

Goran Skogh on Risk Sharing and Environmental Policy

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Göran Skogh on Risk Sharing and Environmental Policy

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This article pays homage to the important work of Göran Skogh, the founding father of the European Association of Law and Economics. It recalls Skogh's work on instrument choice, the transaction cost of insurance and his important contributions to environmental policy. Attention is especially focused on Skogh's contribution to the topic of risk-sharing institutions. The article sketches how Skogh identified the conditions for effective risk-sharing and indicates that risk-sharing can also provide interesting solutions for various (natural) catastrophes.

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Introduction

The goal of this contribution is to honour the founding father of the European Association of Law and Economics (EALE) and of the collaboration between EALE and The Geneva Association by underscoring the importance of the work of Göran Skogh, particularly in the area of risk sharing and environmental policy.¹

The reason for focusing on these particular aspects of the work of Göran Skogh is that these seem the most relevant to his collaboration with The Geneva Association and hence, generally for the domain of liability, risk and insurance. Moreover, we think that the issue of risk sharing, as Göran Skogh introduced it many years ago, could become the new frontier for the development of a wider insurance and risk-sharing system.

Göran Skogh was born on 24 June 1943 and passed away on 11 May 2014. He was connected to the Department of Economics of the University of Lund (Sweden) from 1968 until 1998 and equally to the International Institute of Industrial Environmental Economics (IIIEE) in Lund from 1995 until 1998.²

¹ We have to stress that Skogh published much more widely than merely on environmental policy and insurance. He has, *inter alia*, a few path-breaking articles with Charles Stuart on the economic analysis of crime and punishment as well. See Skogh and Stuart (1992a, b).

² <http://www.iiiee.lu.se/>.

Göran Skogh took the initiative to found the EALE by organising a founding conference in Lund from 19 to 21 March 1984. He was equally the first president of EALE, serving from 1984 till 1987. In 2009, he received the EALE Lifetime Achievement Award.³ In 2012, the Göran Skogh Award for the best paper presented by a young scholar at the EALE annual conference was created. Those awards are financed via the legacy of Göran Skogh.

Created in 1984, EALE is still very active and had its most recent, its 33rd, Annual Conference in Bologna from 14 to 17 September 2016.⁴

As President of EALE, Göran Skogh also took the initiative to engage in cooperation with The Geneva Association. An agreement was concluded with the (then) Secretary-General of The Geneva Association Orio Giarini, which resulted in the organisation of bi-annual joint seminars between EALE and The Geneva Association, always focusing on an application of law and economics to issues of relevance for the study of risk and insurance. The first of those joint workshops was organised in April 1986 and the most recent, the 16th, was organised in Berlin from 28 to 29 May 2015.

He devoted much of his research to the importance of risk-sharing institutions, explaining why, in some cases, mutual risk sharing between operators would be possible, whereas, in the same situation, insurance may not be available.

These insights of Göran Skogh concerning the relative advantages of risk-sharing institutions are quite important, since they may explain why, more particularly for catastrophic losses, operators have developed risk-sharing agreements, often as alternatives, for or in addition to insurance. A careful analysis of the arguments presented by Göran Skogh in favour of risk-sharing agreements may also explain under which particular conditions risk sharing may be able to provide adequate protection, whereas risks would be considered uninsurable on ordinary commercial insurance markets. Interestingly, Göran Skogh also pointed to possibilities of risk sharing between various public institutions (States) and, moreover, he sought possibilities to combine risk sharing with (re)insurance via a multi-layered approach. Those insights are of crucial importance, since nowadays the question often arises as to how much cover can be provided for the so-called catastrophic losses at the same time as how such a compensation mechanism could still provide adequate incentives for prevention. Göran Skogh showed that *inter alia* via the incentives for mutual monitoring inherent in a risk-sharing scheme, this is precisely what risk-sharing institutions could do: provide adequate incentives for prevention on the one hand, and provide adequate compensation to victims, on the other.

In order to present a coherent picture of the work of Göran Skogh, we will particularly focus on the importance of his work for instrument choice (“Instrument Choice” section), insurance theory (“Why Insure?” section) and environmental policy generally (“Environmental Policy” section). The remaining sections will be devoted to the important work of Göran Skogh concerning risk-sharing institutions. We will summarise the insights of Göran Skogh (“Skogh’s Contribution to the Topic of Risk-Sharing Institutions” section) indicating under which conditions risk sharing is likely to provide efficient results (“Conditions for Effective Risk Sharing” section). Next we provide a variety of examples showing how those ideas concerning risk sharing have already been applied in practice. An overview of a variety of cases will illustrate this (“The Legacy of Göran’s Contribution:

³ <http://eale.org/about-eale/history>.

