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Understanding the decisions made at the dawn of the *Prestige* catastrophe

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Abstract: The Prestige tankship, loaded with 77,000 tons of fuel oil, suffered an accident in a storm on November 13, 2002, about 45 miles from the Galician coast. Although the tanker came within 5 miles of Galiza, the Spanish government refused it safe harbor, instead sending it away from shore in a northwestern direction. This was the first in a series of decisions that later provoked the greatest oil spill since the Exxon-Valdez. Related to this event, some interesting economic questions arise, many of which are interdisciplinary, involving engineering, biology, law and political science. This paper aims to explain why the *Prestige* was refused entry into a Galician harbor, and whether the same decision would be taken in the case of another accident. This work finds itself on the boundary between political science and economic theory since it focuses on how decisions are taken inside government departments making use of an economic model to shed light on several seemingly-disconnected events. We show how the Spanish administration proceeds encouraged presiding officials to implement emergency procedures with their own goals in mind. For the case studied, they opted for a previously designed emergency protocol that turned out to underestimate the risks involved in towing the tanker away from the coast. A number of policy recommendations are provided. First, politicians should choose a prestigious official to take emergency decisions in concert with a predetermined and already operative scientific committee. Second, an international compensation scheme must be clearly defined. Since neither of these has been adopted, the paper concludes a similar catastrophe is likely to occur in the future.
Key words: *Prestige*, oil spill, maritime disasters, economic theory, scientific assessment, international compensation scheme.
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1 Introduction

On November 13, 2002, the *Prestige*, a 26-year-old single-hull tankship with 77.000 tons of heavy fuel oil, suffered an accident in a violent storm 45 miles from Galiza, off the Spanish Atlantic coast. Although the vessel came to within 5 miles of the Galician coast, the Spanish government refused it safe harbor, instead sending it away from shore in a northwestern direction. This was the first in a series of decisions that later provoked on November 19 the sinking of the *Prestige* 150 miles off the coast and the biggest oil spill, in terms of extension, since the Exxon-Valdez accident (the entire Spanish northern Atlantic coast was affected, as well as some Portuguese and French coastline). Pristine ecosystems were harmed, and all fishing and seafood collection were forbidden for months along the 1.390 km. Galician coast.[1]

Despite the tragedy of the catastrophe, some interesting economic questions arise, many of which are interdisciplinary, involving engineering, biology, law and political science. Three issues have been extensively treated in the economic literature: i) the monetary valuation of the damage;[2] ii) the fact old single-hull tankships are still in use and allowed to transport fuel,[3] and the incentives to be included in the regulatory set-up to reduce the risks of future accidents;[4] and, iii) the identification of the source of the pollution externality and, consequently, the party responsible for clean-up expense and loss compensation.[5]

Relevant issues, however, are still to be further examined, in particular, those concerning the decision of the Spanish authorities to refuse the *Prestige* safe harbor along the Galician coast. Such a decision has been bitterly criticized by scientific literature,[6] from marine biology[7] to political science,[8] as well as by technical reports.[9] Insofar as the economics literature is concerned, however, there has not yet been an attempt to make use of economic theory to understand why the *Prestige* was refused to entry to any Galician harbor, and whether the same decision will be made again if a new tankship is in danger. The aim of this paper is to fill this gap. This work finds itself at the boundary between political science and economic theory, since it focuses on how decisions are taken inside government departments making using of an economic model to shed light on several seemingly-disconnected issues. The answers provided should be of great use in eliminating wrong procedures from future decisions for similar conditions.

2 Some puzzles surrounding the *Prestige* catastrophe

We can enumerate seven seemingly-disconnected puzzles concerning the *Prestige* catastrophe.

Puzzle 1) Was the decision to tow the Prestige away from shore a political or a technical one?

Some opposition political parties (e.g., the Galician Nacionalist Party [BNG], United Left [IU] and Socialist Party [PSOE]) presented this decision as a political one, revealing the "incompetence" of the government ruling party, and as evidence of low Galician political weight with regard to the central government decision making.[10] In addition, Spanish marine and atmospheric scientists have accused the Spanish government of largely ignoring the scientific community in the aftermath of the spill, demanding that the Spanish authorities improve the mechanisms and logistics for scientific and technical consultation (see Bohannon

et al., 2003). Despite these criticisms, the Spanish government has stood behind all the steps taken,[11] and both the Spanish Minister of Public Works and the Spanish Vice President continue to insist that the decisions were made according to technical, not political criteria.[12]

Puzzle 2) Why did the Spanish authorities not implement a predetermined emergency protocol?

Some authors decry the lack of a protocol for accidents (e.g., González-Laxe *et al.*, 2003c, or Labandeira *et al.*, 2003), and the lack of resources for preventing or fighting pollution in Spain (see Acinas, 2003). Yet, a protocol had been designed and tested in June, 2001, following a mock exercise in A Coruña off the Spanish Atlantic coast consisting of an imagined collision 45 miles north, in which a tankship spills oil. Nevertheless, this protocol was not followed at the time of the *Prestige* accident.

Puzzle 3) What were the scientific arguments behind the decision to tow the Prestige out to sea?

No technical or scientific report evaluating the status of the punctured vessel, or displaying the set of available alternatives in conjunction with contingency outcomes has ever been publicly reported by any Spanish government office. In addition, the marine scientific community largely regretted the decision was taken heedless of the knowledge on sea currents gathered over the years, and complained about the "ineffective use of scientific institutions, resources, and knowledge," which revealed "a serious malfunctioning of the national research system," and threatened "the credibility of the Spanish Earth sciences community as a whole." (Serret *et al.*, 2003). For example, there was no scientific report substantiating the Spanish government's argument that it was impossible to introduce the vessel into a safe harbor,[13] or any of the "scientific" statements released by the Galician and Spanish authorities, such as those concerning the "unlikely event the oil would reach the coast,"[14] the "low risk the vessel posed out to sea;"[15] or the "theory of solidification,"[16] meaning that the oil was to be frozen "like a brick" because of a depth of 3,500 meters and a temperature of 2°C, but which turned out to be wrong.[17]

Puzzle 4) How can the 'tossing-the-hot-potato' behaviour of the Spanish authorities be explained?

Once the vessel was refused safe harbor, the *Prestige* followed a somehow erratic path, first northwestern, then south, and finally southwestern. At the same time, command of the tankship was left to the Smit Salvage team, provided the vessel would never approach the coast.[18] In addition, several statements delivered at press conferences reveal the intention to pass on the problem.[19]

Puzzle 5) Why did the ruling politicians, belonged to the Galician autonomous and Spanish governments, exhibit an (apparent) lack of interest in the catastrophe, and why did they not show their faces for weeks?

One of the most striking puzzles that occurred while the catastrophe was unfolding is that those politicians with competence in the matter showed a lack of interest. For example, they took a weekend holidays the very weekend of the accident, some of them hunting, such as the Minister of Public Works or the Galician President along with several Galician ministries, while others visited a National Park. Even Mr.Aznar, the Spanish President, waited for a whole month before visiting Galiza.

Puzzle 6) Why did the Galician and Spanish ruling politicians deliver inaccurate, or even wrong, statements for weeks concerning the true situation of the spill?

The information provided by the Spanish authorities initially regarding the accident, and later about the magnitude of the spill, was confusing and misleading.[20] In addition, the contrast between the Spanish government information and real facts, annoyed and angered the population, which sought alternative information sources, mainly from Portugal and France.[21] Even Spanish authorities cast doubts on the reliability of these sources.[22] Emitting such misinformation seems incomprehensible, since it postponed implementing measures to prepare for the oil slick's arrivals to shore.

Puzzle 7) Why did the Spanish authorities initially refuse international aid offers and delay making use of all the national human and material resources available in flighting against the oil spill?

