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How effective can international compensation regimes be in pollution prevention?

A discussion of the case of marine oil spills

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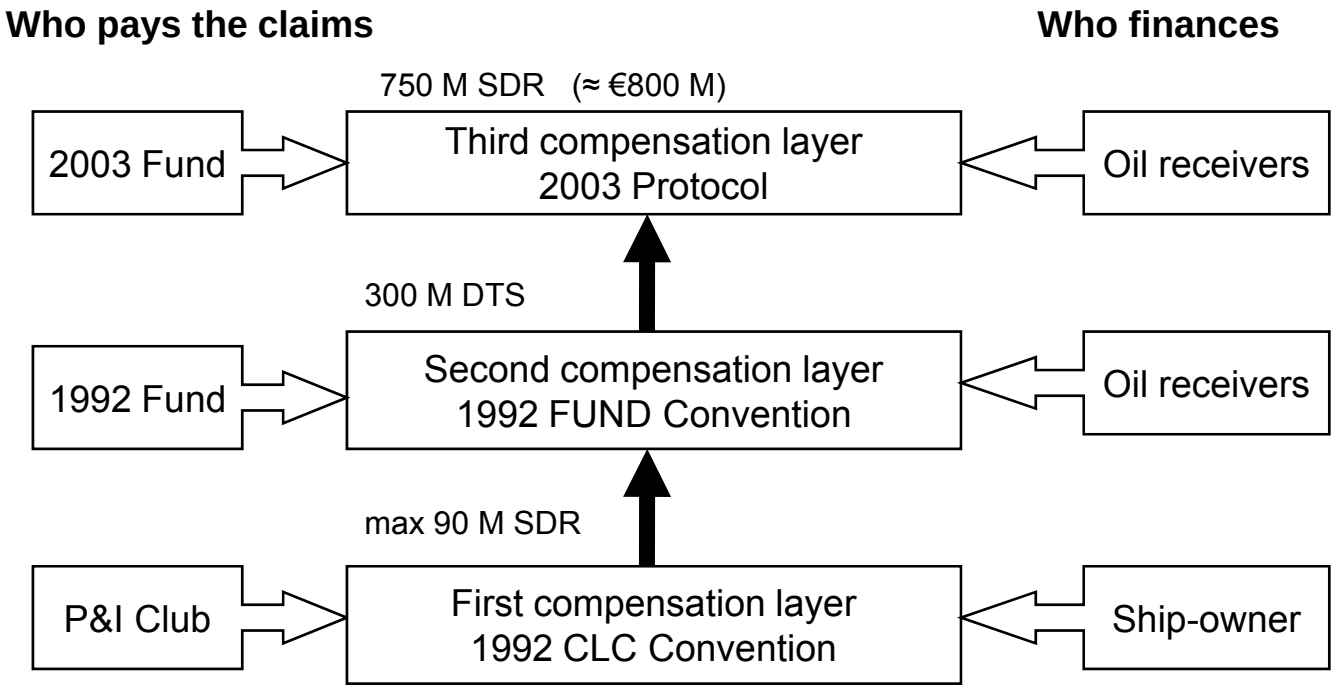
Presentation's structure

- Case study
- Idea of the paper
- The model
- Main results
- Conclusion

Case study: the CLC/FUND regime

- Defined within the International Maritime Organization and in force in many countries

- Strict liability based regime, with financial caps



Idea of the paper

- The deterrent impact of the CLC/FUND regime has been discussed in several papers, mainly from an economic analysis of accident law perspective
  - *Hartje (1984), Maestad (1997), Hay et Thébaud (2002), Kim (2002), Mason (2003), Thébaud and al. (2004), Faure et Hui (2003, 2006), Hay, Thébaud and Perez (…)*
  - *Existence of limiting factors, in particular limitation of compensation*

- However, 2 key features of the CLC/FUND have been ignored:
  - Oil pollution risk as an externality between countries;
  - Voluntary nature of the CLC/FUND regime.

