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Risk Markets and Value Creation Chair

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**Big Insurance is
watching you**

**Can the
precautionary
principle
light the
way ahead?**

Economics for the Common Good

Research highlights

Annual Conference on Risk Markets and Value Creation	<i>page 4</i>
Big Insurance is watching you	<i>page 6</i>
Can the precautionary principle light the way ahead?	<i>page 8</i>

Prizes

SCOR-EGRIE Young Economist Best paper Award	<i>page 11</i>
SCOR – The Geneva Risk and Insurance Review Best Paper Award	<i>page 11</i>

Scientific contributions

Articles in peer-reviewed journals	<i>page 11</i>
Working papers	<i>page 11</i>

Editorial



Dear readers,

How will society respond to the challenges of managing risk in the 21st century? From climate change to aging populations and pandemics, the scale and the nature of the risks we face are evolving fast. While digital technologies can help to address some of these problems, they are also disrupting our lives in ways that threaten lasting harm to the common good.

Since 2008, the SCOR Chair “Risk Markets and Value Creation” has grappled with these crucial issues, supporting theoretical and applied research at TSE that combines methods from financial economics, industrial organization and econometrics. In 2020, the SCOR Foundation for Science generously renewed its support to TSE.

For this issue of the partnership’s newsletter, we look back to the SCOR-TSE Conference on Risk Markets and Value Creation to Toulouse in October, which presented some of the latest economic analysis of societal risks including health, demographic, digital and environmental challenges. This annual event continues to highlight the importance of the partnership, not just in terms of financial backing for

cutting-edge research, but in facilitating the flow of ideas, data and knowledge between TSE researchers and SCOR representatives with first-hand experience of the strategic decisions faced by insurers and risk managers.

We feature interviews with two of the speakers: David Martimort (TSE) on ‘Acting in the Darkness: Some Foundations for the Precautionary Principle’ and Jean-Charles Rochet (University of Geneva, TSE) on ‘Digital Insurance’. David and his coauthor explore whether the precautionary principle can help us to manage the risk of irreversible catastrophe, while Jean-Charles looks at the troubling privacy implications of digital monitoring by insurers.

I look forward to welcoming readers to future events in Toulouse. My thanks to TSE researchers and the SCOR Foundation for Science for their mutual efforts to expand the frontiers of our understanding of risk and its impact on economic decisions.

Wishing you well, and an enlightening read,

Stéphane Villeneuve, *Scientific Director, SCOR-TSE partnership*

Research highlights



SCOR-TSE Conference on Risk Markets and Value Creation

What are the best tools for managing risk? How should we regulate insurance markets in the interests of consumers, firms and society? In October, the return of the annual SCOR-TSE Conference on Risk Markets and Value Creation was a welcome opportunity to get to grips with some of the latest attempts by economists to answer such questions. Stéphane Villeneuve, Scientific Director of the SCOR-TSE partnership, opened the conference expressing his delight at the return of in-person events to Toulouse. He also paid tribute to the scientific excellence of this year's participants.

Presentations on the opening morning of the event included **Thomas Dohmen** (University of Bonn) on the validity of *'Survey Measures of Risk Preferences'*, **Stéphane Loisel** (University of Lyon) on the challenges of longevity risk, and **Caroline Hillairet** (ENSAE-Paris Tech, CREST) on sustainable pension policy. In the afternoon, **François Salanié** (INRAE, TSE) focused on the delay following a tipping point before it triggers catastrophe. How might this impact optimal policies? Meanwhile, **Julia Holzapfel** (University of Munich) examined the use of genetic and behavioral information for pricing insurance contracts. **Stéphane Villeneuve** concluded this first day by presenting his research on Gaussian agency problems with memory and linear contract.

Highlights on Day 2 included **Christian Gollier** (TSE) on *'The Discounting Premium Puzzle'* and **Patrick Pintus** (University of Aix Marseille) on the use of population data to track pandemics and assess vaccines in real time. **Joël Shapiro** (University of Oxford) concluded the event by presenting his research into the impact of stress tests on banks' lending decisions.

In this newsletter, we feature in-depth exchanges with two TSE contributors to the event: **David Martimort** explores whether the precautionary principle is a useful guide for society, and **Jean-Charles Rochet** examines the darker side of digital insurance.

