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The (potential) role of insurance sector in climate change economic policies

Abstract

In the past few years, unstable and extreme weather patterns are increasingly occurring as phenomena of climate change and the link to greenhouse gas emissions is scientifically accepted. Extreme weather patterns cause major damage on health, property and business. Thus, the question is who is going to pay. In this paper, following a law and economics approach, the problem is analysed starting from the consideration that emitters of greenhouse gases externalize the true costs of their contribution to climate change. Efforts to recover these costs, which manifest both through the costs of impacts and the costs of efforts to prevent impacts, could imply a relevant role for the insurance sector. Because the insurance sector is the world's largest industry, the response of insurers to the broader climate-change challenge will no doubt be extremely relevant to solve this internalization problem. Particularly the paper is about the role that insurance sector could play in the design of political economic solutions for climate change consequences. This role can be identified in different directions: (1) insurance coverage for claims of third-parties who allege injury or property damage; (2) insurance financial products to finance technological responses to climate change, such as mitigation and adaptation. Specifically the indirect effect of the insurers is discussed in proactively stimulating climate change prevention behavior related to their customers in the view of the choice of political economic instruments.

Key words: climate change, insurance, environmental policy choice.

JEL Classification: K32, L51, P16, Q28.

Introduction¹

In the past few years, unstable and extreme weather patterns are increasingly occurring and the link between these climate change effects and greenhouse gas emissions is scientifically accepted². Extreme weather patterns cause major damage on property and business and the question of who pays becomes a serious issue that should involve the insurance industry.

Recently climate change topic has become more relevant thanks to the new political leadership in U.S. and, despite the financial crisis, the insurance companies, together with the other financial institutions, are called for actions to reduce global warming effects.

A law and economics point of view focuses on the problem that emitters of greenhouse gases externalize

the true costs of their contribution to climate change³. Efforts to recover these costs, which manifest both through the costs of impacts and the costs to prevent impacts, could imply a role for the insurance sector. Because the insurance sector is the world's largest industry, the response of insurers to the broader climate change challenge will no doubt be the key to, at least partially, solve this internalization problem.

Particularly, the insurance sector could play a relevant role in different directions: first of all, by supplying, as tradition, policies covering claims of third-parties who allege injury or property damage⁴. But not only this, insurance companies are in challenge to design financial products aiming to finance technological responses to climate change, such as mitigation and adaptation.

In this paper, the attention will be on the fact that insurers can induce indirect effects in proactively stimulating climate change prevention behavior related to their customers. Through their insurance products, they can play two primary roles in stimulating climate change prevention behavior. First, by supplying and pricing traditional insurance coverage for damage deriving from climate change insurers can promote actions by businesses and individuals to align policyholders with climate-positive behaviors.

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¹ The final version of this paper benefited of the comments of the participants at the 3th Joint Conference of the European Association of Law and Economics (EALE) and The Geneva Association on Law and Economics of Environmental Insurance, Università Bocconi, Milano 11/12 May 2009; ² Annual Conference of the European Association of Law and Economics, Università Luiss Guido Carli, Roma 17/19 September 2009.

I am very grateful for the comments and I am the only responsible for any mistake.

² "The scientific debate is over, with the Nobel-Prize-winning Intergovernmental Panel on Climate Change, representing the definitive scientific consensus, now using the considered term "unequivocal" in describing its certainty that climate change is here. The economic context has shifted as well. Reports like the UK government's "Stern Review"

³ For seminal contributions on the law and economics approach: see

turn on its head the conventional wisdom that taking action on climate change will harm the economy. Companies and investors now increasingly realize that, in fact, it is the lack of action to combat climate change that is the true threat to the economy, while engaging with the problem and mounting solutions represents not only a duty to shareholders but also a boon for economic growth" (Mills, 2008, p. 132).

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Calabresi (1970) and Shavell (1987).

⁴ This issue is also connected with the definition of a liability system for the consequences of climate change, such as impacts of property damage from extreme weather events. The topic of liability for climate change will not be addressed in this paper (see Faure and Nolkaemper, 2007; Schwartz, 2007).