⁴ <http://eale.org/conference/eale-2015-vienna/general-information>.

The Study Risk-Sharing Institutions Worldwide” section). We will, moreover, show that although risk-sharing institutions have a very long history, they are, under particular conditions, still useful tools, especially for dealing with catastrophic losses (“The Case of Public–Private Partnerships for Nat Cats” section). “Concluding Remarks: Sharing Risk in a Sharing Economy” section concludes the paper.

Instrument choice

One particular domain to which Göran Skogh contributed is what is nowadays referred to as the quest for so-called ‘smart mixes’.⁵ This deals generally with the question as to which type of instrument (or instrument mixes) is most appropriate to control externalities. Today this is an issue on which many scholars interested in the governance of risk publish; however, in the early 1980s when Göran Skogh wrote about it, it was a novel insight.

In several publications,⁶ Skogh discusses the fact that a choice was traditionally made between various ways of controlling externalities. One possibility was to use private law-based mechanisms such as liability rules in order to prevent accidents via deterrence and liability insurance to provide compensation to victims. An alternative was rather to aim at prevention via *ex ante* regulation by government, backed by (administrative and criminal) sanctions and to provide compensation through social security mechanisms which would be financed via taxes. Skogh indicated that there was a strong bias in the economic literature in favour of the former (liability and insurance), since those would be market-based solutions, and against the latter (government regulation and social security). Skogh indicated that there is no a priori reason to argue that one of those instruments would necessarily be better, since the application of all instruments requires necessary information on the part of the decision-maker. Setting efficient standards by regulators may indeed be difficult, given information deficiencies on the side of the public regulator. However, judges within the framework of the application of the negligence rule in a liability regime equally need adequate information in order to be able to set efficient liability standards, and the same is the case for a liability insurer who needs to control the behaviour of a potential injurer in order to reduce the risk of moral hazard. Skogh therefore argues that the private market solution is not a priori better than the regulatory solution. The optimality of the one or the other ultimately depends on the relative information of all decision-makers involved. In some situations, regulators may be better able than private parties to set efficient care standards, for example, or to adequately assess the tax rate in the setting of the application of liability rules and insurance solutions.

These are quite important insights which went against the bias that then existed in the literature in favour of market-based solutions to control externalities. Moreover, Skogh’s insights here also showed that there is not necessarily one instrument which is the optimal solution and that, in practice, instruments may have to be combined depending on the information available to the various decision-makers. Those insights hence opened to some extent the way for research on smart mixes of instruments.

⁵ Following the well-known book by Gunningham *et al.* (1998).

⁶ See, *inter alia*, Skogh (1982, 1989a).

Why insure?

Another of Göran Skogh's contributions of equal importance concerns the fundamental question of why individuals insure. In his seminal publication presenting the transaction-cost theory of insurance,⁷ Skogh indicates that the traditional explanation for insurance has always been based on risk aversion. Risk-averse individuals would take insurance since this would enable them to trade a situation of uncertainty for certainty, thus increasing their expected utility. Skogh, however, noticed that it is remarkable that corporations also insure property and liabilities even for relatively low values and even in situations where corporations have abundant assets at their disposition. The fact that relatively wealthy corporations also take out insurance against small risks hence does not fit into the traditional explanation, since those corporations cannot be considered as averse towards those relatively small risks.

Skogh presents an alternative explanation, arguing that insurance should be seen as a mechanism to reduce transaction costs. In other words: those corporations do not seek cover to deal with their risk aversion (for those small risks they can, to some extent, even be considered as risk neutral), but they wish to use the services offered by insurance companies that may reduce transaction costs. One aspect is that insurers can offer the services of administering claims at much lower costs than corporations would be able to do themselves. One reason is not only the specialisation of insurers in claims handling, but also economies of scale, precisely because insurers specialise in claims handling. Moreover, the advantage for traders is that the contractual conditions in the insurance policy (aiming at the reduction of moral hazard) in fact replace the need for traders to contract in detail, for example, concerning the allocation of risk. That explains why, for example, in the shipping and transport world, insurance is used to a large extent. The insurance conditions stipulated by the insurance company eliminate the need for the trading parties to negotiate in detail the allocation of risk. Again, insurance reduces transaction costs.

This contribution by Göran Skogh provides a fundamental explanation of the phenomenon that traders take out insurance cover even in cases of risk neutrality. It points out that the traditional explanation concerning the demand for insurance ignored the fact that, also in the absence of risk aversion, insurance may be beneficial to traders, more particularly, as a tool to reduce transaction costs.