- Idea of the paper: to take into account these two features in the discussion of the deterrent impact of the CLC/FUND regime

The model

- Adaptation of a standard model of self enforcing international agreements (Barrett 1994, Carraro & Siniscalco 1998) to the case of oil pollution prevention and the IOPC Fund.
- Assumptions:
  - *N* coastal states, identical
  - Marine oil transportation sector is integrated
  - World tanker fleet (*F* ships), equally shared between the *N* countries
  - Ships likely to pollute wherever they happen to be travelling; probability of a spill is linked to the condition of the ship
  - A spill affects only one country and causes damage up to an amount *D*
  - Compensation regime:
    - Only applies in member countries and covers a share *a* ($0<a<1$) of the damage suffered
    - Is financed on a mutual basis by marine oil transportation industries based in member countries

The model

The « standard IEA model » approach

- States:
  1. decide to participate to an agreement or not
  2. control directly the source of activity of the environmental activity
- The key assumption:

Countries participating to a coalition cooperate in order to maximize the welfare at the scale of the coalition

A slight adaptation proposed in the case of oil pollution

- States decide to participate to the international compensation regime or not
- The maritime oil transportation sector controls the risk of oil pollution
- The key assumption reframed:

Marine oil transportation companies based in Member countries cooperate in order to minimize the total cost of oil spills giving rise to compensation

The optimal probability of pollution

- Optimal probability of pollution = probability of accident which minimizes, at the scale of the world, the total social cost of oil spills
- Cost of preventive measures adopted on board a ship:

$$f = \frac{C}{2} \cdot (p - p_{max})^2$$

Unit cost of prevention

Accident prob of the ship

Accident prob under no prevention

- Total social cost of oil spills

$$CS = \frac{C}{2} \cdot (p - p_{max})^2 \cdot F + p \cdot F \cdot D$$

Cost of prevention

Cost of damage

- Optimum probability:

$$p^* = p_{max} - \frac{D}{C}$$

The existence of an international compensation regime

- A two-stage game…
  1. Each country decides whether to participate or not to the international regime
  2. According to the decision of their respective country, national maritime oil transportation companies adapt their arbitration in terms of pollution prevention
- … solved by backward induction

- Supposing that S countries out of N participate to the international regime

Accident probability of a ship registered in a non-cooperating country $p_{NC} = p_{\max}$

Accident probability of a ship registered in a cooperating country $p_C = p_{\max} - a \cdot \frac{D}{C} \cdot \frac{S}{N}$