Secondly, by providing capital to new ventures and by reducing the financial risk to investors in these ventures, insurers can also facilitate the creation of new markets and services that will help to solve the climate change problem.

In all these directions, the insurance industry is dealing with management risk activities. Climate change affects insurers through the risks they accept from clients, since climate change causes increasing intensity and spreading distribution of extreme weather events, and because of the resultant risk of catastrophic property claims. So climate change will not only bring more demand for conventional risk transfer, but also will open opportunities in new areas such as emission reduction projects.

The aim of this paper is to examine the role that can be played by the insurance industry within the political economic instruments choice.

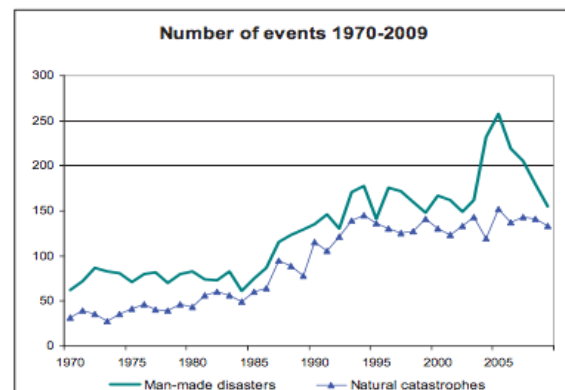
The next Section will address the issue of choosing between environmental policy instruments facing climate change consequences; so after a review of this issue in terms of defining efficient instruments, a characterization of the climate change consequences internalization problem will be discussed. Section 2 deals with the role of insurance industry in supplying different products. Finally in Section 3 this role will be analysed in connection to the issue of mitigation and adaptation. The last Section concludes the potential role of the insurance sector.

1. Facing climate change effects: choosing between environmental policy instruments

The global warming leads to increase in global mean temperatures which in turn would intensify the water cycle, reinforcing existing patterns of water scarcity and abundance and increasing the risk of droughts and floods. The changes in the distribution of heat around the world are likely to disrupt ocean and atmospheric circulations, leading to large and possibly abrupt shifts in regional weather patterns. Coastal areas are affected by sea level increase and there is a probability that some of the coastal cities may become submerged. Increase in precipitation would result in floods and flash-floods become recurrent.

"However, one should note that not only climate

In the future climate change is going to originate an increasing quantity of natural disasters, together with "man-made" disasters, as we can see in Figure 1.



Source: Swiss Re (2010).

Fig. 1. Natural catastrophes and "man-made" disasters

So, in a sense, natural disasters, meaning events caused by natural forces, becomes "man-made" disasters, meaning events associated with human activities¹, given the role of greenhouse gases emitters. More precisely, we can speak of "unintended man-made" disasters originated by global warming (Posner, 2004, p. 43).

The rising costs associated with climate change effects pose serious challenges to governments to adopt efficient strategies to manage the increasing economic consequences. On a political economic point of view, governments are facing the issue to introduce policies to tackle the causes and combat all the effects of greenhouse gas emissions².

About the environmental policy choice, the ensuing debate has been conducted along different views: on the one hand, the choice of policy instruments to be applied is perceived as a public matter and the state, as policy designer, should select the optimal instruments and take responsibility for its imposition in the public interest; on the other, a role must be assigned to the private sector and market-based instruments must be implemented³.

¹ For a complete definition, see Swiss Re (2007, p. 37).

² The choice of policy instruments is an issue already addressed by the economic literature and a large number of instruments have been considered to implement a given set of environmental policy objectives, given that the relative efficiency of these policy instruments has become

change is to blame, but that human actions also are partially responsible for these major natural catastrophes (e.g., flood events are not only due to rainfall but also linked to the stability of soil structures or natural slopes which can be influenced by human constructions). These two factors increase the risk simultaneously, both affecting frequency as well as loss amounts” (Charpentier, 2008, p. 94).

an important question in environmental economics, as shown by the surveys of Cropper and Oates (1992), Segerson (1996). The need to look at political economy factors underlying the choice of instruments has gained some ground, at least since the early contribution of Buchanan and Tullock (1975). Boyer and Laffont (1996) provided some preliminary steps in developing a formal model of political economic choice of environmental instruments. They argued that economists’ general preferences for sophisticated incentive regulation mechanisms must be reconsidered in a political economy approach explicitly considering the private information of economic agents.