Environmental policy

Göran Skogh equally contributed in an important manner to research on environmental policy.⁸ A few specific examples provide nice illustrations of how Göran Skogh used insights from institutional economics to analyse aspects of environmental law and policy, more particularly in his own country Sweden. A good example is a detailed analysis of a case decided by the Swedish High Court with respect to environmental liability.⁹ The case dealt with the question of liability for damage that was caused by a leaky hot water pipe.

⁷ Skogh (1989b).

⁸ See, *inter alia*, Faure and Skogh (2003).

⁹ See Skogh and Rehme (1998).

The defendant argued that there had been no negligence and that as a consequence, there was no liability for the damage. Both the District Court and the Court of Appeal followed the reasoning of the defendant and held that there was no liability, given the fact that there was no negligence. When the case was brought to the High Court, the High Court decided the case in favour of the plaintiff, since it held that a strict liability rule had to be applied for distance-heating hot water operators.

Skogh provides an economic analysis of the decision and applied the well-known framework provided by Steven Shavell.¹⁰ According to economic theory, in cases of the so-called unilateral harm (where only the injurer can influence the accident risk), there is a strong argument in favour of a strict liability rule in order to provide injurers incentives to exercise optimal care and to engage in the activity in an optimal manner. Skogh further argues that the advantage of the strict liability rule is equally that it shifts risks to the operator who was in that particular case better able to insure the loss.

The novel aspect of the paper is that it used traditional economic analysis to critically examine a concrete case decided by the Swedish High Court. This contribution also points to the possibilities of using economic reasoning in judicial decision-making. At the same time, Skogh in his contribution also criticises the High Court, since it in fact only based the strict liability rule on distributional considerations. Skogh (and his co-author) are not convinced by the victim-protection argument followed by the Court and argue that instead, the Court should focus on “the preventive goal of liability and leave the distribution of income and wealth to be controlled by the government through taxation, various social welfare programmes, and other forms of regulation such as the bankruptcy law”.¹¹ Again this argument completely fits into the well-known reasoning of Kaplow and Shavell that rules of private law (like liability rules) should not be used as instruments of income redistribution.¹²

Skogh’s contribution to the topic of risk-sharing institutions

Risk sharing without information on probabilities

The seminal article by Göran Skogh concerning risk sharing was published in 1999 in the *Journal of Institutional and Theoretical Economics*.¹³ Applying Knight’s (1921) classical distinction between risk and uncertainty, the author distinguished between insurance, i.e. when an agent trades a risk to an insurer at a premium fixed *ex ante*, mutual sharing, i.e. when two or more agents share losses with each other, and collective sharing, i.e. when the sharing is financed by taxes and undertaken by the State. He showed that mutual sharing requires less information as compared to insurance. This informational difference explains why mutual and collective sharing are common in situations where the probability distribution of losses is uncertain and, hence, impossible to estimate. Mutually beneficial risk sharing is possible also without assignments of probabilities. This is an important extension of the traditional theory of insurance, which always assumed that such an assignment of probabilities was a condition for risk sharing, at least via insurance. Mutual

¹⁰ See, *inter alia*, Shavell (1980).

¹¹ Skogh and Rehme (1998).

¹² See Kaplow and Shavell (2000, 2001).

¹³ Skogh (1999, pp. 505–515).

sharing may be superior to insurance at uncertainty because insurance premiums are fixed *ex ante*, while risk-sharing partners share losses *ex post*. For mutual risk sharing, it is enough that the parties accept that uncertainty prevails, and the presumption is that they are faced with the same risk. This explains why individuals may search for partners with similar risks for mutual sharing. It also explains why insurance policies usually emerge first when considerable actuarial information is available. The theory presented gives also an explanation of why welfare states collectively cover risks that are unforeseen.

In another article, written with Hong Wu and published in the *Journal of Risk and Uncertainty* in 2005, the risk-sharing concept is explained by the “The ship owner’s tale”.¹⁴ The story is about the sharing of a potential loss of cargo and ship in a situation where no insurance is available. Two ship owners with similar ships, cargos, crews and routes—hence facing the same (unknown) probability of a loss of the same amount—were expected to benefit by sharing the loss of a ship. The two ship owners also realised that the pooling would be more efficient if they had more partners in the risk-sharing group. But the offer to join the pool had to be restricted to ship owners with the same cargo and destination and who could show similar quality of ship and crew. A limitation in the pooling was the varying value of the ship and cargo, and varying destinations. But this shortcoming could be solved by using a unit of measure called a “share”, and then people could join the pool with different shares. It could be expected that a large number of ship owners would join the pool since they regarded membership as beneficial and reasonably fair. In this way, the risks at sea were diversified and the members of the pool earned a relatively stable income and became wealthy, especially after some further refinements. First, the pool introduced prepayments proportional to the shares. The prepayments were to be used for covering losses. Therefore, diversification over time was established and, since the pool members had a common interest in the prevention of accidents, they introduced safety regulations according to the information available. As time went on, they also obtained further information on “high” and “low” risks. The tendency of low risks to leave the pool was mitigated by adjustments in the shares and the benefit of a large pool was therefore maintained.