TSE organizers Jean-Paul Décamps and Stéphane Villeneuve wish to thank Philippe Trainar and his colleagues at SCOR Foundation for Science, and all those who attended, for making this conference such a success.

You have all contributed, in so many different ways, to the collective spirit of enquiry, innovation and exchange that continues to energize this partnership.



Philippe Trainar

Christian Gollier

Big Insurance is watching you



Jean-Charles Rochet

is a professor of economics at TSE and Geneva Finance Research Institute, University of Geneva. His research interests include digital money, banking, financial stability, industrial organization of financial markets, and contract theory.

On the frontline of the digital revolution, the insurance industry is advancing into uncharted territory. Jean-Charles Rochet (University of Geneva, TSE) fears that behind the promise of greater efficiency, the adoption of new technologies by insurers threatens to create a dystopian surveillance society. In his presentation to the SCOR Conference on Risk Markets and Value Creation in October, he outlined his preliminary attempts to develop a new paradigm for understanding digital insurance, focusing on its implications for privacy.

rr **Classical theories of insurance markets have been rendered obsolete by Big Data and artificial intelligence. Economists need to develop new paradigms that correspond to the 21st century**

What was the motivation for this research?

Technology is disrupting financial activities. Old-school banks are increasingly under threat from FinTechs that seek to provide digital solutions for traditional financial services like money or asset management. Big Tech platforms like Amazon and Alibaba are also trying to enter the industry, offering online payments and other services. And the insurance sector has not been spared this disruption: 'InsurTechs' have quickly sprung up to offer new digital solutions and new types of providers.

Classical theories of insurance markets are based on very old paradigms: adverse selection and moral hazard. These paradigms have been rendered obsolete by access to Big Data and artificial intelligence methods. Economists need to develop new paradigms that correspond to the 21st century.

How have ideas about insurance evolved?

Since Rothschild-Stiglitz (1976), economic theory has postulated that insurees have more information than insurers, and that insurees differ mainly in their individual risks, such as the probability of having an accident. The consequence of these two assumptions is that more risky insurees demand more insurance. This is the adverse selection paradigm.

However, empirical research has shown that insurees differ also in their risk aversion, and that

less risky insurees may demand more insurance. This is advantageous selection, which runs counter to the adverse selection paradigm. Moreover, with Big Data and machine learning, modern insurers may know more than insurees. This is called inverse selection.

In the moral hazard paradigm, the probability of accident or illness depends on actions or lifestyle of the insuree. Classical theory assumes that this behavior is not observable by insurer. But when this action can be monitored by the insurer, it changes the rule. This is what I call the digital monitoring model.

Is digital insurance a good thing?

Digital insurance can refer simply to the direct sale of insurance via mobile phones or the internet. While this changes the life of insurers, it's not a change in the type of insurance product. However, in other contexts, digital insurance will have far-reaching impacts on society.

In property and casualty insurance, for example, actuarial risk assessment based on statistics in the past is being replaced by structural risk modeling based on real-time observations, such as the speed of driving of an insured car. This completely changes the nature of the relationship between the customer and the company. In health insurance, real-time monitoring of physical activities - through a connected watch, for example - can deliver extremely precise data that can be used to assess risks far more precisely than traditional actuarial methods.

This digital monitoring can vastly improve the efficiency of insurers' contracts. But the dark side is that it can also violate customers' privacy. I don't necessarily want my insurer to know what I am doing in real time, and it's the same for Facebook or other platforms. This is frightening. Now we have technologies that enable big platforms to collect and use huge amounts of data about us, we are moving towards a society of surveillance. On the one hand, it allows us to solve these famous moral hazard and adverse selection problems. On the other hand, it gives away our private data.

How does your paper attempt to model this situation?

The paper uses a very simple model of health insurance in which individual actions influence the probability of an illness. The probability of illness decreases with "physical activity", like the number of steps, which also generates intrinsic costs and benefits. When actions are not observable by the insurer, the contracts offered correspond to the moral hazard paradigm. When actions can be monitored, the contracts offered correspond to the digital monitoring model.

We start by assuming that the insurer can perfectly monitor physical activity at a certain cost. But in the more realistic case of imperfect monitoring, the optimal contract is complicated to characterize. Deductibles are still needed but both the premium and deductible decrease with observed effort. Here, it's not clear that digital monitoring is better for society, or even for the companies. Their surplus is only increased when the monitoring cost is small and monitoring is precise.

