacity to diversify the risks over the entire population and to spread past losses to future generations, thus creating a form of cross-time diversification which the private market could not achieve (Kunreuther and Michel-Kerjan 2004, 210). On the other hand, they argue that, especially as far as terrorism is concerned, government participation in insurance programs is crucial since the risk of terrorist attacks is partly in the government's control and the government can have more information on ongoing terrorist groups' activities through intelligence services (Kunreuther and Michel-Kerjan 2005).

3.2. *Examples*

There are many examples of government intervening in the financing of catastrophe risks, whereby the government acts as reinsurer of last resort. A well-known example in the field of natural catastrophes (so-called natcats) is provided by the case of France. France introduced mandatory insurance against natural disasters and reinsurance is provided through the Caisse Centrale de Réassurance (CCR). This CCR provides reinsurance via the State and even provides for unlimited coverage (in reinsurance) for natural disasters and technological risks.¹¹ The French State provides an unlimited guarantee to the CCR, which could never be provided by an ordinary insurer (Bruggeman, Faure, Fiore 2010, 381). Many other examples of the government acting as reinsurer of catastrophe risks exist (for an overview see Bruggeman, Faure and Fiore 2010). An interesting one to mention as well is that in many countries after 9/11 the government also intervenes in the reinsurance of the terrorism risk.

For example, Dutch insurers and the country's government have set up in 2003 a reinsurer of last resort, called the Dutch Terrorism Risk Reinsurance Company "NHT", to cover terrorism risks in the Netherlands. This reinsurance pool, which has a capacity of 1 billion Euros per calendar year, is funded by Dutch insurers, the government and reinsurers. It was foreseen that the first 400 million Euros will be

¹¹ For further information on this CCR, see <http://www.ccr.fr>.

reinsured by the participating primary insurers (even in case a particular insurer does not need to collect revenues from the NHT), while losses in excess of 400 million Euros in the annual aggregate will be protected under a reinsurance market excess-of-loss program valued at 300 million Euros, with any shortfall taken up by the Dutch government, acting as a reinsurer of last resort, up to another 300 million Euros. The government asks a premium for its reinsurance capacity which is chosen in such a way that it will price itself out of the market at the time insurability of the terrorism risk is restored. As a result, since 1 January 2006, the Dutch government only needs to guarantee 50 million Euros in case the NHT compensates for more than 950 million Euros.¹²

3.3. *Lessons*

Of course it is not difficult to point at many differences between natural disasters or terrorism on the one hand and the financial crisis on the other. For example the absolute economic impact of the financial crisis can be huge because of the worldwide interrelatedness of banks, issuers of securities and industry. Natural and technological disasters can have widespread damages as well (with huge amounts of losses resulting from it), but the disasters are usually limited to a certain population and some foreseeability of the budget for compensating victims may be possible. The predictability of the total amount of the loss in case of financial disasters can be larger.

A second difference is that the causes of natural disasters or terrorism can usually be easily defined. In a financial crisis it is not so easy to determine whether the economic failure of a firm traces back to the financial crisis or may be induced by general mismanagement. Hence the endogeneity of the risk may be a much more serious problem in case of a financial crisis.

¹² Parliamentary Proceedings of the Second Chamber of Representatives 206-2007, 31 031 IXB, no.1, p. 37.

Still there are possibly a few lessons to be learned from the recent tendency in the literature (although Kunreuther's suggestion already dates from 1968!) and policy evolutions in the field of catastrophes.

First, also in the field of catastrophes many scholars have pointed at the risk of the so-called 'charity hazard', suggesting that an *ex post* payment by government to victims of (natural) catastrophes may create a moral hazard problem on the side of the victims (Rashky and Weck-Hanneman 2007). The same problem arises also in case of bail-outs after a financial crisis. Hence in both cases there may be reasons to avoid, in the words of Epstein (1996) 'catastrophic responses to catastrophic risk'.

Second, also in case of natural catastrophes it was pointed out that a structural solution may be warranted to avoid randomness and *ad hoc*-ism.

Third, the case of catastrophes shows that a multi-layered approach could be followed whereby the advantages of insurance (with the possibilities of risk differentiation) are used to the full extent (thus providing incentives to the prevention of risks), whereby government only intervenes as reinsurer or lender (of last resort) to provide capacity where commercial (re)insurance markets would fail (Schwarze and Wagner 2004).

Fourth, making compensation for victims of catastrophes the joint responsibility of insurers and government may provide for an optimal combination of incentives of all parties involved: insurers, specialised in risk differentiation can ask preventive measures through risk classification and monitoring. The State, being exposed to the residual risk will also have incentives e.g. in the case of natural catastrophes to take preventive measures to avoid the catastrophe in the first place. An economies of scope argument may also be valid here: government may be better placed e.g. to prevent terrorists attacks or to build dikes to prevent flooding. These arguments apply to a large extent *mutatis mutandem* to the case of financial crisis-risks as well.

4. Export insurance

4.1. Theory

In case of a comparison with terrorism or natural catastrophes it could still be argued that those risks are to an important extent different from financial risks. However, a similar construction in fact also exists in another area, being export guarantees. Theoretical starting point is a book by the Rotterdam Nobel Prize Winner Jan Tinbergen who as early as 1962 pointed at the fact that political factors could determine to an important extent the volume of trade between countries, given the potential of political instability (Tinbergen 1962, 265). The theoretical starting point is that the export market can be incomplete as a result of asymmetric information in which case government intervention might be useful to improve efficiency (Moser, Nestmann and Wedow 2006). The risk for an exporting party is that the importer may become insolvent and hence default on the export contract. In addition to this commercial risk actions by the importers host government may cause non payment on the export contract (the so-called political risk). There are several reasons why no perfect insurance for this political risk can be obtained. These are related to:

1. High correlations of risks in an export credit portfolio;
2. Strong time-varying risk exposures and
3. Potentially higher recovery rates of claims stemming from political risks by export credit agencies (Moser, Nestmann and Wedow 2006, 4).