Another startling puzzle is the initial rejection of international aid by the Spanish authorities despite the scarcity of means for flighting against the pollution.[23] In addition, it seems strange that the Spanish authorities did not make full use of all the human and material resources at hand to flight the pollution from the first moment on, such as the Spanish army with a symbolic presence for weeks.[24]

A final comment on these puzzles is in order. Any initial assessment of them requires identifying exactly who took the decision to tow the *Prestige* away from shore. However, one month after the accident, it was still not clear who had made the decision.[25] Later, it was learned that the decision was made by members of the Commission for Crises Coordination, created specifically for this emergency,[26] with the acquiescence of the Minister of Public Works.[27]

3 A theoretical framework for explaining the puzzles

Barreiro-Rivas (2003) attempts to explain some of these puzzles from a political science approach. He characterizes *the logic of indecision* as a type of political irrationality.[28] Departing from a somewhat particular reformulation of Buchanan *et al.* (1962)'s *calculus of consent*,[29] he focuses on understanding the decision/no-decision behavior.[30] As a result of this trade-off, in some particular circumstances, all political decisions are directed towards two implicit ends: "i) furthering the problem, and then minimizing its relevance; and, ii)

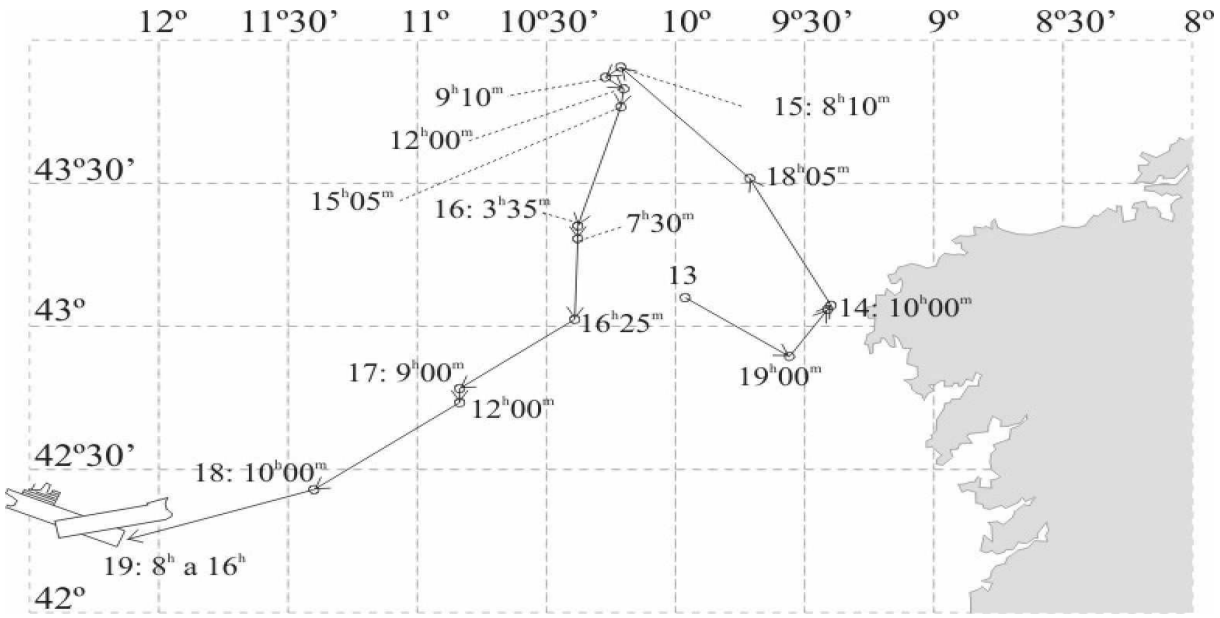

Figure 1: Course of the *Prestige*, November 14-19, 2002.

transferring the problem from one governmental office to another in order to avoid responsibility." (Barreiro-Rivas, 2003, p.32) This theory allows this author to work out some of the above puzzles out concerning the *Prestige* affair: why the predesigned protocol was never followed (*Puzzle 2*); why neither technical reports, nor files that guided the protocols implemented were ever made available by any governmental office (*Puzzle 3*); why Spanish authorities tried to divert the problem to other countries, first to northern Europe and then to Portugal (*Puzzle 4*); and, why the information provided by Spanish authorities downplayed the magnitude of the accident and, later, the oil spill (*Puzzles 6 and 7*).

However, this intuitive approach lacks of a formal set-up for explaining all the decisions and effects at once, even leaving some puzzles explicitly unanswered. Below, we present an economic model formalizing and extending Barreiro-Rivas's intuitions developed from a political science point of view. Also, this model accounts for two additional issues: why the *Prestige* was refused entry into any Galician harbor, and whether the same decision would be made when the next accident happens.

Three initial comments are in order. First, the model will be restricted to the decisions made from November 13 to November 14 (see Figure 1). Second, we focus on analyzing *inside-the-government decisions*, so we present an economic model that illuminates the decisions of those government officials in charge.[31] Finally, one might think that the decisions taken do not comprise the key issue of the *Prestige* affair, but 'the low standards for dangerous cargo vessels,' as the Oil Pollution Act, 1990, has made clear by crowding out dangerous vessels from US waters. Nevertheless, we must remember that even though the probability of another accident may be lowered, it cannot be removed entirely. So it makes sense to study how decisions were taken, and how they should be taken next time.[32]

3.1 An economic model

Next, we formalize Barreiro-Rivas' intuitions into a simple economic model that incorporates the main features of the *Prestige* incident.

The agents. The decision-makers are the political-technical officials, who are assigned to the Merchant Marine Office, under the Spanish Law 27/1992, art.87. We make use of the term *political* official meaning a technocrat occupying a job of responsibility as a result of his appointment by some politician, who is his boss.[33]

The consumption set. The alternative choice set for the decision-maker is whether to tow the *Prestige* into one of the H_G Galician harbors, or to tow it offshore.

Preferences: goals and (technical) responsibilities. The goals of the decision-maker, namely the political-technical official, need not coincide with the goals of the politician who has designated him. While the latter may be interested in votes, we will assume the former take decisions aimed to keep himself in his seat as long as possible.[34] The command of the official's position and the wage he receives involve two kind of responsibilities: first, he must make the politician's life easier, that is, deal with routine daily problems and work them out; and second, as a political-technical staff member, he must make correct decisions using technical criteria in looking after the Spanish coasts (so no mistakes are expected). The job entails not bothering or disturbing his boss unless it is extremely necessary, and not showing any flaw or weakness before him, because the politician trusts him to take decisions. Whenever the consequences of the decision taken involve society's and official's own losses, the official suffers a cost, both subjective and/or monetary, that we will denote by C.

The information set. The last element of the economic model is the official's information at hand for taking decisions. This issue will become more clear later, so we will address it in the following section.