For the authors, the tale gives a plausible picture of the establishment of pooling and the evolution of insurance, even if experience and historical information may simplify pricing and thus simplify the trade of risks in the market. An additional point based on the restated diversification theorem is that hazards that are unpredictable or not even foreseeable may be beneficially shared by all citizens, as long as the presumption of equality is mutually accepted.

Public risk sharing

This idea of public risk sharing had also been explained in few articles in which Göran Skogh applied risk sharing to the case of nuclear liability. In a first study concerning compensation for damages caused by nuclear accidents, he suggested that States conclude a new convention based on a risk-sharing agreement.¹⁵ Skogh and his co-author suggested the creation of a mutual guarantee fund including all nuclear power plants in the signatory States. The mutual pool would cover the liability in case of an accident, as a result of which

¹⁴ Skogh and Wu (2005, pp. 35–51).

¹⁵ Faure and Skogh (1992, pp. 499–513).

all plants share the costs of accidents wherever they occur in signatory States. It will obviously be in the interest of the mutual fund to control its members and to reduce risk. The suggested convention would hence function as an *ex ante* agreement among States and plant owners on how to distribute the costs of potential accidents.

In a subsequent publication, Göran Skogh applied these ideas to the creation of a European nuclear accident pool.¹⁶ He now comes up with a specific proposal based on reciprocal risk sharing between the nuclear Member States. Again, he argues that the major advantage of such a pool, created through a convention, is that there will be a collective incentive to control and limit accident losses.

Conditions for effective risk sharing

On the basis of this overview of the publications of Göran Skogh restating the basic theory of risk sharing, it appears that risk sharing can be an attractive tool to protect risk-averse actors and to generate large amounts of compensation which can equally lead to better prevention of risk via mutual monitoring. However, Göran Skogh equally indicated that risk sharing may not be able to generate those benefits under all circumstances. Particular conditions will have to be met. But, perhaps even more importantly, the government can also take action to stimulate the efficient generation of risk-sharing agreements.

A first condition for a mutual guarantee to work in its simplest form is that the parties in the pool must accept and trust that, statistically, they all face a similar risk.¹⁷ Does that imply that risk sharing is impossible if risks are no longer homogeneous? Not necessarily. If, for example, two farmers concluded a risk-sharing agreement for the risk of a house being destroyed on a farm, risk sharing is still possible if, for example, one farm's house is double the value of the other. That may simply imply that the farmer with the more expensive house has a larger share in the pool.¹⁸

A second and related issue is that the assumption that all risks are equal may not necessarily hold. One participant to the pool could (for other reasons than the value of the asset) constitute a larger risk. Hence, in order to have optimal incentives for prevention, the risk-sharing agreement must also be able to mutually monitor and control moral hazard and adverse selection.¹⁹ This incentive for mutual monitoring will, in principle, be strong since the pool has precisely the incentive to control all its members, since the collective risk will increase if one of the members was to free ride. Precisely for technical and highly complicated (new) risks, operators may, in some cases, have better information (compared to insurers) on optimal preventive technologies. That could be reflected in a differentiation of the contribution to the pool or in exclusion from membership for bad risks. The question will of course arise as to what extent the pool is indeed able to carry out effective mutual monitoring and thus to control moral hazard and adverse selection. If a differentiation between different types of risk were not sufficiently possible, moral hazard could not be adequately controlled and there is a likelihood that the pool would not emerge.

¹⁶ See Skogh (2008a, pp. 74–287).

¹⁷ See Skogh (1998, pp. 247–264).

¹⁸ See Skogh (2008b, p. 300).

¹⁹ Skogh (1998, p. 254).

A third condition for the pool to function is that sufficient firms exist which have a similar risk, as a result of which an effective diversification of risk would become possible.²⁰ If the risk pool is too small, a risk-sharing pool may not emerge.

A fourth and logical condition is that the pool can be established without overly high transaction costs. Normally, the costs of pooling could be relatively limited, especially if the risks are similar or at least comparable and if mutual monitoring is possible at relatively low cost. In principle, since subjective probabilities do not need to be known *ex ante*,²¹ risk sharing does not require past loss experience or statistical information, which again, can lower costs. However, under some circumstances, prepayment may be required from the pool members, which could be a tool to enhance trust among the members.²²

Also, the government can play an important role in stimulating risk sharing. This is particularly the case with respect to the government's role as the creator of safety regulation. Mandatory safety regulation would have the major advantage that all members of the pool know that there are at least some minimum safety standards with which all participants have to comply. Mandatory safety regulation can thus be a useful tool to promote mutual risk sharing.