The third argument is particularly interesting: the government would be better able to bundle all claims and can use diplomatic means to recover the due obligations. Also other studies hold that from the perspective of recovering efficiency losses the use of an export credit programme is justifiable. Shifting the risk to government also reduces the costs of collecting information about credit standing of importing markets (Rienstra-Munnica, Turvey and Koo 2006).

4.2. *Example*

The way this works is that government provides export credit guarantees. In Germany this is for example run via Euler Hermes Kreditversicherungs AG and PriceWaterhouseCooper. The public export guarantees are integrated in the accounts of the government. Premiums and fees are transferred to the federal budget and indemnification of claims is also paid out of federal funds. Euler Hermes is only paid a fee for handling the export scheme. The statute determines a maximum exposure limit. The credit insurance provided by Euler Hermes does not provide coverage for the commercial risk (being that a private importer would become insolvent), but only of political risks that have been specifically defined.¹³ The risk premiums charged by Euler Hermes are based on country ratings. The goal of export insurance and the support by government is to promote exports. The reimbursement clearly indicates a subsidy component, which is deemed justified to deal with the political risks which would otherwise hamper German exports (Moser, Nestmann and Wedow 2006, 7). Almost all countries have these forms of export credit insurances, which include an element of subsidy on foreign exports (Rienstra-Munnica, Turvey and Koo 2006).

4.3. *Lesson*

Of course to some these subsidies and government intervention may create market distortions. Moreover, questions could also arise concerning the compatibility of the subsidies with the regulations of the World Trade Organisation. More interesting for the scope of our paper is that export insurances are clearly seen as a sort of subsidy to overcome financial crisis in importing (often developing) countries by providing liquidity for exported goods (Funatsu 1986). The argument is that the state is considered to be a better insurer to cover these political risks and to have better capacities to monitor the payback possibilities of faulty credits.¹⁴ Moreover, the German credit insurance agency, Euler Hermes, apparently carefully distinguishes between commercial risks and political risks. This shows that it should be possible to

¹³ See <http://www.exportkreditgarantien.de/eng/index.html>.

¹⁴ However, there is of course always the risk that the state will use the official export insurance as a tool of strategic export promotion (e.g. through reduced premiums) in which case the export insurance may amount to state aid (Dewit 2001).

distinguish also between business failure due to commercial risks (e.g. mismanagement) or due to a financial crisis.

5. Proposal

5.1. A structural approach

The approach in the previous sections shows that using insurance to cover risks posed by a financial crisis may be difficult, but not impossible, provided certain conditions are met (2.4), e.g. concerning the possibility for the insurer only to cover the exogenous risk and to control moral hazard and adverse selection adequately via risk differentiation. This obviously assumes adequate information on the side of insurers. The major remaining problem, the lacking capacity as a result of large financial losses, could be covered by *ex post* government intervention. However, the type of government intervention we propose is in important ways different than the intervention of government via *ex post* bail-out of large financial intermediaries, as in the recent financial crisis of 2008.

First we would suggest dealing *ex ante* with the possibility of losses due to a financial crisis in a structural way rather than *ad hoc* and *ex post*. This aims (via insurance) at implementing market solutions for compensating victims of financial crisis. Hence, compensation will no longer be *ad hoc*, but structural.

Second, government intervention should be (like in the case of terrorism or natcats) limited to intervening there where private insurance markets fail due to lacking capacities. Hence, the government intervention will be limited and compensation will be partly paid by private insurance companies. The result will be that market incentives to assess and monitor the hidden characteristics and hidden behaviour of (potential) beneficiaries remain intact. While in case of a full *ex post* bail-out the state has to make a full investigation into all details, whether a financial intermediary qualifies for a subsidy, the structural involvement of insurance companies will have the effect that information concerning the financial status of financial intermediaries will be collected largely *ex ante*. In addition, competition between private insurance companies will provide high powered incentives to price risks adequately (static

efficiency) as well as to engage in innovative activities to make better risk assessments (dynamic efficiency).

An apparent advantage of this structural approach is its pre-emptive effect on financial crises. Since insurance companies will have to permanently monitor insured companies, in order to make adequate risk assessments and to adapt insurance premiums, there will be a constant flow of information regarding a company's financial status, business model and management capacity. While yet 'due diligence' of companies takes place almost exclusively in the event of mergers or initial public offerings (Pack 2002) and it is also questionable whether regular audits by accounting firms make a proper assessment of a company's financial status,¹⁵ the engagement of insurance companies would be an additional safeguard for providing proper information on a company's financial status. Those permanently generated and disseminated information would help to stabilize a financial system by making the market participants' investment decisions more informed. In the following paragraphs the pre-emptive effect of the suggested structural approach will become clearer by discussing the approach's details.

Moreover, our proposal also has the advantage that it seems distributionally fairer than the current system (of bailing out), which takes place in a random manner, *ad hoc* and has negative effects on incentives to prevent crises. Moreover, under the current bailing out, the shareholders of financial institutions receive additional protection, whereas they can only reap the benefits themselves in case of profits. Under our system, financial institutions (and thus their shareholders) would pay via insurance premiums for the protection awarded to them.