3.1.1 The political-technical official problem

The problem is represented by the decision tree in Figure 2. A tankship accident occurs within Spanish waters. The official in charge first has to decide whether or not the emergency is significant enough for his political boss to be bothered for help, a decision denoted by X_1. If it is, he gets in touch with his boss and suffers the cost $C(X_1)$ of being considered a fool by someone who had trusted him, as he seems to make no effort to manage the contingency himself. If it is not, he has to confront the decision X_2 of sending the vessel away from shore or introducing it into a harbor. The latter would require an additional third decision X_3, namely the choice of a suitable Galician harbor to accomodate the tankship, among the H_G available. Afterwards, there is a stochastic realization: with a probability of π_j, the tankship breaks apart inside harbor j, causing a local catastrophe, with the official receiving a cost $C^{\pi}(X_3, j) > 0$, which is probably different for each of the $j \in H_G$ harbors; and, with a probability of $1 - \pi_j$ nothing happens, and no cost is incurred, i.e. $C^{1-\pi}(X_3, j) = 0$ for each of the $j \in H_G$ harbors. In the case of the vessel being sent away from shore, there are two ensuing stochastic realizations. First, with a probability of $1 - \rho$ no misfortune occurs offshore, e.g., the oil is unloaded from the tankship on the high seas, so no cost is involved, i.e. $C^{1-\rho}(X_2) = 0$; and with a probability of ρ a catastrophe takes place. Next, with a probability of ψ, the spill reaches the Galician/Spanish coast, with a cost $C^{\rho\psi}(X_2) > 0$; and with a probability of $1 - \psi$, the catastrophe does not affect the Spanish coast. In this

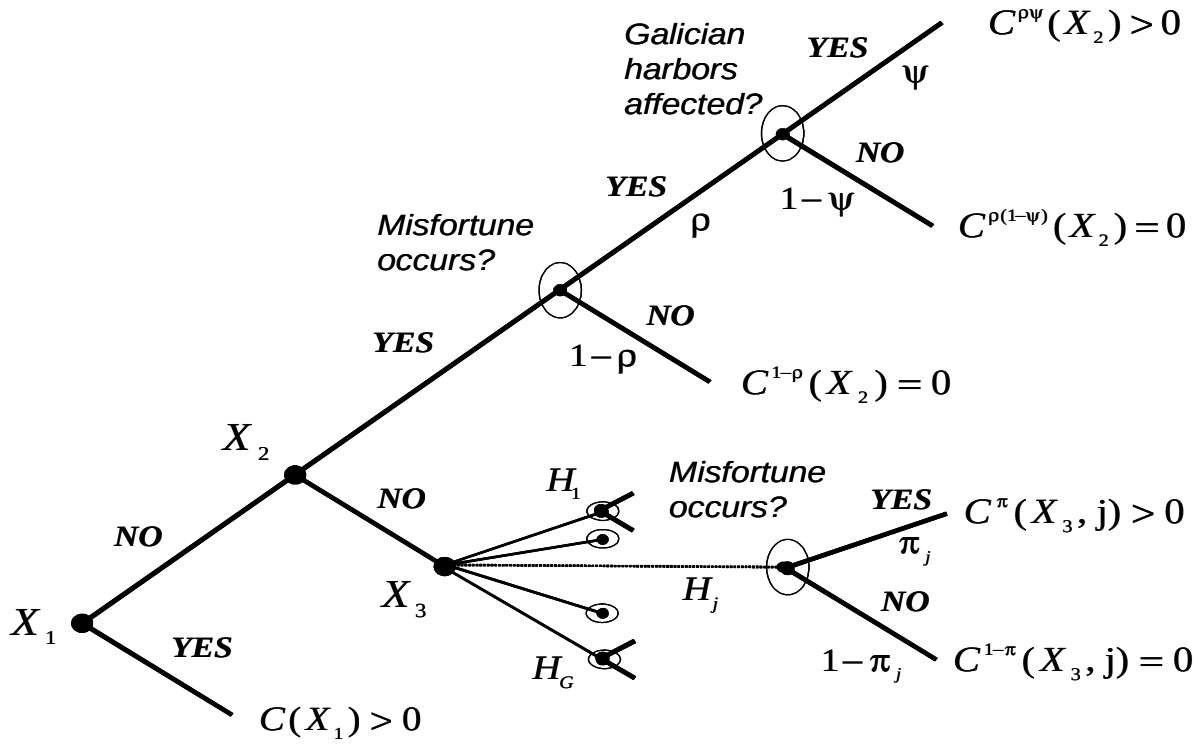

Figure 2: Political-technical official's decision tree. Decisions: $X_1 \equiv$ bother the political boss?; $X_2 \equiv$ tow the vessel away from shore?; and, $X_3 \equiv$ introduce the vessel into harbor j (with $j = 1,...H_G$)?. The circle around a knot represents a stochastic event.

case an international diplomatic conflict may result, but the official has fulfillel the goal of protecting his country's coast, and he incurs no cost, i.e. $C^{\rho(1-\psi)}(X_2) = 0$.

The political-technical official problem is choosing an alternative that minimizes his own costs,

$$\min\Big\{C(X_1);\ \ \{(1-\pi_j)C^{1-\pi}(X_3,j)+\pi_j C^{\pi}(X_3,j)\}_{j=1}^{H_G};$$
$$(1-\rho)C^{1-\rho}(X_2)+\rho\Big[(1-\psi)C^{\rho(1-\psi)}(X_2)+\psi C^{\rho\psi}(X_2)\Big]\Big\};$$

or, equivalently,

$$\min\Big\{C(X_1);\ \ \{\pi_j C^{\pi}(X_3,j)\}_{j=1}^{H_G};\quad \rho\psi C^{\rho\psi}(X_2)\Big\}. \tag{1}$$

That is, the political-technical official has to minimize his own costs regarding: i) whether to bother his boss and be considered a fool, $C(X_1)$; ii) whether to tow the vessel into some Galician harbor $j \in H_G$, where with some positive probability an accident will take place, $C^{\pi}(X_3, j)$; or, iii) whether to tow it away from shore and with some probability that a misfortune will occur and, in addition, affecting the Spanish coast, $C^{\rho\psi}(X_2)$. To simplify the analysis, we could consider the official's own cost to be the same as for the adverse event, e.g., he will be fired if an accident happens: $C^{\pi}(X_3, j) = C^{\rho\psi}(X_2) > 0$ for $j \in H_G$.

Finally, we turn back to the *information set* available to the official making the decision. The set is compounded by the probabilities of catastrophe: whether occurring within some harbor j, π_j with $j \in H_G$; or occurring away from shore and affecting the Galician/Spanish coast, $\rho\psi$. We will assume the information set represents the political-technical official's expectations of these probabilities, i.e., $\left\{\{\pi_j^e\}_{j\in H_G}, \rho^e\psi^e\right\}$.

Hiring technical officials: the principal-agent problem. The economic model described above could be thought as a particular study of a more general hidden-actions hidden-information *principal-agent* problem (see Mas-Collel *et al.*, 1995, Chap.14). The *principal*, the Ministry of Public Works, hires a technical official to deal with maritime affairs, including emergency contingencies, and to see to Spanish coast well-being. We have skipped the analysis of contract design, and its efficiency properties, as it is already at work at the time of the accident (and likely set administratively). Instead, we have focused on the *agent*'s problem of minimizing his subjective cost, C. Yet, we could think this cost depends on: i) an official individual net cost, $\mathbf{C}$, e.g., the monetary cost of getting fired, as well as having his reputation suffer because of his mishandling of the situation; ii) the technical officer's level of involvement in solving the contingency (i.e., his *level of effort*), denoted by e, which may be observable; and, iii) the monetary and non-monetary costs for those Spaniards affected by the spill that are offset by the monetary (and intangible) compensations received, which will be denoted by $\mathcal{C}$. For expository purposes, we can link these costs to the official subjective costs as follows: Higher levels of effort lowers the official's welfare; also, the higher the social costs and the lower the effort, the higher the probability of suffering a monetary cost. Then the official subjective cost is

$$C = \sigma(A\mathcal{C} + Be^{-1})\,\mathbf{C} + g(e)$$

where the function $\sigma \in [0,1]$ is the probability of incurring a monetary cost, increasingly monotonic on $\mathcal{C}$ and decreasingly monotonic on e; A, B are positive parameters; and, g is an increasing cost function in the effort. Notably, the *agent*'s level of effort e is unobservable for the *principal*, unless it is clearly shown, as in decision X_1; in such a case, B measures the "fool-effect."

3.2 A theoretical result

The framework described above is a model displaying multiple-equilibria. Among the possible results, let us take up the following.