However, an important element remains the size of the pool. To some extent, the size should be considerable enough to allow the spreading of risk; on the other hand, the pools cannot become too large either. In the latter case, the administrative costs of running the pool would become so large that the comparative benefits compared to insurance would disappear.

The legacy of Göran's contribution: the study of risk-sharing institutions worldwide

Attractiveness for new risks

As we already indicated, summarising Göran Skogh's work (above in "Skogh's Contribution to the Topic of Risk-Sharing Institutions" and "Conditions for Effective Risk Sharing"), risk sharing may specifically be a useful tool when risks are highly technical and complicated and where insurers lack information that would enable them to calculate subjective probabilities that are needed to set actuarially fair premiums. It is well known that insurer ambiguity may lead insurers to call for a so-called risk premium in order to deal with their ambiguity.²³ The problem is that, especially when new risks are involved, statistical information based on a past loss experience may not be available. Subjective probabilities needed to calculate the actuarially fair premium will hence be based on modelling and predictions. Those can include a large safety margin to deal with insurer ambiguity.

More particularly, in cases where operators have better information on the risk and hence consider the premiums charged by insurers to be excessive, supply and demand will not meet, thus leading to uninsurability. If operators themselves are better able to calculate

²⁰ *Ibid.*

²¹ Skogh (2008b, p. 300).

²² Skogh (1998, p. 254).

²³ See more particularly Hogarth and Kunreuther (1985, pp. 386–390); Kunreuther *et al.* (1993, pp. 71–87).

risks and more particularly, if they have better information on preventive technologies and if operators are exposed to similar risks, a risk-sharing agreement may emerge. Recall that for risk sharing, actuarial information on *ex ante* probabilities of the accident risk is not needed. Information is needed on the relative contribution of each member to the risk. This only requires the pool to be able to distinguish whether members implement preventive technologies and to differentiate the relative contributions to the pool accordingly.

Risk sharing for marine pollution risks

There are various examples of risk sharing in the area of marine pollution, of which some have been more or less successful. One example of such a risk-sharing agreement is provided by the so-called protection and indemnity clubs (P&I Clubs), which are non-profit-making, risk-sharing agreements covering *inter alia* oil pollution risks.²⁴ A P&I Club is nothing less than a risk-sharing agreement between tanker owners who mutually share each other's pollution risks. Ship owners are hence members of the Club and liability for oil pollution damage is covered through the P&I Club. The conditions for cover are determined in the rules of the P&I Club. Those rules, of course, aim at risk differentiation and reducing the problems of free riding and moral hazard. All P&I Clubs are joined together in the International Group of P&I Clubs, which provides reinsurance. Cover for oil pollution damage is provided up to US\$1060 million; through reinsurance, the cover can go as high as US\$3060 million.²⁵

Interestingly, risk sharing plays less of a role with another pollution risk, namely the risk related to offshore oil and gas activities. Two risk-sharing pools—Oil Insurance Limited (OIL) and Oil Casualty Insurance Limited (OCIL)—have been created.²⁶ Basically, OIL and OCIL are risk-sharing agreements between operators. They provide a maximum coverage of US\$300 million, but have a serious deductible of “not less than US\$10 million”. Notwithstanding the potential advantages of such risk pooling arrangements, these risk pooling schemes are not very popular in practice. Major operators like BP are relatively critical of these risk-sharing schemes in the offshore area. They argue that with those schemes risks are insufficiently differentiated.²⁷

Moreover, operators also argue that the risk pools do not have full solidarity since, depending on the contractual arrangements, in some cases the liable operator will be compensated by OIL or OCIL but will have to repay (a part of) the damage over a specific (usually five years) period.²⁸ Also other major oil companies held that OIL and OCIL are not attractive for them. The mutualisation in OIL and OCIL could lead to the danger for major oil and gas operators of smaller operators free riding on them. In that case, the larger oil companies would de facto become the guarantors of smaller players.²⁹ They argue that currently within these pools the risk differentiation is too low.

In sum, OIL and OCIL are apparently attractive for some middle-size players. However, for smaller players, they may not be attractive (given large retention) and for major players

²⁴ See *inter alia* Bongaerts and de Bièvre (1987, pp. 145–187).

²⁵ <http://www.igpandi.org/Group+Agreements/Pool+reinsurance+programme>.

²⁶ www.businessinsurance.com/articles/20100912/NEWS/100919977, last accessed on 6 October 2015.