5.2. *A multi-layered approach*

From the discussion of financial compensation for victims of catastrophes in section 3 could be learned that a multi-layered approach can be introduced whereby a first layer

¹⁵ The cases of *Enron* and *Parmalat* have clearly pointed to the deficient role of accounting firms. More recently, the New York attorney general *Andrew Cuomo* sued *Ernst & Young*, charging the accounting firm of helping *Lehman Brothers*, its client, to "engage in a massive accounting fraud" by misleading investors about the investment bank's financial status (December 21, 2010, Supreme Court of the United States, County of New York).

is typically born by the victims themselves. The second layer of losses is covered by private insurance companies and reinsurance. The third layer of losses is covered by the public budget whereby the government becomes a reinsurer of last resort. This model, so we propose, also has capacity to be applied to potential losses caused by a financial crisis.

While it is not likely that the economic risks of a financial crisis can be fully insured by private insurers, because insurers are highly intertwined with financial markets and because of the sheer amount of funds that are needed, the introduction of private insurance can reduce the risk that the public spends subsidies to firms, which are in trouble even without financial crisis. More technically spoken, a multi-layered insurance program can serve as a screening device that reduces the likelihood of granting non-eligible subsidies, when a public agency has to decide on a huge amount of applications for subsidies in a short time.

The *first* layer of a multi-layered insurance program is typically the requirement that the insurance holder bears a part of the costs by himself (Kunreuther and Michel-Kerjan 2004). This is an incentive for firms not to engage in moral hazard, but it may also help to overcome adverse selection. For example, the requirement to hold enough equity to compensate temporary losses may be understood as a sort of obligation for firms to self-insure a part of the losses in the event of a financial crisis. In addition, a firm may freely adopt Corporate Governance Codices, in order to signal insurers that the firm strives for a proper management. This kind of self-selection may lead to a reduction of premiums for insurance and may also be a convincing argument for the public to speedily grant aid in the event of a financial crisis.

At the *second* layer private insurers offer risk adjusted insurance contracts to firms, which will cover the risk of becoming illiquid and which will guarantee the maintenance of a firm's operations. Although in case of a severe financial crisis this private part of the financial safety net will often not be sufficient to rescue all firms, it will nevertheless contribute to financial stability. However, the most significant aspect of the second layer is that insurers will undertake investigations (e.g. due diligence and stress tests), in order to calculate the risk adjusted premiums for firms. By doing such investigations information about a firm's economic performance and financial

stability will be uncovered. This information is of great importance, when a public agency has quickly to decide whether a subsidy is applicable. While in “normal” times a public agency may have enough time and resources to undertake its own *ex post* investigations, whether a firm is eligible for benefit, in times of a financial crisis public administration will be overburdened by applications for financial help and can refer to the information provided by insurance companies.

We should add one note here: in our system, the second layer would consist of an intervention of private insurers. However, in practice, several alternatives have developed to deal with catastrophic risk as alternatives to insurance. One obvious example concerns the use of the financial market for catastrophes in so-called cat bonds. Although it may seem like a strange option to use financial instruments to deal with risks posed by financial institutions, this option should certainly not be ruled out. After all, it was shown that these financial instruments covering catastrophic risks have done relatively well through the financial crises (Bruggeman 2010). Another alternative which has been developed in the market (more particularly for dealing with oil pollution risks)¹⁶ is the development of a risk sharing agreement. Through these agreements, risks are distributed among operators exposed to a similar risk. Like in the case of insurance, it protects risk averse individuals against risk, but risks are mutually shared rather than shifted to a third party. To the extent that financial institutions would be able to develop themselves such a risk distribution agreement (for example via a pool of financial institutions), this could be a viable alternative to provide compensation in the second layer as well. The preference for a risk distribution agreement rather than insurance merely is related to the operational costs of both systems and the ability of either insurers or financial institutions to adequately monitor risks. In principle, financial institutions themselves may be better able to exercise mutual monitoring. However, through pressure exercised by larger institutions, mutual monitoring may be suboptimal and an objective risk assessment and monitoring via insurers may be preferred.

At the *third* layer the public steps in as a “re-insurer of last resort” and may grant subsidies. While at the second layer private insurance companies can only diversify

¹⁶ Through the so-called Protection and Indemnity (P&I) clubs.

risk horizontally between actual firms of a risk pool, government can diversify the risks over the entire population of firms and spread past losses to future taxpayers, which is a sort of cross-time diversification of risk which private insurance markets cannot achieve (Kunreuther and Michel-Kerjan 2004). Again, because of the information which is generated by private insurance firms on the second layer and the signals that are freely given by firms on the first layer, public agencies can make timely decisions on subsidies with a considerably reduced failure rate.

5.3. *Specific aspects*

Admittedly we for now suffice by pointing at the potential of insurance for dealing with financial crisis via a multi-layered insurance approach, according to the example of the role of government in case of financial compensation for victims of other catastrophes. However, we do realise that a lot of practical ‘details’ may still have to be answered which can be crucial for the effectiveness of the system. A first aspect concerns the question for whom this multi-layered framework should be provided as a protection against financial crisis. Theoretically the system could be applicable both to financial intermediaries as well as to companies in the real economy. However, the bailing out (for which we precisely want to present an alternative) especially took place as far as financial intermediaries are concerned. Therefore, for simplicity, we explore the possibilities of our model first for financial institutions, although it could be applicable to the real economy as well.