Proposition 1 *If* $C(X_1) >>> C^{\pi}(X_3, j) = C^{\rho\psi}(X_2)$ *for all* $j \in H_G$*, the problem reduces to*

$$\min\left\{\pi_{j^*}^e;\quad \rho^e\psi^e\right\},$$

with $\pi_{j^*}^e = min_{j\in H_G}\pi_j^e$*. If* $\rho^e\psi^e$ *is small enough, then the political-technical official's optimal choice is to tow the vessel away from shore, i.e.,* $X^* = X_2$*.*

We will make use of this result to shed light on the decisions involved in sending the *Prestige* out of sea, and to work out the puzzles.

4 A qualitative assessment of the parameters

In order to understand the decisions involved in the *Prestige* affair, it is necessary to characterize the parameters of the problem for this case study: i) each of the subjective costs: $C(X_1)$, $C^{\rho\psi}(X_2)$ and $\{C^{\pi}(X_3, j)\}_{j \in H_G}$, as well as those assumed to be zero, i.e., $C^{1-\rho}(X_2)$, $C^{\rho(1-\psi)}(X_2)$ and $\{C^{1-\pi}(X_3, j)\}_{j \in H_G}$; ii) the expected probabilities: $\rho^e \psi^e$, and π_j^e for $j \in H_G$; and, iii) other cost parameters, such as A and B. Despite the difficulty of a quantitative calibration, we may display some qualitative patterns to assess them relying on fact and events; that is, we will make use external information to gauge the relative magnitude of the costs and expected probabilities. This information has three origins: first, the decisions taken by the same actors previous to the *Prestige* accident; second, the Spanish government's governing style; and, third, the monetary compensations paid out after previous oil spill the accidents. See Table 1.

The 'Castor' affair and the Spanish position on distressed vessels. The *Castor*, a vessel with an inflammable load of 31,068 tons, suffered an accident just outside Almería, on the Spanish Mediterranean coast on December 31, 2000. Permission to dock was requested, but the Spanish authorities ordered the tankship to move off the Spanish coast after rescuing the crew.[35] Mr.O'Neil, the IMO Secretary-General, showed his concern over this incident, which brought to light the issue of *ports of refuge*.[36] After the *Castor* affair, Spain submitted to the IMO's Maritime Safety Committee observations on and interpretations of law, policy, and management issues concerning the designation of places of refuge by coastal states. The Spanish position can be summarized thus: "the right of a vessel in distress to enter a port, place of refuge or territorial waters must be interpreted solely as the right to preserve or save lives of its crew and passengers, and that such right of entry cannot exist when measures have already been taken to save persons on board" (Chircop, 2002, p.219).[37] Mr.López-Sors, a marine engineer, was already Head of the Merchant Marine Office at the time of the accident and fully shared this view.[38]

The Spanish position provides some qualitative information regarding some parameters of the model. First, it reinforces the assumption that the main task of the political-technical official is to keep the Spanish coast safe, so that $C^{\rho(1-\psi)}(X_2) = 0$.[39] In addition, if the vessel is sent offshore and an accident does not occur, no Spanish politician will complain about the decision. On the contrary, if the vessel is admitted into a harbor and a catastrophe takes place, the official will be "punished," e.g., fired; that is, $C^{\pi}(X_3, j) >>> C^{\rho(1-\psi)}(X_2)$ and, $C^{\pi}(X_3, j) >>> C^{1-\pi}(X_3, j)$ for all $j \in H_G$. Second, the protocol implemented for the *Castor* became an important precedent because the vessel was sent away from shore and the problem was worked out far away and at no cost to the Spanish authorities. This means that in the future, it would be expected that others would solve the problem the same way; so the probability that something would happen offshore, $\rho^e \psi^e$, was far from low at the time of the *Prestige*'s SOS. In addition, in terms of the *principal-agent* problem reinterpretation, the straightforward implementation of this protocol would reduce the unobservable level of effort e required to manage an emergency contingency, reducing the *agent*'s cost.

The governing style. In general, governments are not particularly characterized by self-criticism of their governing style. Spain is not an exception, where resignations or dismissals of political officials are rare, if not highly unusual. The Popular Party's (PP) governing

style could have exacerbated such manners, maybe as a reaction to the corrupt environment pervading the later phase of the previous Socialist Party ruling period.

In a political environment where no political responsibility is assumed or recognized, the bothering-your-boss cost is very high, i.e., $C(X_1) >>> 0$.[40] In terms of the *principal-agent* problem reinterpretation, this means that B will probably be very high.

Monetary compensation received after an accident. The loss incurred from an accident includes economic costs for citizens and firms located in the area, as well as environmental degradation. After an oil spill accident, compensation to those affected usually slowly comes and insufficiently. Insurance companies are reluctant to speed up payment procedures, and responsibility claims through international judges are expensive and take time.[41] This leads to further delay in payment, so national governments have had to usually dispense the money in advance.[42] This is the reason politicians want to avoid a spill in their backyards. Salvage companies have years of experience dealing with damaged craft, but they also stand to score if they can retrieve most of the oil. Oil-tanker rescue jobs are taken on spec, and if a ship and cargo are not salvaged, the owner and insurers only cover a salvage company's cost. That is why countries, such as Spain, are suspicious of salvagers' arguments. It is, in this respect, that Mr.López-Sors asserted in a television interview following the *Castor* affair, "The salvage company wants me to risk my coast and my people in a highly touristic area and for what? For their profits." (See Bahree *et al.*, 2005)

Concerning the parameters of our model, this means that citizens losses $\mathcal{C}$ are highly weighed in the Spanish official's problem, i.e., in terms of the *principal-agent* problem reinterpretation, A is high.

5 Discussion

The economic model displayed in Section 3 formalizes and extends Barreiro-Rivas's intuitions based on a political science approach. Not surprisingly, we can reach his same conclusions with our formal framework. The goal of this section is to also deal with new issues. First we will review the puzzles, and then we will focus on why the *Prestige* was refused entry into any Galician harbor, and whether the same decision would be taken after the next accident.

5.1 Understanding the puzzles

To begin with, our model illustrates that the decision to send the *Prestige* out to sea was a technical one (*Puzzle 1*). If the decision were political, based on Galiza's slight political weight in the Spanish central government's decision-making, then the cost of introducing the vessel into any harbor would be zero, i.e., $C^{\pi}(X_3, j) = 0$ for all $j \in H_G$. Accordingly, for any strictly-positive expected probability $\rho^e \psi^e > 0$, the outcome of the political-technical official problem (1) would be to introduce the vessel into any of the Galician harbors, i.e., $X^* = (X_3, j)$ with some $j \in H_G$, instead of sending it offshore. In contrast, our set-up agrees with the version defended by the Spanish government and other authors (e.g., Díaz *et al.* 2003): the decision was made by a *political*-technical official, who had the right to make this decision by Spanish Law 27/1992 and was designated by the Minister of Public Works to develop this task.[43]

Official's costs		
To be considered a fool	$C(X_1)$	high/very high [2]
No accident inside harbor $j \in H_G$	$C^{1-\pi}(X_3, j)$	null [0]
An accident inside harbor $j \in H_G$	$C^{\pi}(X_3, j)$	very high [1]
		much higher than $C^{1-\pi}(X_3, j)$ [1]
		much higher than $C^{\rho(1-\psi)}(X_3, j)$ [1]
		equal to $C^{\rho\psi}(X_2) > 0$ [0]
No misfortune offshore	$C^{1-\rho}(X_2)$	null [0]
Misfortune offshore not affecting Spain	$C^{\rho(1-\psi)}(X_2)$	null [1]
Misfortune offshore affecting Spain	$C^{\rho\psi}(X_2)$	high [1]
		equal to $C^{\pi}(X_3, j) > 0$ for $j \in H_G$ [0]
Official's a costs parameters		
Weight of citizens' losses	A	high [3]
Weight of effort	B	high/very high [2]
Official's a priori probabilities		
An accident inside harbor $j \in H_G$	π_j	
An accident offshore	ρ	
An accident offshore affecting Spain	$\rho^e\psi^e$	low/very low [1]

Table 1: **Qualitative assessment of the parameters.** Source criteria: [0] Assumption; [1] The *Castor* affair and the Spanish position on distressed vessels, [2] The governing style, [3] Monetary compensation received after an accident.