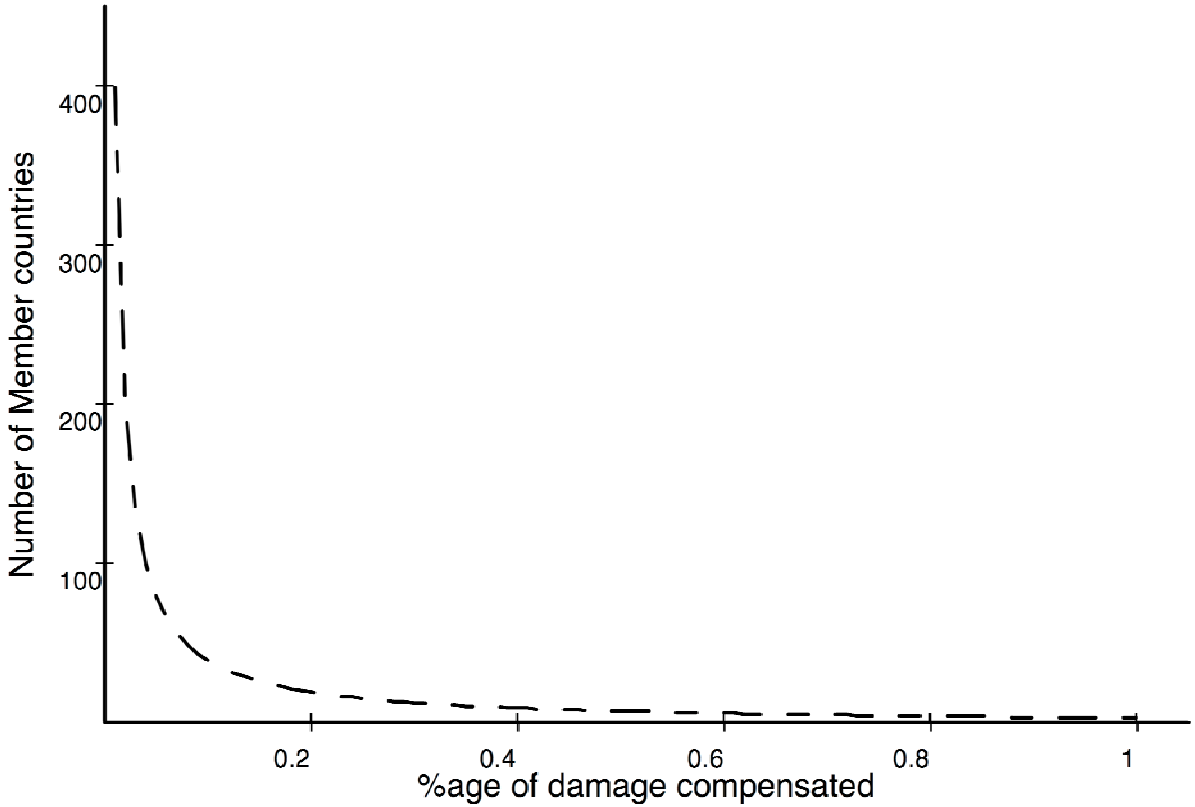
Accident probability of an average ship $\overline{p} = p_{\max} - a \cdot \frac{D}{C} \cdot \left(\frac{S}{N} \right)^2$

The existence of an international compensation regime

- Cost of oil pollution for a single country: sum of the cost of prevention beared by its oil transportation industry and the uncompensated damage
- The international compensation regime needs to be self inforcing, i.e. profitable and stable
- **Proposition 1:**

1. An international compensation regime exists.
2. The number of member countries is equal to or greater than 3 and is a decreasing function of *a.*

Proposition 1



Compensatory and preventive performance of an international compensation regime

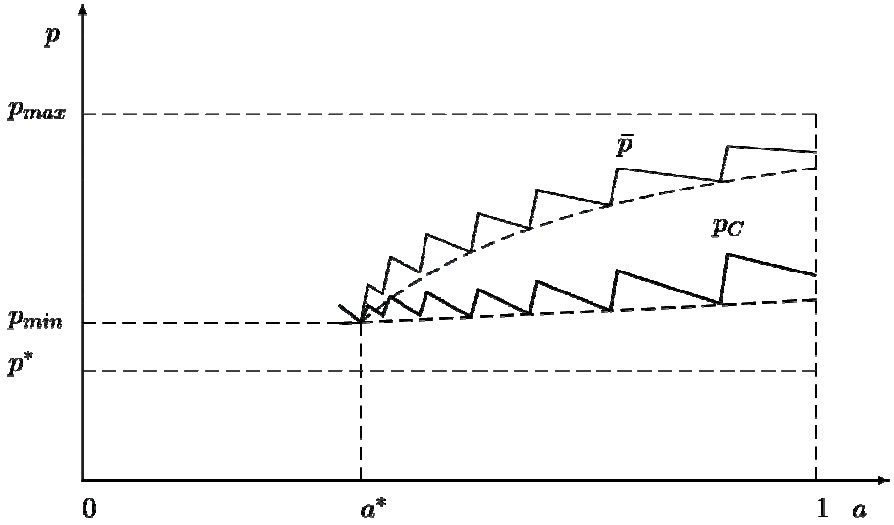
- **Proposition 2**: The social cost of oil spills increases with *a*