A second issue is how one distinguishes whether losses are caused by a financial crisis. This problem is as such not new. It also appears in the insurance of natural catastrophes where for example in France specific insurance coverage is only provided when damage is caused by a natural catastrophe. Hence, in France it has to be determined whether an event can be classified as a natural catastrophe. Likewise in our case it will have to be determined whether a financial problem can be classified as a financial crisis, as a result of which the proposed system will be triggered. In the literature those decisions are associated with ‘sorting costs’ (see Levmore and Logue 2003) and can as such be overcome as well. The example of France shows that the government will take an administrative decision declaring a particular event a natural

catastrophe, as a result of which the system will be triggered (Moreteau 2007 and Moreteau, Cannarsa and Lafay 2006). A similar system could thus be used in our model as well to deal with the sorting costs: government could declare a particular stressful financial situation 'a financial crisis' as a result of which the multi-layered approach will be triggered. Thereby an advantage of the proposed approach is that the government can also refer to the specific information which insurers have already collected. However, the official declaration of financial crisis will of course not mean that all damages claimed by the insured companies will be paid by the system. It will obviously still have to be determined whether the business failure and resulting problems of the financial intermediaries were really caused by the financial crisis and not by endogenous factors (such as mismanagement).

Third, we referred to government intervening as a reinsurer of last resort to grant financial aid. This assumes that the intervention of government in the third layer would amount to a subsidy. That should of course not necessarily be the case. It has been argued that an efficient reinsurance by the government would suppose that risk based premiums should be charged in order to provide incentives to invest in cost effective loss prevention measures (Gron and Sykes 2002). State provided reinsurance should thus in principle use risk-based premiums which reflect actual risk to the extent possible (Bruggeman, Faure and Fiore 2010, 377-378). Nevertheless, the intervention of government as reinsurer has been criticised because it would amount to a subsidy (Levmore and Logue 2003, 304). However, government reinsurance should of course not necessarily be provided gratis (Kunreuther and Michel-Kerjan 2004, 204 and 211). To the extent it is feasible the government should charge a price for the reinsurance it provides. To the extent this is possible the subsidy character of the government intervention hence reduces.

A fourth and complicated issue is whether a multi-layered coverage system for financial crisis should be made mandatory. Here the parallel with natural catastrophes may not be that obvious. In the case of natural catastrophes the system is often made mandatory (like in France and Belgium) and the suggestions to come to comprehensive natural disaster insurance, repeatedly made by Kunreuther (e.g. Kunreuther 2006) also seem to be based on a mandatory system of insurance (Kunreuther 1996). The arguments supporting compulsory insurance for natural

disasters are that potential victims largely underestimate risks. Behavioural experiments also show that individuals do not take insurance against low probability high loss events, even if it would increase their utility (Slovic et al. 2000, 60-61 and 70-71). Behavioural problems like bounded rationality cause individuals to take an 'it will not happen to me' attitude and hence not to purchase insurance coverage (Kunreuther 1996, 175; Faure and Bruggeman 2008, 21-27). However, these behavioural arguments based on limited information and bounded rationality which support mandatory insurance in the case of natcats may not apply in the case of financial intermediaries who seek coverage against risks caused by financial crisis. As a starting point the system should therefore be voluntary. The advantage is that a separating equilibrium is created to distinguish between the good and the bad risks. Those who would not seek insurance coverage (presumably the bad risks) would then also not be bailed out, in order to preserve the credibility of the system.

The problem is, however, that the starting point to create the system in the first place was that financial risks are systemic. In other words: destabilisation of one financial intermediary (like Lehman Brothers) could lead to the destabilisation of the entire economy. If the system is supposed to prevent these kinds of systemic risks there may be an argument in making it mandatory. However, this may create the problem that there could be a pooling equilibrium in which it is no longer possible to distinguish between good and bad risks. Moreover, a system of mandatory insurance unavoidably always lead to a cross-subsidisation whereby good risks finance bad risks (Faure 2007, 349-350). The question therefore arises whether it is possible, even under mandatory insurance, to attain a separating equilibrium, in other words, distinguishing between good and bad risks. Again, the example of natural catastrophes may be instructive. For example in Belgium there is mandatory insurance against flooding, included in the fire insurance. However, premiums are not fixed and can hence be differentiated. Thus good risks (e.g. protecting themselves with preventive measures against flooding) can, even in a mandatory insurance system, still be rewarded as a result of risk differentiation.

The problem remains, however, that insurers should still have sufficient information to punish the bad risks with higher premiums and reward the good risks. If that were not the case the risk would remain (like in the case of bail-outs today) that a financial

institution has incentives to behave as a gambler (counting to be protected by the system). As a general rule one could therefore hold that the system could be mandatory in order to prevent systemic risks, but this supposes that insurers charge risk differentiated premiums and are able to monitor financial institutions adequately. Those may be (too) heavy assumptions, which have to be discussed a bit deeper in the next paragraph.

5.4. *Further challenges*

5.4.1. The implementation of a separating equilibrium

As already mentioned an important problem is the design of a mechanism which differentiates between firms that got into trouble because of the financial crisis and those firms which are in trouble anyway (without financial crisis). An informative separating equilibrium between the two groups can be attained, if firms can choose between different insurance contracts, or can decide to not insure the risk at all.¹⁷ A firm that has not insured the risk may not qualify for receiving public aid. Alternatively, in case that all firms have to insure, a pooling equilibrium may occur, which provides no substantial information for the decision on whether a subsidy is justified or not. That is, mandatory insurance leaves no or only little room for self-selection of firms. Therefore, making insurance voluntary seems to be essential. However, if firms are free to take insurance or not, then they may behave strategically and take no insurance. They may speculate that in case of a financial crisis they may get financial help anyway, because of the systemic risks that have to be prevented or because of (blackmailing) politicians,¹⁸ which want to signal activity to voters (Dewatripont and Seabright 2006).