²⁷ Interview with representatives of BP on 26 March 2013.

²⁸ Discussion with representatives of OGP on 25 February 2013.

²⁹ Interview with representatives of Shell International BV on 14 March 2013 in Rotterdam.

they may not be attractive either, given the danger of negative redistribution (low-risk majors contributing to high-risk members in the pool, thus creating adverse selection).

Hence for major operators, joining those pools is not attractive out of the fear that they would de facto subsidise the presumably higher risk³⁰ posed by smaller and medium-sized operators.³¹ Also others hold, as was mentioned above, that the risk differentiation in the pools is too small. To some extent, this is unavoidable: since the probability of an event occurring is relatively low, the marginal differences between good and bad risks may be small as a result of which a differentiation of the contributions may not sufficiently incentivise.³²

Potential and conditions

That example shows that risk-sharing agreements do have a lot of potential to provide cover and stimulate prevention (via mutual monitoring) for new risks also. However, a condition is obviously that risk differentiation should be such that the marginal difference between the contributions of different operators should effectively be high enough in order to provide adequate incentives for prevention. The case of offshore pollution shows that there are too many differences between the stakeholders involved (very large players, the so-called majors versus small and medium-sized operators) as a result of which the condition of similar risk is not satisfied. In that case, a risk-sharing agreement will not emerge.

Another example where risk sharing plays a role comes from yet another catastrophic risk, that is, nuclear. Nuclear operators have created so-called mutual nuclear insurance pools. They have as goal to cover for the first-party nuclear damage.³³ Interestingly, risk-sharing arrangements for the nuclear liability risk in Europe have not emerged yet. One obvious reason is that the regulatory safety regime in Europe is not harmonised, as a result of which there could be differences in safety standards between the various installations. That may hence inhibit the emergence of a risk-sharing agreement, since the good risks would fear to see their liabilities increased as a result of the bad risks. The danger of cross-subsidisation may in this way inhibit the creation of a risk-sharing agreement. That also shows that there may be an important task for the government in stimulating risk-sharing agreements, more particularly through mandating safety regulation. That would at least provide security to the members of the risk-sharing agreements that all need to comply with minimum standards set in safety regulation.

To some extent, risk-sharing agreements are also starting to play a more important role at the regulatory level. This is so because risk sharing could also be a tool which the government would be willing to consider as proof of the solvency of an operator. The risks related to so-called carbon capture and storage may constitute an example. The risks to which operators of a CCS storage site are exposed are relatively comparable. However, an *ex ante* assessment, e.g. of the likelihood that CO₂ may escape from the storage site, is very difficult to make. Under those circumstances, risk pooling between operators exposed to a similar risk may be attractive.³⁴

³⁰ In the sense that they may more easily suffer from an insolvency risk.

³¹ Interview with representatives of BP, 26 March 2013.

³² Interview with representatives of Shell International BV, 14 March 2013.

³³ For details see *inter alia* Faure and Vanden Borre (2008, pp. 219–287).

³⁴ See *inter alia* de Figueiredo *et al.* (2005, p. 653).

Increasingly, risk sharing between operators is now also considered as a serious alternative to insurance, especially in circumstances where insurability may be difficult, given lacking actuarial information. This may especially be a problem given the uncertainty associated with new risks. As indicated by Skogh, the risk-sharing agreements could, especially in a combination with State support (in case of catastrophic risk) provide cover and stimulate prevention. There are increasingly new risks related to various new forms of energy (such as shale gas and fracking, but one could equally think about methane hydrates extraction, etc.). All those technologies may provide beneficial effects to society, but the risks involved may be large, or at least unknown. The latter aspect may inhibit insurance from providing cover since probabilities cannot be assigned. It is precisely there where risk sharing may prove beneficial and may hence allow those new technologies to emerge, whereby risk-sharing agreements could equally reduce risks for the operators involved.

The case of public–private partnerships for nat cats

In several publications, Göran Skogh pointed at the benefits of public risk sharing especially for catastrophic risks.³⁵ Interestingly, Skogh argued in favour of public–private partnerships, whereby public support (from the State) for a catastrophe would only intervene as a top layer to deal with the really catastrophic risk. Skogh mentioned the following principles for public support for catastrophes.³⁶

- First, small losses should be excluded, since those can be diversified in other ways and can be regarded as a deductible.
- Second, insurable risks should be excluded from public support as well. Otherwise public support would undermine established pools.³⁷
- Third, the accident should be unforeseen or reasonably ignored, which confirms the presumption of exposure to a similar risk of all citizens.
- Fourth, to the extent that the catastrophe was unforeseeable, the absence of care should not disqualify for compensation. However, negligence in precautions that could be taken may be a reason to deny compensation.