In particular, the Head of the Merchant Marine Office followed a protocol for dangerous cargo vessels in distress previously implemented during the *Castor* accident, and this fact unlock three of the puzzles. First, it explains why the predesigned protocol was never followed (*Puzzle 2*). Second, it makes clear why neither technical reports nor files that guided the protocols implemented were ever made available by any government office (*Puzzle 3*). In this respect, the *Castor* episode reinforced the presumption of a low value for the *a priori* probability of an offshore disaster eventually affecting the Spanish coast, $\rho^e\psi^e$. However, such a value for true expected probability regarding a distressed vessel in the calm Mediterranean, turns out to be far from undervaluated when the distressed vessel is one in the stormy waters of the Atlantic. Accordingly, at the time of the *Prestige* accident, the real risks involved in sending the vessel away from shore were greatly underestimated; that is, $\rho^e\psi^e <<< \rho^{Sc}\psi^{Sc}$, where the latter is the true *a priori* probability that can only be found by seeking the counsel of a scientific committee. Indeed, the misleading and unsound scientific arguments made at the time can only be explained by the lack of scientific counseling in assessing of the probability $\rho^e\psi^e$. And third, the fact that the decision to send the vessel away from shore

was previously decided fits into Barreiro-Rivas' (2003) *logic of indecision* pattern (*Puzzle 4*). As a consequence of this decision, there was a desperate quest to justify a previously decision with objective arguments.[44]

Finally, the Spanish style of governing, in particular Mr.Aznar's government, suggests the cost of bothering-your-boss being very high. Thus, *political* officials downplayed the situation, which could in turn explain the remaining puzzles. First, this may account for the lack of interest by Galician and Spanish ruling politicians since the situation was supposedly undercontrol, and why some "unaware" politicians took a free weekend (*Puzzle 5*). Second, this explains the delay in forming a true assessment of the disaster and why the information provided by the Spanish authorities downplayed the magnitude of the accident and of the subsequent oil spill (*Puzzle 6*).[45] Finally, this also explains the Spanish authorities' rejection of any foreign aid for cleaning the spill, and the delay in sounding the alarm to deploy all Spanish human and material resources to fight the pollution (*Puzzle 7*).

5.2 Understanding the decisions

Our economic model emphasizes three key elements in the decision-making procedure regarding the *Prestige* accident. First, we see the way decisions are taken inside Spanish governmental offices. The net the decision-making cost is restricted to the political-technical official's own costs, and in particular to the bothering-your-boss costs, $C(X_1)$.

Second, we have the deficient scientific assessment of the costs and benefits of the alternative scenarios, and the probabilities of appearances. The true net costs for each of the scenarios, $\mathcal{C}^{\pi}(X_3, j)$ for $j \in H_G$ and $\mathcal{C}^{\rho\psi}(X_2)$, as well as the probabilities of a catastrophe occurring in each of them, i.e., $\{\pi_j^e\}_{i \in H_G}$, ρ^e and ψ^e, very likely requires a previously constituted scientific team.[46]

Finally, there is the non-existence of an international compensation scheme. The *Prestige* affair made clear that the decision regarding a distressed vessel has the characteristics of a *free-rider* problem. The key issue is that introducing the distressed vessel into a Galician harbor $j^* \in H_G$ could eventually result in a local catastrophe, but the compensation of the costs suffered by this Galician harbor $\mathcal{C}^{\pi}(X_3, j^*)$ are only restricted to national and insurance sources, usually slow.[47] Thus, the costs associated with pollution suffered by each country are mainly assumed by each country's government; in terms of the model, $\mathcal{C}^{\pi}(X_3, j^*)$ and $\mathcal{C}^{\rho\psi}(X_2)$ are strictly positive for the Spanish government, while $\mathcal{C}^{\rho(1-\psi)}(X_2) = 0$ for the pollution affecting other countries, and vice versa for another country affected (e.g., France, Portugal or the UK). Because no Galician harbor can appropriate benefits from any other harbor (either Galician or foreign), none offers the tanker safe haven and, then, all Atlantic harbors are eventually damaged. The problem stems from the insufficient compensation for those eventually affected to mitigate the costs for a harbor j^*, $C^{\pi}(X_3, j^*)$, for some Galician harbor $j^* \in H_G$. This means that any country's individual decision concerning the distressed vessel would yield a (*Pareto*) *inefficient* outcome that could be improved upon international cooperation. In economic terms, there is a missing financial market for the pollution caused by the distressed vessel, both domestically and internationally, i.e., the nonexistence of a standard international maritime compensation scheme protocol.

These three elements have remained unchanged from the *Prestige* disaster, so the catastrophe will (very likely) occur again.

6 Concluding comments: policy recommendations

In this paper we have shown how economic theory can shed light to understand the key elements of the *Prestige* accident. Our analysis now concludes by proposing some policy recommendations. Initially, politicians, and not political-technical officials, should make the decisions under a state of an emergency: in democratic societies citizens have the right to choose those who will make decisions related to their lives. However, because political-technical officials are in charge of day-to-day affairs, the question arises of who decides what is an emergency event and what is not; or, in other words, how bothering-your-boss costs $C(X_1)$ can be reduced. Here, one would need to design and implement an efficient contract for the hidden-actions hidden-information *principal-agent* problem shown in Section 3, where the *principal* provides enough incentives for the *agent* to make a high-level effort e in looking out for citizens costs $\mathcal{C}$.

Such a contract, however, may be difficult to design. That is why Lord Donaldson (1999) has taken an alternative approach by detaching the decision making from political responsibility; in the terms of our model, this reduces decision-maker subjective costs. In his report, he proposes hiring a politically-independent, prestigious person, known as the *Secretary of State's representative* (SOSREP), who exercises "ultimate control of any salvage operation where there is a threat of significant pollution [...] acting in the over-riding public interest." (Recomm.9).[48] However, as the *Prestige* accident has shown, a maritime accident is not only a local problem; it may finally turn out to be a cross-national one. So a SOSREP on the European level, perhaps assessed by a board of national SOSREPs, could better allocate resources and efforts. The implementation of this proposal on an international basis, however, requires three additional key elements, as emphasized in this paper.

The first element is that decisions must be based on scientific assessment of the costs of alternatives, as well as of the probabilities of certain events occurring, i.e. $\mathcal{C}^{\pi}(X_3, j)$ for $j \in H_G$ and $\mathcal{C}^{\rho\psi}(X_2)$, and $\{\pi_j^e\}_{i\in H_G}$, ρ^e and ψ^e. The counsel of this scientific team would be of great help in evaluating the magnitude of the peril of an accident, thereby reducing the bothering-your-boss cost $C(X_1)$. Thus, it is crucial such an emergency scientific committee must be predetermined and already operative by the time of the emergency event. Freire *et al.* (2006) have proposed some developments for an effective response to catastrophes based on the creation of a temporally stable scientific infrastructure with the aim of creating scientific knowledge. At the moment of the incident, this would be available for quick damage assessment following the initial evaluation carried out "in real time."[49]

The second element centers on the necessity for technical maritime infrastructure for salvage, towing and repairing distressed vessels (e.g., tugboats, shipyards, etc.), a location for carrying out such activities, as well as anti-pollution infrastructure. The authorities would come to rely on such an infrastructure for emergency contingencies. It is worth observing that there is an important amount of maritime traffic in commodities and oil nowadays about the periphery of Europe, corresponding mainly to poor regions (e.g., Baltic countries, French and Spanish Atlantic regions, Portugal, Southern Italy, Greece, Cyprus, etc.). Marine salvage and repair activities could turn into a profitable business opportunity for these regions, so incentives and funding facilities should be encouraged. Observe that Spanish initiatives to move the shipping corridor farther out to sea following the *Prestige* affair (Comisiones, 2002c), however, go in the opposite direction, as this will only increase

the cost and time it takes to help vessels in trouble.