There is obviously a dilemma between accurately identifying good and bad risks by a system of voluntary insurance on the one hand and preventing financial contagion and systemic risks by a mandatory insurance on the other hand. However, there are

¹⁷ For a general discussion of this kind of insurance problems see Rothschild and Stiglitz (1976) and Allard et al. (1997).

¹⁸ This sort of behavior has been vividly described in the natural disasters literature as ‘charity hazard’ (Raschky and Weck-Hannemann 2007), when individuals reject to insure against natural hazards, if they anticipate governmental and private aid.

screening and signaling devices at hand, which may overcome the problem of a pooling equilibrium in case of a mandatory insurance.

There is apparently the possibility that firms invest voluntarily in additional signals, like adopting a prudential Corporate Governance Code or adapt to a particular capital structure (Leland and Pyle 1977), in order to become identified as a good risk. Then insurance premiums may be lowered for those firms, while firms that do not invest in those costly signals may have to pay higher premiums. As a consequence it is possible to calculate risk adjusted premiums.

Nevertheless, yet it is not clear if the incentive to engage in signaling is strong enough for firms. Therefore, a pooling equilibrium may be not prevented. However, the screening activities of insurers can also contribute to attain a separating equilibrium. At a first stage insurers will permanently monitor financial intermediaries,¹⁹ in order to adjust premiums. This may reveal at least some information about the insured companies, which are useful for calculating risk adjusted premiums. The question is then whether even an incomplete screening that does not uncover all risks may be sufficient to attain a separating equilibrium. To be sure, the incompleteness of information will hinder insurance companies to correctly calculate premiums and to simply overcome the problem of a pooling equilibrium in case of a mandatory insurance of the risk of a financial crisis. But even small adjustments of premiums may have a disciplinary effect on financial intermediaries and can incentivize them to engage in financial risk prevention. The means with which this “leverage-effect” can be attained is corporate governance via media (Dyck, Volchkova and Zingales 2008). If the current insurance premiums of financial intermediaries are made public, then capital markets can evaluate this information and take it into account when the firm value is determined, also a firm’s capital costs may depend on the level of the insurance premium. In principle the mechanism is the same as with rating agencies, whereby here it is not an abstract code, like AAA, which indicates a certain risk level within a pre-specified band-width, but a price signal, which mirrors the risk

¹⁹ In this respect, again export insurance is an instructive example. Usually the state as lender of last resort of export insurance undertakes a permanent monitoring of the importing country, thereby assessing the risk (changes) and maybe launching political initiatives to lower the involved risks (Egger and Url 2006).

evaluation of a firm by an insurer. An advantage of this sort of rating by insurers (compared to traditional rating agencies) might be that insurance companies have a strong incentive to adequately price the risk, in order to maintain their financial stability on the one hand and to make competitive offers of insurance premiums to financial intermediaries on the other hand. In the end financial intermediaries may have a strong incentive to engage in reliable measures for preventing financial instability, in order to lower insurance premiums as well as to signal capital markets to be good risk.

In summary, attaining a separating equilibrium is by no means simple. However, it is not impossible by considering smart mechanism designs. In addition, our proposed structural approach may also be of interest for overcoming topical problems of rating agencies, which in the recent financial crisis have failed to accurately inform market participants of the inherent risks of certain financial products.

5.4.2. The problem of state intervention

A second kind of problem is concerned with the interplay between the second and the third layer of insurance. This problem occurs if the government as a “re-insurer of last resort” impinges on the insurance premiums of the second layer. For example, the government may enforce an equalization of premiums between firms or between industries, with the consequence that premiums are no longer risk adjusted. The driving force behind this sort of state intervention may be interest groups which seek to impede competition (for an overview see Joskow 1973; Gardner and Grace 1993; Faure and Van den Bergh 1995). Thereby the lobbying against risk adjusted premiums may be triggered by insurance companies as well as by insured companies. Insurance companies may want to restrain competition between insurance companies, in order to set a monopoly price. This cartel is then stabilized by the state, which administers and enforces the cartel prize. Insured companies may be interested in infringements of the state, in order to shift a part of the burden of insurance to competitors. In addition, the equalization of premiums will result in a pooling equilibrium from which financial intermediaries profit which are bad risks.

While state intervention into the adequate calculation of insurance premiums for financial intermediaries is certainly a serious matter, it is not a special problem of our proposal. It is always tempting for firms to get a cartel stabilized by the help of the state (Taylor and Klein 2008).

However, there is another antitrust relevant issue implied which needs attention. Insurance companies may be financially intertwined with the financial intermediaries they insure. These cross links can be abused to grant competitive advantages to financial intermediaries, which are financially affiliated to the insurance company. Thereby the abusive competitive advantage not only consists of relatively lower insurance premiums for the linked financial intermediaries in comparison to the non-linked ones, but a reduced premium will also signal a financial status of the intermediary which allows it to raise capital at lower costs than its competitors. Therefore, antitrust policy has to be targeted on the neutrality of the insurance companies with regard to the conditions they provide to financially linked and non-linked financial intermediaries. However, those problems are not totally new to competition policy and can be solved either within the general application of competition policy or with the help of a more specialized sector regulation. The important issue is that governments act strictly as “re-insurer of last resort” and maintain competition on private insurance markets of the second layer.