It is interesting to note that these conditions for public support for catastrophes identified by Göran Skogh in fact preclude the partnerships between public and private institutions whereby the government only intervenes by providing an upper layer of compensation for damages that cannot be covered on ordinary insurance or reinsurance markets.³⁸ Through this type of multi-layered approach, whereby insurers and reinsurers cover the insurable amounts of compensation and the government only intervenes to provide cover beyond the insurable amounts, a type of risk-sharing agreement is created between the private and the

³⁵ See *inter alia* Skogh (1998, pp. 256–258, 2008b, pp. 302–303).

³⁶ Skogh (2008b, p. 303).

³⁷ Skogh in this respect refers to the well-known charity hazard, referring to the fact that compensation by the State could dilute incentives to take out insurance. See in that respect Raschky and Weck-Hannemann (2007, pp. 321–329) and Schwarze and Wagner (2004, pp. 154–168).

³⁸ For details, see Bruggeman *et al.* (2010, pp. 369–390).

public sectors. One result of those arrangements is obviously that prevention becomes a common interest of the private partners and the State.

In many countries, various forms of collaboration between public and private entities have been established as a means of providing new sources of capital and obtaining access to markets in order to supplement traditional insurance market capacities. The so-called public–private partnership (PPP) model would enable private and public institutions to collaborate strategically and to optimise the incentive system.³⁹

In the case of the natural catastrophe insurance scheme, the key issue is the assignment of roles to the private and public sector, respectively, as regards providing compensation, setting incentives for reducing the risk of catastrophic losses and organising the financial management of risks of large-scale disasters.⁴⁰ Among countries these roles are different, but a common feature is some form of partnership between public and private institutions.⁴¹ The French model, which emerges to be very efficient for what concerns coverage penetration, is based on a three-chief-actors system: the French government (the Treasury), the private insurers and the public reinsurer—the Caisse Centrale de Réassurance (CCR), a French State-owned reinsurance company.⁴² The CCR is financed through the premiums levied to cover the natural catastrophes and are then used to pay for the damage covered through the CCR. The CCR also acts as reinsurer for French insurance companies and the CCR itself is covered by the State through an unlimited guarantee.⁴³

These examples show that, nowadays, Göran Skogh’s message that higher amounts of compensation can be reached via public–private partnerships has been implemented in various legal systems as far as the cover for natural catastrophes is concerned. The multi-layered approach that we just described in fact is based on a collaboration between insurance and reinsurance companies that provide the first layers of cover and the State (or, as in the French case, the CCR) that provides an additional layer of cover. This model has also been advocated in the EU Green Paper on Insurance and Disasters (2013) of which Sect. 2.4 holds:

Governments may serve as (re-)insurers of last resort by taking on risks above a certain disaster damage level, i.e. stop-loss reinsurance. This approach blends the potential risk-spreading capacity of the government and the ability of the market to apply insurance principles and also to use its administrative capacity, i.e. collecting premiums, marketing and handling claims. Public programmes, therefore, may provide for cover at the highest risk levels, while the private market retains some or all of the lower tiers of risk.⁴⁴

³⁹ The European Commission stated in its Green Paper on PPPs that the term refers to forms of cooperation between public authorities and the world of business which aim to ensure the funding, construction, renovation, management or maintenance of an infrastructure or the provision of a service. See: Commission of the European Communities: Green Paper on public–private partnerships and community law on public contracts and concessions, COM (2004) 327 final, 2004.

⁴⁰ Grossi and Kunreuther (2005).

⁴¹ For an analysis of a number of different insurance systems in selected European countries (Austria, Denmark, France, Germany, Italy, the Netherlands, Poland, Spain, Switzerland and Great Britain), see Porrini and Schwarze (2014, pp. 7–28).

⁴² de Marcellis-Warin and Michel-Kerjan (2011).

⁴³ See Cannarsa *et al.* (2006, pp. 101–103).

⁴⁴ EC (2013) *Green Paper On The Insurance Of Natural And Man-Made Disasters*, Strasbourg, COM (2013), 213 final, p. 9.

This shows that the insight that catastrophic risk, where, of course, large uncertainties exist and the assignment of probabilities can be difficult, can best be covered through a public–private risk-sharing scheme, along the lines suggested in the publications of Göran Skogh.

Concluding remarks: sharing risk in a sharing economy

Göran Skogh played an important role in the development of the law and economics movement in Europe. He is the symbolic founding father of EALE and was its first president. He also initiated the collaboration between EALE and The Geneva Association and therefore played an important role in stimulating research whereby insights from law and economics were also applied to the fields of liability, risk and insurance.