A third element is concern with the need of a suitable compensation scheme among countries. This scheme must greatly reduce the (net) costs of $\mathcal{C}(X_3, j)$, and then turn the *free-rider* outcome presented in this paper, into an efficient one.

At any rate, unless these steps are taken, the disaster will be take place again.[50] Furthermore, what we have learnt from the *Prestige* incident is that the next time around the catastrophe will be fully diverted to some other country, as this decision will increase neither political-technical official's costs nor the Spanish politicians's cost, i.e., $C^{\rho(1-\psi)}(X_2) = 0$.[51] And we should not expect a different decision from any other coastal country government. That is why full international cooperation is urgently required on scientific and compensatory grounds.

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Notes

[1]For a description of the accident see Bahamas Maritime Authority (2003) or ITOPF (2003). For more technical details see ABS (2003) and IACS (2003). For a detailed exposure of the events in the Spanish Parliament see the official Spanish government version in Comisiones (2002a, pp.20927-31), Comisiones Mixtas (2002, pp.2809-10), Pleno y Diputación Permanente (2002a, pp.10503-4), and for a critical version by the opposition parties, see Pleno y Diputación Permanente (2002b, p.10782-4). See Zamora-Terrés (2003) for a comprehensive explanation of the accident. For a more journalistic, less technical depiction of the events see Catalán-Deus (2003), De Toro (2003), Díaz *et al.* (2003), and Gómez *et al.* (2003). Finally, see IOPC (2006) for a brief summary of the reports on the investigation into the causes of the incident conducted by the Bahamas Maritime Authority, the Spanish Ministry of Public Works (Ministerio de Fomento), and the French Ministry of Transport and the Sea (Secrétariat D'État aux Transports et à La Mer).

[2] The analysis of the economic effects have gone mainly in two directions. One strand in the literature has shown how the accident harmed economic sectors and activities. (For example, the general detrimental economic effects on the Galician economy –De la Dehesa, 2002–, and the negative effects on Galician fishery sector and on other economic activities, like tourism, as discussed in different contributions included in González-Laxe 2003, Garza-Gil *et al.* 2006a, or García-Negro *et al.* 2004; for the Basque country see Riera *et al.* 2004). The other strand has offered a quantification of the negative impact on Galician coastal economy, which includes present and future loss in economic activity, considering use and existence values, as well as destruction of the natural environment (again, see the contributions included in González-Laxe 2003, or others such as Cámaras de Comercio de Galicia 2003, Doldán-García 2003, García-Negro *et al.* 2002, Garza-Gil *et al.* 2006b, Loureiro *et al.* 2006, Surís *et al.* 2003, 2004, Varela-Lafuente *et al.* 2003, Vázquez *et al.* 2003a, 2004, and more recently Surís-Regueiro *et al.* 2007; for the Basque economy see Galarraga-Gallastegi *et al.* 2004). It is important to note that any monetary valuation requires a methodology for non-market goods (García-Negro *et al.* 2007). Goods of this kind requires the information provided by Marine Biology studies, such as those included in González-Laxe (2003), the Fundación Santiago Rey Fernández-Latorre (2003), non-academic journals such as *Grial* and *Tempos Novos*, and the resulting publications in scientific journals (see Albaigés *et al.* 2006).

[3]Some authors have pointed out the present regulatory set-up for maritime transport lacks suitable international legal security. This entails a blurred definition of the responsibility to determine financial compensations for marine oil spills, making "globalization and neoliberalism" ultimately responsible for the *Prestige* accident (e.g., see González-Laxe *et al.* 2003a, García-Pérez 2003, and Vence 2003.). In developing this view, González-Laxe *et al.* (2003c, sec.4) present a transaction cost model in which the polluting carrier company is made fully responsible for the damage, and they show how several alternative compensation mechanisms would induce maritime carrier companies to invest in security. They conclude that regulation of the maritime transport of potential contaminants, plus implementation of suitable financial compensation mechanisms, would better offset social costs.

[4]González-Laxe *et al.*. (2003a,b) have studied maritime security, the regulatory set-up in the European Union, and the problems in implementing new proposals. Other authors have made several suggestions for improving maritime transport security through public intervention, most of them included in González-Laxe *et al.*. (2003c)'s proposals for EU regulatory change (e.g., Labandeira *et al.* 2003, Nunca-Máis 2003, Vázquez *et al.* 2003b, or Viladrich-Grau 2004). See also the European Parliament (2004)'s resolution and background documents from the meetings of the *Temporary Committee on Improving Safety at Sea*. Since reducing the accident risk for dangerous load transport to zero is not realistic, setting the regulatory requirements to reduce such a risk in the future requires a joint effort by engineering, economics and legal experts: this regulation would include technical requirements for the vessels, clear guidelines for compensation and responsibilities after an accident, a penalty scheme, and some supervision measures.

[5]This issue comes close to falling under the theory of international penal law (a perspective from the law literature is presented in García-Rubio 2003, García-Rubio *et al.* 2003, Martínez-Buján 2003, or Méndez-Martínez *et al.* 2003 Sec.II.2.8). There has been a long tradition since Coase (1960) of studying inefficient

allocations with externalities and allocating property rights, leading some authors (e.g., Labandeira *et al.*, 2003) to favor public intervention, as a market failure exists concerning catastrophe– and risk–management at the hydrocarbon maritime transport. Such government intervention would include risk prevention, an emergency plan for limiting damage and reducing loss, and treatment and regeneration toward recovering pre-catastrophe conditions. This would require necessitate identifying the source of the pollution externality and the property rights directly or indirectly affected, as well as determining whom is to be paid and how, the cleaning expenses, and compensation for present and future loss. Indeed, the *Prestige* affair makes plain that these are not trivial issues. The economics literature customarily allocates property rights under the principle "the polluter must pay," and here a tanker in the middle of the Atlantic has an accident, sinks, and ends up polluting the sea and the coast (see, e.g., González-Laxe *et al.*, 2003a,b,c, Labandeira *et al.*, 2003, and the related literature). This leads to legal action against the registered owner (Mare Shipping Inc.), the manager (Universe Maritime Ltd), the insurer (London Steam-ship Owners Mutual Insurance Association) and, if negligence during inspection is proven, the classification society (American Bureau of Shipping). Yet, it was precisely the public intervention of a democratically-elected government that magnified the catastrophe in its decision to refuse the *Prestige* safe harbor and to send the punctured tanker off-shore. That is, the call for government intervention because of market failure of the first welfare theorem, to introduce measures and actions that will increase maritime transport security and avert polluting accidents, does not usually take into consideration lobbying pressures and the qualifications and experience of the officials presiding over the pertinent governmental departments taking political decisions. Such a different approach may have relevant consequences for identifying additional responsible parties (see Martínez-Buján 2004, for a penal law analysis of the responsibilities ascribed to the Spanish government). Responsibility in the *Prestige* case is presently being studied in the Corcubión Criminal Court. Although it may seem that this issue goes beyond economic analysis and into political science, in particular into institutionalism, this paper will demonstrate that economic theory can account for decision-making in the *Prestige* affair.

[6]The critiques focus on three issues: i) politicians' dismissal of academic and technical counseling about the situation of the vessel and possible alternatives, leading to an consequent incorrect perception of the situation and risks; ii) refusal to allow the tankship safe haven, instead sending it out into an adverse Atlantic ocean with no means to alleviate additional problems, thus magnifying the catastrophe; and, iii) disregard for the International Maritime Organization (IMO) protocols for maritime accidents, to which the Spanish government had subscribed.