Of course, a related issue in case of state intervention is that one can always wonder whether it is possible to metaphorically bind the hands of the state with golden handcuffs. In other words, preventing them from bailing out after the introduction of the structural solution we propose here. Pressure on politicians may indeed always exist. However, we claim that this pressure will be reduced in case of a structural solution which is already at hand. Moreover, again, the comparison with the case of the natural catastrophes is illustrative: in countries where structural solutions (mandatory insurance with state provided reinsurance) do exist (like in France) there is less of a need to call on government to provide direct compensation in case of a natural disaster. Structural solutions can thus indeed help to prevent the tendency of politicians to bail out in case of crisis.

5.4.3. Coordination problems of compensation

A third problem may be borne by the coordination of compensations by the second and third layer. The proposed model suggests that public subsidies are granted, if the second layer ascertains the event of loss in case of a financial crisis and if the funds provided by the second layer are not sufficient to financially stabilize a financial intermediary.

However, there is the chance that the coordination of payments of the different layers is not as frictionless as necessary. The second layer of private insurance may pay while the government refuses to grant aid. This case seems unproblematic as long as the compensation paid by the insurance company covers the economically necessary amount of funds to stabilize a financial intermediary. It becomes complicated, if the government refuses to pay, while the private layer is paying and the funds are not sufficient to stabilize a financial intermediary. Also, it is possible that the private insurance company refuses to pay, while the state does pay a subsidy. Then the beneficiary as well as the government may claim that the insurance company also has to pay.

The crucial point is that private insurance companies as well as the state may try to shift the burden of paying compensations. Private insurance companies may try to shift the burden to the public, while the government may try to spend generously subsidies by leveraging the own budget by involving insurance companies. Therefore, in order to prevent lengthy law suits and to provide timely compensations to financial intermediaries, strategic behavior has to be abandoned. That is, it is indispensable that there is a clear-cut and reliable legal framework, which coordinates the decisions of the second and third layer.²⁰ This legal framework must comprise two main components: 1) There has to be an automatism which is triggered in case of a financial crisis, which leads to a timely activation of private insurance and public funds. The reason for an automatism is that a discretionary mechanism may lead to opportunistic *ex post* actions of the involved parties, which would try to bargain a

²⁰ Again, it is striking that state aid control may learn from disaster management, how to coordinate the different layers of insurance. For example, in the Netherlands terrorism insurance is organized in a way that the different insurance levels do not interfere (see above 3.2).

more profitable sharing of costs, thereby delaying the timely availability of funds. 2) The final decision to officially declare the situation of a financial crisis is certainly with the government, which is the legitimate legal representative of a jurisdiction. However, this decision has to be substantiated by a committee which is independent from any special interests, which may be in favor of suppressing or stating falsely a financial crisis. Such an independent committee might be formed of financial experts or a special independent legal body may be assigned, as for example the constitutional court.

In general, the coordination problem points to the need of legal safeguards on the constitutional level, which trigger reasonable decisions on the post-constitutional level. Public choice and constitutional law and economics provide the tools for a legal mechanism design, which precludes strategic actions of the involved players (see for example Buchanan 1975 and Vanberg 1994).

6. Concluding remarks

In this paper we transfer insights from the theory and practice of insuring technological and natural disasters to the idea of insuring the financial risk of financial intermediaries in case of a financial crisis. Although technological and natural catastrophes are certainly different from financial crises in many respects, it is striking that both events have similar features in regard to the problems that an adequate insurance for both risks has to overcome. This implies that it is theoretically possible to insure financial intermediaries against the risk of financial crisis. More practically it is possible to borrow “insurance technology” from the technique of insuring natural and technological disasters.

At the heart of our proposal is the idea of a multilayered approach which comprises self-insurance, private insurance and the state of re-insurer. These three layers of insurance have to be well-matched, in order to overcome a pooling equilibrium, undue state intervention and coordination problems. While these are all serious problems, they are not specific to our proposal and can be tackled by employing insights from insurance theory, antitrust and public choice.

One major advantage of our proposal is that insurance companies can monitor financial institutions and hence contribute to the prevention of financial crises. Of course, the effectiveness of the system will to a large extent depend upon the ability (and willingness) of insurance companies to actively exercise this monitoring. Moreover, we of course do not claim that monitoring by insurers is the only remedy to prevent financial crises. Other instruments (not addressed in this paper), like regulation and a reform of corporate governance in banks (see Paces 2010) may have a far more important role to play in that respect. Our focus was on the role that insurance could play in preventing financial crises and in intervening in case crises would arise. The main thrust of our paper is that the role of insurers in that respect can be far more promising than the current practice of bailing out of financial institutions.

Notwithstanding our optimistic stance, we are aware that our proposal is only a first step on the way to an insurance approach towards the avoidance and management of financial crises.

List of References

Akerlof, G., ‘The Market for “Lemons”: Quality, Uncertainty and the Market Mechanism’, *Quarterly Journal of Economics*, 1970, 84, 488-500.

Allard, M., Cresta, J.-P. and Rochet, J.-C., ‘Pooling and Separating Equilibria in Insurance Markets with Adverse Selection and Distribution Costs’, *Geneva Papers on Risk and Insurance – Theory*, 1997, 22, 103-120.

Anabtawi, I. and Schwarcz, S.L., ‘Regulating Systemic Risk. Towards an Analytical Framework’, available at: <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1670017>.

Arrow, K., ‘Uncertainty and the Welfare Economics of Medical Care’, *American Economic Review*, 1963, 53, 941-973.

Bruggeman, V., ‘Capital Market Instruments for Natural Catastrophe and Terrorism Risks: A Bright Future?’, *Environmental Law Reporter. News & Analysis*, 2010, 40, 10136-10153.