³ This is the issue of “judgement-proof” (see Shavell, 1986).

In the case of climate change consequences, the environmental policy choice involves the assignment of respective roles of private and public sector to provide compensation and incentives to reduce the risk of catastrophic losses and financial management of large-scale disaster risks².

The choice of both public and private instruments is essential given that in the case in which the government does not provide any policy instruments to prevent the events and to compensate the victims, the costs of natural catastrophes fall on the individuals. In many cases, these costs could be a substantial portion of an individual’s wealth, leading to devastating personal and business liabilities³.

Alternatively the government can carry the risk directly or as “insurer of last resort”; in this case, the costs of weather events are borne by the taxpayer, contributing according to the tax regime of the country, or private sector can, at least partially, cover weather risks and the costs of climate change is shared among a portion of society: with risk-based pricing, those at greatest risk pay most for this risk-sharing, while those who avoid risk pay less.

This last “private” solution can be achieved by the insurance industry involvement. The extent to which policy instruments choice implies the involvement of private insurance to cover property damage due to severe weather patterns can be seen in Table 1 in relation to different countries.

Table 1. Comparison of insurance coverage for storm and flood damage in major insurance markets

Country	Insurance coverage	Degree of state involvement
UK	Insurance covers all natural perils including floods, windstorms, and subsidence. Good uptake (> 90%) as required as a condition of mortgage.	None: primary insurance and reinsurance provided through private market.
France	Storm coverage included as standard. All policyholders pay premium surcharge set by the government (12% of the fire premium for most lines of business). Natural catastrophe coverage is mandatory.	Unlimited government guarantee for catastrophes provided through Caisse Centrale de Réassurance. Catastrophes Naturelles (CATNAT) is the national program which covers floods, subsidence, mud slides, earthquakes, tidal waves and avalanches.
Germany	Storm coverage included as standard. Insurance for natural catastrophe is optional and available from private insurers for an additional premium. Flood uptake is typically low (~ 5%). Natural catastrophe coverage is not mandatory.	None.
Rest of Europe	Each market has its own limitations on coverage. Extent of uptake varies by maturity of market, and degree to which cover is required by law or as a condition of other finance-providers (e.g., mortgage lenders).	State does not normally intervene in insurance provision but some countries have a pooled system through the government (e.g., Spain, Norway, Switzerland, Denmark). In the Netherlands, the government acts as insurer of last resort for flood, as the private market does not provide.
Japan	Property policies cover windstorm.	Primary insurance and reinsurance provided through private market.
Australia	Property insurance coverage is available for most perils, with subsidence generally excluded for residential policies. Scope of cover varies from company to company and can range from full (river) flood cover to local flash flood or stormwater only. Few companies offer however full cover for domestic risks.	Primary insurance and reinsurance provided through private market.
USA	Most property insurance policies cover wind damage. Flood is usually excluded.	The federal government covers flood perils. For hurricanes, insurance is provided through the private market. In Florida, primary insurers may purchase reinsurance from the Florida Hurricane Catastrophe Fund.

Source: Association of British Insurers (2005, p. 13).

In some cases, the private market covers much of the risk (e.g., UK), while in others, the government is more closely involved, either directly carrying the risk (e.g., USA for flood) or acting as “insurer of last resort” (e.g., France). The private insurance market

and to reduce the cost of capital (e.g., special government disaster funds); finally by creating a regulatory framework that allows private insurance market to work properly (special fiscal treatment for disaster insurance premiums, possibility of tax-deductible

generally covers windstorm risks, whereas flood risks are often provided through a pooled or government-backed insurance arrangement.

Public policies can support insurance sector in different ways. First of all by providing mandatory regime for insurance (e.g., mandatory catastrophe insurance coverage included in basic property insurance policies such as homeowners); then by providing State guarantee to limit private sector exposure

¹ See Lewis (1996).

² See Porrini (2005).

reserve funds).