As this contribution has shown, Skogh was not only an important figure in the promotion of law and economics in Europe, but also contributed to the literature with important scholarly work. As this contribution has shown, he did fundamental theoretical work, for example, by presenting the transaction-cost theory of insurance (advocating an explanation of why insurance is sought also in situations of risk neutrality) and by providing the theoretical underpinnings of risk pooling (explaining why pooling of risk between operators may, under some circumstances, be more effective than insurance).

Indeed, following on the work of Göran Skogh, one can argue that, for countries and regions affected by natural disasters, risk transfer and insurance are the key measures that can increase resilience in advance of these events and enhance recovery efforts in their aftermath. These tools enable governments, businesses and households to protect themselves against the financial losses brought by natural disasters. There is now growing recognition that these risk-sharing systems can deliver wider resilience benefits.

But many communities remain unprotected from the human and financial risks of natural disasters. Insurance and reinsurance mechanisms that are appropriate for the type and scale of respective risks in many contexts—particularly in societies and communities with high exposure, potentially to recurrent small-scale disaster events—are inaccessible or are yet to be developed. Clear evidence is required to demonstrate how risk transfer and insurance mechanisms, and particularly an appropriate pricing of risk, can be an incentive for disaster risk-sensitive public and private planning and investment.

“Historically, sharing of losses in mutual pools, or by public authorities, appeared in Europe already in the Middle Ages; insurance without actuarial or technical interpretation of probabilities also has a long history. However, insurance contracts became more frequent and an established industry in the 19th century as actuarial science developed. Besides, new ventures and hazards motivate new sharing pools, which may in the future develop into traded insurance contracts. This may explain contemporary co-existence of insurance and mutual pooling.”⁴⁵

Moreover, although many countries have insurance sectors with a long history, and many more have displayed promising developments in recent times, disaster insurance penetration remains low, especially for those locations with the highest exposure. Many communities are entirely unprotected from the financial risks of natural disasters. As a

⁴⁵ Skogh and Wu (2005, pp. 35–51).

result, the contribution that risk transfer and insurance mechanisms can make to reinforcing and promoting societal resilience as countries develop and grow, can be entirely absent. In this sense, there is enough room for new research that can, in the light of the ideas of Göran Skogh, be developed along the following lines.

First of all, in many underdeveloped parts of the world, communities that are subject to nat-cat risks have organised kinds of “informal insurance systems”, which is the most important way that people share risk, especially in rural areas where people are reluctant to purchase formal insurance contracts. The main example is the market of rainfall insurance coverage that has not yet developed widely in rural India, but where poor farmers become “informally” insured on the basis of their caste networks, which provide for a system of risk sharing.⁴⁶ The ensuing debate about the advantage and disadvantage of “informal insurance” and the connection with formal insurance seems to demonstrate that informal risk-sharing arrangements are only effective against low to moderate weather shocks, but tend to fail in the face of extreme weather shocks.⁴⁷

This is a general phenomenon of the formation of risk-sharing networks by which people exposed to similar risks mitigate the consequences by making insurance arrangements among themselves. There is already a large body of theoretical and empirical work on risk-sharing arrangements trying to demonstrate the conditions of an efficient implementation of this kind of self-insurance.⁴⁸ Nowadays, we can expect that this kind of risk-sharing system will, in the future, also develop in other contexts, given the evolution of networks that currently link people all over the world. Moreover, the evolution of networks includes consumers that are characterised by an increasing sense of responsibility to their exposure to risks.

At present in our economic system, a number of decentralised peer-to-peer markets, now colloquially known as the “sharing economy”, have emerged as alternative suppliers of goods and services traditionally provided by long-established industries. Hence, the issue of risk sharing, as Göran Skogh introduced it many years ago, could become the new frontier for the development of a wider insurance and risk-sharing system.

In addition, Göran Skogh often applied the important theoretical law and economics insights through practical cases. He showed how, for example, a liability case of the Swedish High Court could be interpreted in economic terms and also suggests the application of a property rights regime for better protection of endangered species (wolverines) in northern Scandinavia.⁴⁹ And also the insights concerning risk pooling were applied to the important case of liability for nuclear accidents, thus potentially leading to higher amounts of compensation for victims but, more importantly, also better incentives for prevention.

There are many reasons to remember the important contributions of Göran Skogh with gratitude, both as far as the development of law and economics in Europe is concerned and with regard to his scholarly work.

⁴⁶ Mobarak and Rosenzweig (2013, pp. 375–380).

⁴⁷ Collier *et al.* (2009), Akter (2012).

⁴⁸ See *inter alia* Bramouille and Kranton (2007, pp. 275–294).

⁴⁹ Sellenthin and Skogh (2004).

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