The most original or interesting part is when I reintroduce some form of adverse selection, giving individuals different tastes. For example, some people enjoy exercise more than others. By observing individuals' behavior, insurers gain information about those tastes. If the insurer can sell or reuse that information, this can be bad for everyone, especially the customer who suffers privacy violations. The value of privacy has many dimensions, so it's very complicated.

What are the key contributions?

The paper develops a new 'digital monitoring' paradigm for capturing new types of insurance contracts based on real-time monitoring.

Moral hazard generates two inefficiencies: incomplete insurance, in the sense that a positive deductible is needed to provide incentives for effort; and inefficient effort (too little, or too much). My model shows that even though digital monitoring can reduce these inefficiencies, it does not necessarily improve welfare. Instead, the temptation for insurers to exploit insurees' data can violate privacy and generate more distortions.

Based on this research, my policy recommendation is that a competition authority charged with protecting consumers should prevent insurers from selling or re-using information collected through digital monitoring.

 **Digital monitoring can vastly improve the efficiency of insurers' contracts. But the dark side is that it can also violate customers' privacy. This is frightening**

Can the precautionary principle light the way ahead?



David Martimort

is a professor of economics at TSE.

He specializes in incentives theory and its applications and his research interests include industrial organization, regulation, development economics, political economy, public economics and environmental and resource economics, with a special emphasis on issues related to regulatory and public governance.

As our actions continue to heat the planet, we may trigger tipping points that accelerate the onset of climate catastrophe. Examples include the collapse of the West Antarctic ice sheet, or mass die-off of coral reefs. Faced with such risks, the precautionary principle has often been invoked as a guide to decision-making. It suggests we should refrain from undertaking any action if there is no proof it would not harm future generations' well-being. In a new working paper, Louise Guillouet (Columbia) and David Martimort (TSE) examine possible foundations for this principle in a world of irreversible risks, limited information and opportunists.

rr Observers question whether the principle provides a clear and convenient guide for decision-making under uncertainty. It might do more harm than good, by hindering innovation and growth

Why do standard cost-benefit analysis tools struggle to cope with environmental and health risks?

Many of these risks are due to our own production and consumption choices. Dealing with them can be particularly complicated when they threaten to cause irreversible changes. Current efforts against global warming, for example, aim to control rising temperatures, with little hope of reducing them. Similarly, GMO crops may irreversibly modify the surrounding biotope. Other examples include pollution caused by fracking, use of carcinogens including bisphenol A or glyphosate, antimicrobial resistance caused by overuse of antibiotics, or the environmental destruction and health issues following a nuclear accident.

The costs and benefits of such decisions are also often assessed under major uncertainty. Although the consequences of acting might harm the environment, the degree and probability of these destructive events are largely unknown.

How have policymakers responded?

The guidelines adopted to structure decision-making and regulation in these contexts vary greatly

around the world. For example, while GMOs are authorized in the US, they are forbidden in most of Europe. Many are inspired by the precautionary principle, as developed by the philosopher Hans Jonas' Vorsorgeprinzip, who urged more responsibility towards future generations.

The Rio Earth Summit in 1992 acknowledged the following expression of the principle: "Where there are threats of serious and irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." A similar concept is now part of the French Constitution. Any risk regulation must thus comply with the legal framework built on this principle.

Why is the precautionary principle controversial?

Many observers have questioned whether the principle provides a clear and convenient guide for decision-making under uncertainty. Doubts exist about whether its adoption might do more harm than good, by hindering innovation and growth.

Shrouded in ambiguity, the concept can sometimes be understood as discouraging action, even in contexts in which true precaution might require it. For example, investments in clean-energy technologies have an uncertain but promising future in terms of reducing harmful emissions. It is also difficult to agree on what is meant by "full scientific certainty" and how beliefs about underlying risks are formed over time.

How does your paper approach this minefield?

We consider decision-makers whose actions earn a surplus but also increase the likelihood of triggering an irreversible environmental disaster. Past a tipping point, for which only the distribution of possible values is known, the probability of catastrophe jumps. We investigate how well the precautionary principle, viewed as a constitutional commitment to an action plan, can serve as a guide in this context.