Moreover, insurance industry may have limited capacity, and a pooled or government-backed compensation system is the only way to deal with the substantial costs of natural catastrophes. To cover the most extreme events, insurers rely on reinsurance, either through the private market or from the state. Generally, the reinsurer assumes responsibility for covering a portion of the risk, especially for rare but extreme event losses. This enables insurers to access greater capital in a cost-effective way, and assist in managing liquidity following a large claim event. In most coun-

tries, regulation sets out capital requirements, ensuring solvency for all but the most unusual events.

Beyond the difference between private and public environmental policy instruments, another important distinction is between *ex ante* and *ex post* policy instruments and the identification of the role of insurance industry.

The political economy theory uses to compare two kinds of instruments, namely *ex ante* and *ex post* instruments: the first corresponds to regulatory instruments that *ex ante* fix precaution standards (i.e., command and control policies) to control environmental risks; the second corresponds to *ex post* intervention that provides compensation to victims while internalizing the social costs of harm producing activities (i.e., tort liability system)¹.

In the case of climate change consequences, the damages and the victims could receive compensation through an insurance provider. So, in this sense, insurance contributes to implement *ex post* policy instruments. But also insurance could give indirectly an incentive to take precaution with *ex ante* effects.

In fact property, casualty, health, and liability insurance for individuals and businesses all present opportunities for insurers to stimulate preventive policyholder behavior: in fact, insurance contract terms and conditions can create incentives to improve climate outcomes and the pricing structures can give financial advantages to policyholders who engage in climate-friendly behavior.

Within the debate about the political economic instruments choice, insurance can be considered as a market-based kind of instrument that contributes to reach an *ex post* compensation giving also *ex ante* incentive to preventive behaviors.

As a result of the large number of instruments that have been considered to implement environmental policy objectives, the relative efficiency of these

In the next Section, different insurance products will be analysed to see how they can efficiently contribute to the solution of the climate change issue.

2. The role of the insurance industry in relation to different products

2.1. Insurance in relation with climate change.

Insurance is one of the main mechanisms used by individuals and business to manage the financial consequences of risk, including the threat posed by natural hazards such as windstorms and floods. Traditionally, insurance works by pooling risks across a large and diverse population. Each individual or business protects themselves against an uncertain loss by paying an annual premium towards the pool's expected losses. The insurer holds premiums in a fund that, along with investment income and supplementary capital (where necessary), compensates to those that experience losses.

So, first of all, climate change consequences are insured through the coverage of the risks that insurance industry accepts from clients, since climate experts predict changes in the intensity and distribution of extreme weather events (especially water-related and storms), and because of the resulting risk of catastrophic property claims.

In this sense insurers are influenced by climate change because weather patterns increase their clients' exposure and they are asked to adapt their risk assessment and review their underwriting (pricing, contract conditions and risk acceptance procedures) with a view to their specific risk exposure (line of business, geography, etc.).

This kind of products constitutes the core business of the insurance industry. But specifically in the case of climate change many problems arise.

First, climate change's relationship to global weather patterns increases the potential for losses so large that they threaten the solvency of insurers as

policy instruments has become an important question in environmental economics. Looking at this problem from a law and economics perspective, the efficiency of different instruments indicates their practical, and so direct, potential to achieve concrete objectives. In particular, three objectives emerge as relevant in judging the practical efficiency of environmental policies: the first is paying accident compensation to the victims; the second is prevention, in the sense of providing incentives to improve safety standards; and the third is connected with technological change in the sense of encouraging to adopt lower-risk technologies².

¹ See Shavell (1984), Boyer, Porini (2002).

² See Baumol, Oates (1975), Bohm, Russell (1985).

more severe weather becomes more common and overall variability of conditions increases.

Second, uncertainties in assessing climate change's impacts are high, affecting property and casualty, business interruption, health, and liability insurance, among others. As a result, where a risk has significant ambiguous components, insurers are both more likely to charge a significantly higher premium and more likely to avoid insuring the risk entirely than where a risk is more well-defined.

Third, it is likely that many climate change-related risks are correlated, creating a skewed risk pool and exacerbating the risk of extremely large losses, and that some of these risks are not well-distributed across existing insureds.

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Finally, as a result of insurers' uncertainty aversion and need to protect against extremely large losses from single or related events, it is not clear that insurers will be willing to insure against some climate change-related risks at a price that policyholders are willing to pay.