[7]See the letter published in *Science* by Serret *et al.* (2003) (and see also Bohannon *et al.*, 2003, and Fernández-Suárez, 2003). The Popular Party vetoed Mr.Serret appearence in the Spanish Parliament (see Comisiones 2003b, pp.22874-81), but his arguments can be found in Méndez-Martínez *et al.* (2003, Sec.II.3.2).

[8]See Barreiro-Rivas (2003).

[9]The reports by the ABS (2003), the Bahamas Maritime Authority (2003) and the French Office for the Research of Maritime Accidents (BEA-Mer) (2003), all criticized the decision. See, also, a strong institutional critique issued by the Committee on the Environment, Public Health and Consumer Policy (2003).

[10]See Comisiones (2002b), Pleno de la Diputación Permanente 2002b,c), and Comisiones (2003a, p.21826).

[11] The decision to send the vessel away from shore was defended in the Spanish Parliament by Mr.Aznar, the Spanish President, Mr.Rajoy-Brey, the Spanish Vice President, and Mr.Álvarez-Cascos, the Ministry of Public Works. They even challenged the opposition parties to designate a Galician harbor in which the vessel should have been docked (see Pleno y Diputación Permanente, 2002b, p.10763; Comisiones Mixtas, 2002, P.2848; and Pleno y Diputación Permanente, 2002c, p.10960, respectively). Moreover, the same decision would be made in a repeat scenario, as reported by the Spanish government (see Senado, 2003, p.48).

[12]See several statements by Mr.Rajoy-Brey to the Parliament (Comisiones Mixtas, 2002, p.2810, 2831; or Pleno y Diputación Permanente, 2002b, p.10787).

[13]Martínez-Mayán (Marine Engineering Faculty, O Ferrol) testified before Judge Francisco Javier Collazo

in Corcubión that Mr.Del-Real, the Captain of A Coruña Harbor Headquarters, had asserted him that the Crisis Coordination Commission would not think of such a possibility when he was asked whether there was a chance of transferring the oil to another tankship offshore.

[14]Press conferences by Mr.Fernández-de-Mesa, Delegate of the Spanish government in Galiza, on November 14 and 15; and by Mr.Rajoy-Brey on November 21.

[15]Press conferences by Mr.Fernández-de-Mesa, November 14; or, "At 60 miles, the risk is not that high," Mr.López-Veiga, Galician Ministry of Fishing, November 15.

[16]Press conferences by Mr.Fernández-de-Mesa, November 19; and by Mr.Rajoy-Brey, November 21.

[17]Later, two new (pseudo-)scientific theories have appeared supporting the government's decision to tow out to sea. First, there came an explanation relying on Shannon (1948)'s information theory, namely that there is a trade-off between information provided by an event and its probability of occurrence. Díaz *et al.* (2003, pp.81-82) thus attempted to argue that the decision to sending the *Prestige* away from shore was rational inasmuch as the alternative of bringing it toward the coast would provide little information because of the high frequency of previous oil spills along the shores of Galiza (e.g., the *Urquiola*, the *Cason* and the *Aegean Sea*). Second, the theory developed by the Consellería de Pesca e Asuntos Marítimos (2004, p.99) as resulted of which "more widespread low levels of pollution are better than more concentrated high levels of pollution."

[18]After learning about the accident, on November 13, Technosub International Inc. moved fast by getting in touch with its partner in Rotterdam, SMIT Salvage NV, to contact the tanker's owner and insurers and win the rescue contract. On November 14, Mr.Geert Koffeman, SMIT's deputy chief executive, flew to A Coruña to try to convince Spanish officials to allow SMIT to tow the tankship into A Coruña harbor in order to avoid a major oil spill and the vessel's eventual breakup. However, Mr.Koffeman was not even able to present his argument, and asserted "They only wanted one thing; that we take the tanker far away." (See Bahree *et al.*, 2005). On that same day, before leaving the command to Cap.Huismans, head of Smith Salvage, Mr.Del-Real required from him a written agreement ensuring that the *Prestige* "will not be less than 120 marine miles of the Spanish waters or out of such waters."

[19]For example, the following statements by Mr.Fernández-de-Mesa are revelatory: "The vessel will be sent 100 to 200 miles offshore. At such a distance, the menace will be largely mitigated" (November 14); "Tides will send the tankship offshore" (November 15); or "Going beyond Spanish waters into Portuguese exclusive zone, the tankship will be not an Spanish responsibility any longer" (November 18).

[20]Several authorities played down the situation. For example, we have Mr.Fraga, the Galician president, saying "The worst danger is over now" (November 15); Mr.Arias-Cañete, Spanish Minister of Agriculture and Fisheries, saying, "Luckily, the swift intervention of the Spanish authorities to move the vessel off the coast causes us not to fear an ecological disaster such as on other occasions, nor do we expect big problems in the Spanish waters or fisheries." (November 16); Mr.López-Veiga saying about the magnitude of the disaster, "There will be no more oil left to reach the shore" (November 17); and Mr.López-Sors, Head of the Spanish Merchant Marine, saying, "It cannot be called an oil slick; they are black and scattered spots" (November 17). Interestingly, the Spanish authorities resisted using the term "oil slick" for weeks, despite the pictures shown on television and in newspapers. For example, Mr.Rajoy-Brey declared "It is affecting to an important area of A Coruña province, but it is not an oil slick" (November 23), and on November 26 Mr.Arias-Cañete further insisted, "The spill is affecting a very important area, but it is not an oil slick."

[21] At the same time, that the *Voz de Galicia* headlines, the main Galician newspaper, read "The Storm Pushes New Black Tide Exceeding Any Forecast" (November 21), "Portugal And France Sight New Oil Spots, But Spain Denies It," (November 23) and "Galiza Faces a New Oil Spill a Worst-case Scenario." (November 24), government authorities were asserting "The oil slick will not reach the Rias Baixas [the southern Galician coast]" (Mr.Rajoy-Brey, November 21); "If we had not moved the vessel out to sea, the slick would already be on the coast." (Mr.López-Veiga, November 26); "The oil should not reach the coast, but all possible measures have been taken." (Mr.Rajoy-Brey, November 28); and "I would like to say that

I am very conscious, and everybody is conscious, of the unlimited capacity to create alarm. [...] Sometimes alarm is created deliberately and there are probably no contrasting elements in some information provided from a real point of view, and from a sound point of view." (Mr.Aznar in Rome, November 28).

[22]The two main information sources concerning the movements of the spill were the French CEDRE and the Portuguese Instituto Hidrográfico. The latter even placed buoys in the spill to follow by satellite. Yet, Mr.Rajoy-Brey raised doubt regarding the veracity of their information.

[23]Two examples are illustrative. As late as November 21, and after several offers, the Minister of Public Works finally agree to receive antipollution ships from other UE countries, since Spain had none. Also, a Canadian firm offered protective gear for extracting fuel from beaches (10 Tons of special gloves, mask, nautical clothes, boots, etc.) at cost price (8,34 Euros/unit). Yet, the Public Works Office expressed thanks on November 30 and rejected the offer asserting, "The clearance process is in its final phase, and it is not expected that the spill will significantly affect the coast." (See Méndez-Martínez *et al.* 2003 Sec. III.2.13.)

[24]From November 18 to 22, only a small number of Spanish navy soldiers cleaned oil from the beaches. They did not returned until November 27. Things changed after the Galician shellfish workers complained to King Juan Carlos about the scarce contribution of the Spanish army (December 2), and subsequently the soldiers were fully mobilized (December 5). Meanwhile, a group of 10 officials belonged to the Belgian army and 20 members of the Belgian Civil Service arrived in Galiza with oil clearance equipment on December 2, but could not find any coordination headquarters from which to take orders. Finally, Mr.Trillo-Figueroa, the Minister of Defense, complained about the "tremendous injustice [of ignoring the effort of the Spanish army] from the first moment on, [as well as] more human resources were offered several times, but they have not been considered necessary." (December 6).

[25]See Mr.Rajoy-Brey's statement in Pleno y Diputación Permanente (2002b, p.10792).