Acting in the darkness, our decision-makers initially consider not only the irreversibility of earlier actions but also their beliefs about proximity to the tipping point. Any action changes the likelihood of passing the tipping point, so it also affects the decision-maker's subsequent beliefs. As decision-makers become more pessimistic that the tipping point has been passed, they are more likely to ignore environmental considerations and adopt their myopic optimum.

In this context, we show that the optimal trajectory can be obtained with a social contract, or 'feedback rule', that depends on the existing stock of past actions and the decision-maker's current beliefs about whether the tipping point has been passed. These beliefs are constructed from the history of past actions.

What are the issues with using such a complete feedback rule?

Developing an action plan which is contingent on all possible values of the stock and beliefs requires a huge degree of rationality and computational ability. In the absence of hard scientific evidence on the state of the system, beliefs might also be easily manipulated, especially when experts face difficulties in conveying evidence to policymakers and interest groups have a stake in muddying the waters.

How do you address such issues?

In response, we look at the performances of incomplete feedback rules that only depend on the stock of past actions. The performances of such rules are strikingly different depending on whether deviations from planned actions are observable. We show that the optimal trajectory can still be implemented provided that any deviations by the decision-makers are observable by their future selves. This allows future selves to reconstruct the evolution of beliefs and implement the optimal trajectory.

When decision-makers may act opportunistically and their deviations are not observable, the feedback rule requires too much caution. As long as actions have been cautious, beliefs evolve slowly and decision-makers remain optimistic that the tipping point has not been passed. This behavior is self-fulfilling, justifying excessive prudence. The optimum trajectory can be restored by imposing a commitment to the feedback rule that would be optimal had deviations been observable, forcing bolder actions.

 **The word 'precaution' should be viewed as expressing a broader concern of society for avoiding opportunistic behavior and adopting optimal strategies rather than suboptimal ones**

What does this suggest about the validity of the precautionary principle?

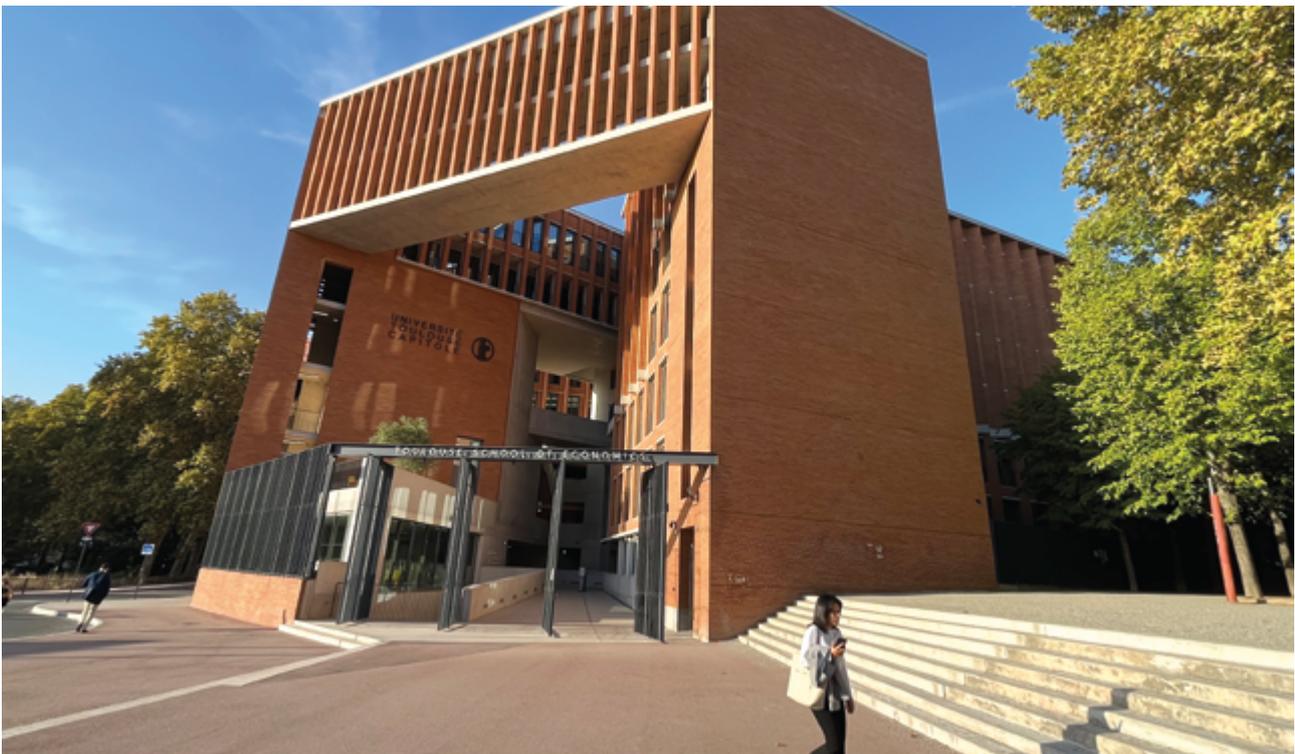
Our paper contributes to the view that the precautionary principle can provide a guide for actions in informationally-constrained environments where decision-makers may act opportunistically. In our model, beliefs are entirely determined by the profile of past actions. When deviations cannot be detected, future selves of the deviating decision-maker have no hard evidence on the evolution of such beliefs and can only conjecture about this based on the feedback rule. Because it states that one should not act without evidence, the precautionary principle can be interpreted as describing such behavior.