Bruggeman, V., Faure, M.G. and Fiore, K., ‘The Government as Reinsurer of Catastrophe Risks?’, *The Geneva Papers on Risk and Insurance*, 2010, 35, 369-390.

Buchanan, J.M., *The Limits of Liberty*, Chicago, University of Chicago, 1975.

Crocker, K.J. and Snow, A., ‘The Theory of Risk Classification’, in Dionne, G., (ed.), *Handbook of Insurance*, Boston, Kluwer Academic Publishers, 2000, 245-276.

Dewatripont, M. and Seabright, P., ‘“Wasteful” Public Spending and State Aid Control’, *Journal of the European Economic Association*, 2006, 4, 513-522.

Dewit, G., ‘Intervention in Risky Export Markets: Insurance, Strategic Action or Aid?’, *European Journal of Political Economy*, 2001, 17, 575-592.

Dijkstra, R. and Faure, M.G., ‘Compensating Victims of Bankrupted Financial Institutions: a Law and Economics Analysis’, *Journal of Financial Regulation and Compliance*, 2011, forthcoming.

Dionne, G. (ed.), *Handbook of Insurance*, Boston, Kluwer Academic, 2000.

Dionne, G., Doherty, N. and Vonbaron, N., ‘Adverse Selection in Insurance Markets’, in Dionne, G., (ed.), *Handbook of Insurance*, Boston, Kluwer Academic Publishers, 2000, 185-243.

Dyck, A., Volchkova, N. and Zingales, L., ‘The Corporate Governance Role of the Media: Evidence from Russia’, *Journal of Finance*, 2008, 63, 1093-1135.

Egger, P. and Url, Th., ‘Public Export Credit Guarantees and Foreign Trade Structure: Evidence from Austria’, *The World Economy*, 2006, 29, 399-418.

- Epstein, R., 'Catastrophic Responses to Catastrophic Risks', *Journal of Risk and Uncertainty*, 1996, 12, 287-308.
- Faure, M., 'Financial Compensation for Victims of Catastrophes: A Law and Economics Perspective', *Law & Policy*, 2007, 29, 339-367.
- Faure, M. and Bruggeman, V., 'Catastrophic Risks and First Party Insurance', *Connecticut Insurance Law Journal*, 2008, 15, 1-52.
- Faure, M.G. and Hartlief, T., *Insurance and Expanding Systemic Risks*, Paris, OECD, 2003.
- Faure, M.G. and Van den Bergh, R., 'Restrictions of competition on insurance markets and the applicability of EC antitrust law', *Kyklos*, 1995, 48, 65-85.
- Froot, K.A., *The Financing of Catastrophe Risk*, Chicago and London, The University of Chicago Press, 1999.
- Funatsu, H., 'Export Credit Insurance', *Journal of Risk and Insurance*, 1986, 53, 679-692.
- Gardner, L.A. and Gardner, M.F., 'X-Efficiency in the US life insurance industry', *Journal of Banking and Finance*, 1993, 17, 497-410.
- Gosner, A., 'Gibt es neue unversicherbare Risiken?', in *Der Umgang mit den Risiken im Grenzbereich der Versicherbarkeit*. Dokumentation über ein Symposium am 18.-20. Oktober 2001 in Schloß Marbach, Böhningen, Karlsruhe, Verlag Versicherungswirtschaft, 2002, 5-10.
- Groeneveld, H., "Towards a Balanced Deposit Guarantee System in Europe", *Forum Financier*, 2009, vol. 6(7), 419-426.
- Gron, A. and Sykes, A.O., 'A Role for Government?', *Regulation*, 2002, 25, 44-51.
- Harrington, S.E., 'Rethinking Disaster Policy', *Regulation – de Cato review of business and government*, 2000, 23, 40-46.
- Joskow, P.L., 'Cartels, Competition and Regulation in the Property-Liability Insurance Industry', *Bell Journal of Economics and Management Science*, 1973, 4, 375-427
- Kaplow, L., 'Incentives and Government Relief for Risk', *Journal of Risk and Uncertainty*, 1991, 4, 167-175.
- Kunreuther, H., 'The Case for Comprehensive Disaster Insurance', *Journal of Law and Economics*, 1968, 11, 133-163.
- Kunreuther, H., 'Mitigating Disaster Losses through Insurance', *Journal of Risk and Uncertainty*, 1996, 12, 171-187.

Kunreuther, H., Hogarth, R. and Mezaros, J., 'Insurer Ambiguity and Market Failure', *Journal of Risk and Uncertainty*, 1993, 71-87.

Kunreuther, H. and Michel-Kerjan, E., 'Challenges for Terrorism Risk Insurance in the United States', *Journal of Economic Perspectives*, 2004, 18, 201-214.

Kunreuther, H. and Michel-Kerjan, E., 'Insurability of (Mega-) Terrorism Risk: Challenges and Perspectives', OECD, *Terrorism Risk Insurance in OECD Countries*, Paris, OECD Publishing, 2005, 107-148.

Kunreuther, H. and Pauly, M., 'Rules rather than Discretion: Lessons from Hurricane Katrina', *Journal of Risk and Uncertainty*, 2006, 33, 101-116.

Leland, H. and Pyle, H., 'Informational Asymmetries, Financial Structure, and Financial Intermediation', *Journal of Finance*, 1977, 32, 371-387.