[26]This Commission was created on November 14 at 5:00AM (see Comisiones Mixtas 2002, p. 2811) and was made up of the Delegate of the Spanish government in Galiza –i.e. the Spanish government's top official in Galiza– (Mr.Fernández-De-Mesa), the Head of the Merchant Marine Office (Mr.López-Sors), and its delegate in A Coruña, the Captain of A Coruña Harbor Headquarters (Mr.Del-Real). From April 2 to 3, 2003, Mr.López-Sors testified before Judge Collazo in Corcubión and assumed exclusive responsibility for the decision.

[27]See Comisiones (2002b, p.21246).

[28]The existence of a rational decision on political grounds requires three conditions: a) it must be possible to explain the reasons and aims for the political decision taken; b) there must be an overall evaluation of the contingent future events, with the one with the least costs being chosen; and, c) there must exist a set of alternatives along with a comparative analysis of costs and effects for each one.

[29]The "calculus of consent" notion renders understandable some political decisions whenever the benefits are higher than the costs, as a straightforward use of the rational decision rule (see Frank, 2001, Chap.1). For example, this is the case when important concessions are made by majority parties to active minorities in order to integrate them into the final democratic consensus.

[30]That is, "whenever active decision-making, as opposed to the alternative no-decision option, yields higher costs than benefits, including the respective benefits and expected costs of the no-decision option, the 'logic of indecision' arises."

[31]The institutional setting of how decisions are taken within the Spanish governmental departments are taken as given. This is important because different institutional settings could come up with different outcomes.

[32]This issue falls into the realm of political science for determining the suitability of institutional settings, as greatly emphasized by the institutionalism approach.

[33]Here, we follow the claim by the Spanish government and other authors (e.g., Díaz *et al.*, 2003), asserting the decisions made in the *Prestige* affair were technical, not political.

[34]There has been a long tradition in economics, since Adam Smith, arguing that individual selfishness should not be condemned because it results in improved social welfare. That is, a selfish civil servant who wishes to keep on his position must also look after the interests of all those citizens who will favor his continuance.

[35]After wandering through calm Mediterranean waters for 35 days without finding a sheltered place, the ship was towed to a relatively sheltered spot off the coast of Tunisia where her cargo was safely unloaded.

[36]At the opening address of the seventy-fourth session of the Maritime Safety Committee held in 2001, he asserted that "the time had come for IMO to consider the problem globally, [...] to adopt any measures required to ensure that [...] coastal States review their contingency arrangements so that disabled ships were provided with assistance and facilities." (see IMO, 2001, p.9).

[37]The Spanish government's interpretation of Art.11 of the International Salvage Convention, 1989, was that it imposes no obligation to admit ships in distress into their ports, but simply states a duty to cooperate. Regarding this matter, Chircop indicates this interpretation raised principled concerns as to the potential unworkability of the Convention if places of refuge were not made available for completing salvage operations.

[38]He was self-congratulatory in pronouncing that this was the protocol to be implemented: "The policy of the Spanish maritime authorities is to rescue the crew, of course, but in what respects of the distressed vessel –off our coasts!" (see Cacho, 2002). See also Bahree *et al.* (2005).

[39]Mr.Álvarez-Cascos' statements at the Spanish parliament also seem to support this view (see Pleno y Diputación Permanente, 2001, p.3511).

[40]See for example, Comisiones (2002b, p.21249) and The Economist (2004). Some statements from the Spanish authorities are illustrative of this issue. After the *Prestige* sunk, Mr.Aznar asserted, "It is possible we arrived late in some situations, but we have tried to correct them immediately; it is possible that we have taken some wrong decisions but, if we have been aware of them, we have tried to correct them and we have corrected them." (December 9). And Mr.Álvarez-Cascos: "The organization rose to the occasion and the response has been optimal[...] I have not been relieved from the command, nor have I received any command." (December 15).

[41]Making judicial demands becomes a more complicated task when the distressed vessel has sailed under a flag of convenience, or whenever true ownership is hidden behind a confusing net of corporate links. In such a case responsibility for the disaster is diluted and finally reduced to the insurance compensation.

[42] International Oil Pollution Compensation Funds (IOPC Funds) created a fund in 1992 to provide a pollution compensation scheme of up to 135 million Special Drawing Rights (SDR), about US$186 million, to supplement compensation paid by the vessel's insurance in the case this is insufficient and pollution reaches the coast. A new increase and a Supplementary Fund have been designated since the *Prestige* incident, so nowadays the total amount available for compensation for each incident is 750 million SDR (US$1.033 million).

[43]Mr.López-Sors' self-accusation before Jugde Collazo only came to confirm what Cacho (2002) had asserted previously.

[44]For example, on November 19 with the vessel already sunk, a meeting was held in the office of the Delegate of the Spanish government in Galiza with 17 experts (marine engineers, merchant marine captains, professors from the Marine Engineering School in Ferrol and High Civil Marine School in A Coruña, and officials belonging to the French customs), who issued a note "considering the measures adopted by the Spanish maritime authorities as the correct and most suitable ones." (See Comisiones Mixtas, 2002, p.2811)

[45]As put forward by Barreiro-Rivas (2003, p.32) "We have the intuition that many of the false statements

released by Mr.Rajoy-Brey, as the government spokesman, [...] are a consequence of a complete ignorance as to what had really happened."

[46]It may be deduced that the Spanish authorities had not a contingency protocol to required scientific assessment, when Mr.Álvarez-Cascos asserted "the emergencies are solve up in real time. [All the decisions taken by the government] in real time are the only valid one, [as] the scenarios of theoretical reconstruction could be help to reach several conclusions, but they are irrelevant to solve the problem up." (December 23)

[47] Compensation from the *Aegean Sea* accident in 1992 at the entrance to A Coruña bay took 10 years to finally be paid. The only international compensation came from a financial fund provided by the IOPC Funds that also took 5 to 8 years to pay victims. See the IOPC annual reports to follow the trail of compensations for the *Prestige* incident.

[48] Interestingly, this proposal relies on the same economic principles for choosing an independent governor for Central Banks who is in charge of controlling inflation in the public interest. We maintain this analogy throughout our proposal.

[49]The proposal could easily be implemented at the European Union level by strengthening the structures and organizational capacity and collaboration of the existing scientific institutions and public administration across Europe. The Framework Programmes funded by the EU could target specific topics to be studied, appointing the most appropriate research teams to carry them out. These scientific teams would be composed of members from European coastal countries, as they could perform *in situ* studies, as well as provide help for real time initial evaluations. Such a program would also strengthen trans-European collaboration, e.g., northern Mediterranean academic institutions. One final advantage is that this would require very little bureaucracy, perhaps only a small committee attached to the EU Commission, to aim and coordinate global efforts, and to lead and coordinate scientific assessment in real time when an accident occurs (and beyond) in order to counsel politicians. Each scientific team network would be specialized in different areas: marine engineering (vessel features), marine sciences (comprehensive oceanographic models), economics (valuation costs), maritime law (legislative proposals), etc. This knowledge would also contribute to decision-support tools, such as the Decision Support System proposed by Wirtz *et al.* (2006, 2007).

[50]To illustrate that nothing has changed, six months after the accident the Spanish government, in a written response to a Spanish senator, asserted that under the same circumstances, the distressed vessel would be sent away from shore (see Senado, 2003, p.48). This incident was spotlighted with some concern in Dirk Sterckx's report (see European Parliament, 2004, p.732).

[51]For example, in an the interview Mr.Fernández-de-Mesa asserted "If the tankship had kept its course northwards, we would never have had this tide" (November 22). Interestingly, Wirtz *et al.*'s (2006, 2007) studies of the *Prestige* offshore options, taking into account only the Spanish environmental and economic costs, found northeastern and northwestern towing routes as the best-ranked options, while the southwest direction corresponds as being the worst case scenario.