2.2. Insurance coverage and financial responsibility. Within the "traditional" activity of supplying coverage for the climate change consequences, other business opportunities emerge for all type of customers (private, commercial, industrial), as it is focused in Table 2.

Table 2. Important climate change-related risks and opportunities for insurers

Insurance class/ line of business	Risks (from climate impacts, policy implementation, or policy failure)	Opportunities (from proactive policy or climate impact)
Property	<ul style="list-style-type: none"> ◆ Unprecedented accumulation of extreme events threaten solvency/liquidity. ◆ Getting cover may become harder. ◆ Lack of capital/reinsurance. ◆ Inaccurate risk pricing. ◆ Misinformed response from public sector. ◆ More costly repair work. 	<ul style="list-style-type: none"> ◆ More demand for insurance and alternative risk transfer. ◆ Risk differentials can be priced. ◆ Insurance of "Kyoto" projects. ◆ Administration of disaster recovery. ◆ Prototype equipment can be insured.
Casualty	<ul style="list-style-type: none"> ◆ Unexpected claims for duty of care. ◆ Product failures in new conditions. ◆ Disruption to transport (extreme events). 	<ul style="list-style-type: none"> ◆ Cover for professional services to carbon markets. ◆ "Green" transport products such as low-mileage motor policies.
Life/health/savings	<ul style="list-style-type: none"> ◆ Episodic impacts on human health. ◆ Underestimating human life expectancy due to warmer winter in northern hemisphere transfer. ◆ Reduced disposable income due to disasters. 	<ul style="list-style-type: none"> ◆ More demand for health cover savings. ◆ Growing wealth in developing markets due to technology transfer.
Other under-writing	<ul style="list-style-type: none"> ◆ Increased losses from business interruption, e.g. due to failure of public utilities. ◆ Disruption to leisure events. ◆ Increased losses in agrobusiness. ◆ Novel technology in energy sector. 	<ul style="list-style-type: none"> ◆ Alternative risk transfer (catastrophe bonds, etc.). ◆ R&D risks for low carbon technology. ◆ Consulting/advisory services. ◆ Insurance for emissions trading. ◆ Trade risks for technology exports. ◆ Carbon becomes an insurable asset.

Source: Allianz (2005, p. 26).

Climate change will affect, and in some cases is already affecting, most major types of insurance products. First, insurers will feel the impact of climate change on property and casualty insurance, where the insurer bears the risk of a loss suffered directly by the policyholder. These property and casualty claims include not only damage to insured property as a direct result of weather-

to promote framework of contingency measures to tackle climate change consequences¹.

Also compensation funds, together with the traditional insurance products, are internalization instruments. These funds created in connection with a regulatory system to cover environmental damage, and victim compensations, can be financed by a taxation system or by firms' contribution system.

but also claims for business interruptions and other consequences of weather-induced events. Second, health and life insurers will face increasing costs. Third, insurers will face claims based on liability insurance, where the insurer pays for legal claims brought by third parties against the policyholder.

Depending on the risk involved, all these types of insurance may be particularly affected by climate change-related losses or present unique opportunities to encourage the mitigation of such losses. And insurers will face challenges to insurability that may deeply impact the industry's ability to spread risk.

To cover the economic costs of natural disasters, in some countries not only insurance companies supply catastrophe insurance coverage, but also a system of compensation fund is established, such as a special government disaster funds within the target

taxation system or by a firms' contribution system. But both products deals with the issue of emergency assistance and compensation for disaster losses on an *ex post* basis.

Other insurance products provide also *ex ante* commitment of financial resources, such as the so-called "financial responsibility" products. This term defines all the tools that require polluters to demonstrate *ex ante* sufficient financial resources to correct and compensate for environmental damage that may arise through the activities of a firm. In its common application, financial responsibility implies that the operation of hazardous plants and other business is authorized only if firms can prove that future claims will be financially covered, for example, through letters of credit and surety bonds, cash accounts and certificates of deposit, self-insurance and corporate guarantees².

¹ See Mills and Lecomte (2006).

² About financial responsibility, see Faure and Grimeaud (2003), Boyd (2001).