Levitine, A.J., 'In Defence of Bail-outs', *Georgia Law Journal*, 2011, 99, available at <http://ssrn.com/abstract=1548787>

Levmore, S. and Logue, K.D., 'Insuring against Terrorism – and Crime', *Michigan Law Review*, 2003, vol. 102, 268-327.

MacMinn, R. and Garven, J., 'On Corporate Insurance' in Dionne, G. (ed.), *Handbook of Insurance*, Boston, Kluwer, Academic, 2000, 541-564.

Monti, A., 'Environmental Risk: A Comparative Law and Economics Approach to Liability and Insurance', *European Review of Private Law*, 2001, 51-79.

Moreteau, O., 'Policing the Compensation of Victims of Catastrophes: Combining Solidarity and Self-responsibility', in Van Boom, W.H. and Faure, M. (eds.), *Shifts in Compensation between Private and Public Systems*, Vienna, Springer, 2007, 199-218.

Moreteau, O., Cannarsa, M. and Lafay, F., 'France', in Faure, M. and Hartlief, T. (eds.), *Financial Compensation for Victims of Catastrophes. A Comparative Legal Approach*, Vienna, Springer, 2006, 81-118.

Moser, Chr., Nestmann, Th. and Wedow, M., 'Political Risk and Export Promotion: Evidence from Germany', Deutsche Bank Research, working paper series, Research Notes 23, December 2006.

Müller, E., 'Möglichkeiten des Kapitalmarktes zur Aufnahme von Versicherungsrisiken (Securitisation)', in *Der Umgang mit den Risiken im Grenzbereich der Versicherbarkeit*. Dokumentation über ein Symposium am 18.-20. Oktober 2001 in Schloß Marbach, Böhningen, Karlsruhe, Verlag Versicherungswirtschaft, 2002, 43-46.

Okamoto, K.S. 2009, 'After the Bail-out: Regulating Systemic Moral Hazard', <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1292476###>, forthcoming in 57 *UCLA Law Review* 2009.

Paccos, A.M., 'Consequences of Uncertainty for Regulation: Law and Economics of the Financial Crisis', *European Company and Financial Law Review*, 2010, 7, 479–511.

Pack, H., 'Due Diligence', in Picot, G. (ed.), *Handbook of mergers and acquisitions*, Basingstoke, Macmillan, 2002, 153-183

Priest, G., 'The Government, the Market and the Problem of Catastrophic Loss', *Journal of Risk and Uncertainty*, 1996, 12, 219-237.

Rashky, P.A. and Weck-Hanneman, H., 'Charity Hazard – a Real Hazard to Natural Disaster Insurance?', *Environmental Hazard*, 2007, 7, 321-329.

Rienstra-Munninca, P., Turvey, C. and Koo, W., *A Theoretical Analysis of Economic Impacts of Export Credit Insurance and Guarantees*, American Agricultural Economics Association Annual Meeting, 2006.

Rothschild, M. and Stiglitz, J., 'Equilibrium in Competitive Insurance Market. An Essay on the Economics of Imperfect Information', *Quarterly Journal of Economics*, 1976, 90, 630-649.

Schwarcz, S.L., 'Systemic Risk', *Georgia Law Journal*, 2008, 97, 193-249.

Schwarze, R. and Wagner, G., 'In the Aftermath of Dresden. New Directions in German Flood Insurance', *Geneva Papers on Risk and Insurance*, 2004, 29, 154-168.

Shavell, S., 'On Moral Hazard and Insurance', *Quarterly Journal of Economics*, 1979, 93, 541-562.

Skogh, G., 'The Transactions Cost Theory of Insurance: Contracting Impediments and Costs', *Journal of Risk and Insurance*, 1989, 726-732.

Slovic, P., Fischhoff, B., Liechtenstein, S., Corrigan, B. and Combs, B., 'Preference for Insuring against Probable Small Losses: Insurance Implications', in Slovic, P. (ed.), *The Perception of Risk*, London, Earthscan, 2000, 51-72.

Smith, R.E., Canelo, E.A. and Di Dio, A., 'Re-inventing Reinsurance using the Capital Markets', *Geneva Papers on Risk and Insurance*, 1997, 22, 26-37.

Taylor, J. E. and Klein, P., 'Anatomy of a Cartel: The National Industrial Recovery Act of 1933 and the Compliance Crisis of 1934', *Research in Economic History*, 2008, 26, 235-271.

Tinbergen, J., *Shaping the World Economy: Suggestions for an International Economic Policy*, New York, the 20th Century Fund, 1962.

Vanberg, V., *Rules and Choice in Economics*, London, Routledge, 1994.

Von der Schulenburg-Graf, M.J., 'Comment during the Discussion of a Meeting on Insurability' in *Der Umgang mit den Risiken im Grenzbereich der Versicherbarkeit*. Dokumentation über ein Symposium am 18.-20. Oktober 2001 in Schloß Marbach, Böhningen, Karlsruhe, Verlag Versicherungswirtschaft, 2002, 9-10.

Wagner, F., 'Risk securitisation. An Alternative Risk Transfer of Insurance Companies', *Geneva Papers on Risk and Insurance*, 1998, 540-607.

Winter, R., 'Optimal Insurance under Moral Hazard', in Dionne, G., (ed.), *Handbook of Insurance*, Boston, Kluwer Academic Publishers, 2000, 155-183.

Zech, J., 'Will the International Financial Markets Replace Traditional Insurance Products', *Geneva Papers on Risk and Insurance*, 1998, 23, 490-495.

Zech, J., 'Rethinking Risk Management: the Combination of Financial and Industrial Risk', *Geneva Papers on Risk and Insurance*, 2001, 26, 71-82.