Explanation of this counter intuitive result:

An increase in *a :*

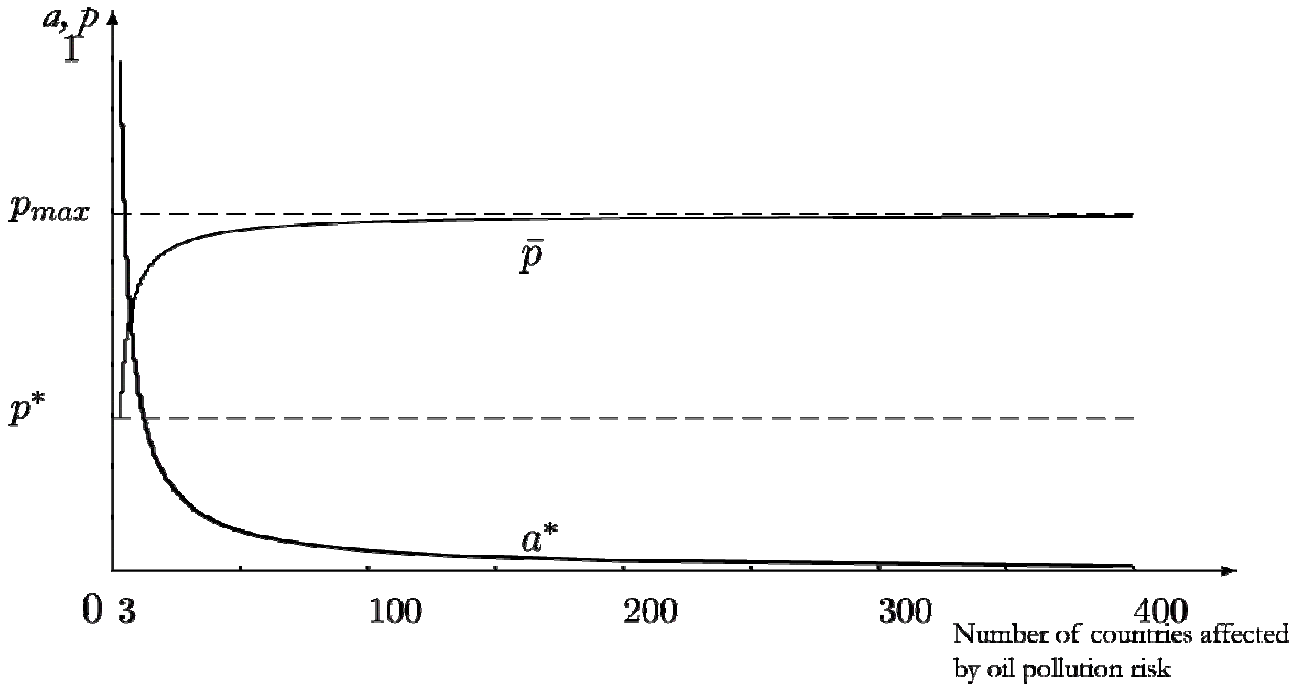
1. increases the quality of ships in member countries, *ceteris paribus*;
2. decreases the number of countries joining the international regime (cf. proposition 1).

The second effect prevails over the first effect



Compensatory and preventive performance of an international compensation regime

- **Proposition 3**: The maximum efficacy of the international regime is a decreasing function of the number of countries affected by the risk of oil spills (*N*)



Conclusions

- Contributions of the paper:
  1. The voluntary nature of the CLC/FUND regime limits its performance in oil pollution deterrence, as well as the number of countries affected by oil polluton risk;
  2. A potential justification of the current existence of financial caps;
  3. A new expression of the possibility of a trade-off between compensation and prevention (Pitchford, 1996).

- Limitations of the paper:
  1. Assuming identical countries?
  2. Non-financial motivation in participation in IEA
  3. …