We favor a more normative approach that views the precautionary principle as a constitutional constraint on the set of feasible actions. In our context, this constraint is only needed in the scenario with non-observable deviations. Here, the precautionary principle could be interpreted as an 'action' principle since, without it, behavior becomes too cautious. The word 'precaution' should then be viewed as expressing a broader concern of society for avoiding opportunistic behavior and adopting optimal strategies rather than suboptimal ones.

Are there any promising directions for future research?

Our framework could be modified in several interesting ways. Signals on the location of the tipping point could be learned by the decision-maker, maybe thanks to scientific advances. Alternatively, society could be made up of overlapping generations of decision-makers with different objectives. In this context, earlier selves might consume too much and the precautionary principle could improve the welfare of future generations. Relatedly, future selves may not be fully rational and put an excessive weight on the most recent information. With observable deviations, this might lead to excessive actions that could be somewhat mitigated by the precautionary principle.

The precautionary principle could also act as a political constraint on future decisions. For example, democratically elected decision-makers might enact laws that stipulate limits on future actions, if they know they are to be replaced by others who favor higher actions. In contrast, a decision-maker who does not care about the environment could force successors to adopt a minimal level of actions.



Prizes

The Risk Markets and Value Creation Chair supports the prizes organized within the framework of the 2022 annual seminar of the EGRIE (European Group of Risk and Insurance Economists).



SCOR-EGRIE Young Economist Best Paper Award

Congratulations to **Lan Zou** (*University of St.Gallen*) who received the SCOR-EGRIE Young Economist Award for her paper:

“The impact of subsidies on deductible choice in health insurance”



SCOR – The Geneva Risk and Insurance Review Best Paper Award

Congratulations to **Alexis Louaas** (*Ecole polytechnique & Square Research Center*) and **Pierre Picard** (*Ecole polytechnique*) who are the 2022 laureates for their paper:

“Optimal insurance coverage of low-probability catastrophic risks”

Scientific contributions

Articles in peer-reviewed journals

- **Jean-Paul Décamps** and **Stéphane Villeneuve**, “Learning about profitability and dynamic cash management”, *Journal of Economic Theory*, vol. 205, n. 105522, *October 2022*.
- **Nicolas Treich**, “The Dasgupta Review and the problem of anthropocentrism”, *Environmental and Resource Economics*, *March 2022*.

Working papers

- **Stéphane Villeneuve** and **Eduardo Abi Jaber**, “Gaussian Agency problems with memory and Linear Contracts”, TSE Working Paper, n. 22-1363, *September 2022*.
- **Chiara Canta** and **Helmuth Cremer**, “Family bargaining and the gender gap in informal care”, TSE Working Paper, n. 2022-1352, *August 2022*.
- **Jessica Martin** and **Stéphane Villeneuve**, “A class of explicit optimal contracts in the face of shutdown”, TSE Working Paper, n. 21-1183, *January 2021, revised April 2022*.



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Toulouse School of Economics

1, Esplanade de l'Université
31080 Toulouse Cedex 06
Tel: +33 (0)5 67 73 27 68

www.tse-fr.eu
partnership@tse-fr.eu

SCOR
FOUNDATION FOR SCIENCE

www.scor.com/fr
5, Avenue Kléber, 75795 Paris Cedex 16
Phone : +33 (0) 1 58 44 70 00

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