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Splitting nuclear parks or not? The third party liability role

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ABSTRACT

This paper studies how the combination of strict liability regime, a stringent control from regulatory agencies and insurance companies could help in defining the highest prevention level concerning ultra-hazardous industries. It presents a model extended from two to n nuclear power stations and shows that the institutional conditions (cap on operator's liability and insurance compensation) play a fundamental role in inducing whether or not to centralize the management of a nuclear park. It reaches conclusive results in defining the critical ratios that induce either a centralized or a decentralized management.

1. Introduction

The founders of "Law and Economics"[1] highlight the popular view that an ounce of prevention is worth a pound of cure. Indeed, in Western countries, wrongdoers must repair damage to victims and, obviously, the prospect of having to pay heavy compensation is a potent engine for preventing harm. Accordingly, the Society requires that CEO's of risky activities ensure the highest safety standards. However, this demand puts them in a quandary because they have to make sure of cash outlays for preventing some future and uncertain damage costs. In the economists language this means minimizing the primary accident costs, namely the sum of the expected damage and prevention costs.[2]

Complying with tort law involves that care remains "inside" the firm. This means that the manager has to allocate the firms resources between productive activities and unproductive investments for prevention. However, legitimately, the economist may wonder whether an upstream reorganization of the industrial sector itself could not help global safety. This involves comparing the consequences of integrating risky facilities under a single management, or, on the contrary, devolving it to decentralized, independent managers and owners. This paper explores this topic by assessing the reciprocal performances of centralized and decentralized management of risky facilities. It shows that searching for the highest safety standards involves combining both the best security inside" the firms (or facilities), but also, determining the most suitable "external" organization of the sector. Consequently, given the third party liability regime, this study aims at understanding which kind of organization optimally minimizes the accident costs and maximizes the prevention level.

To give a reliable picture of how liability regimes influence the competition pattern, we refer to Indias Nuclear Liability Act adopted in 2010. India's fast rapid economic growth has generated ever increasing needs for energy that its obsolete energy infrastructure cannot satisfy. Consequently, the Indian government decided to impose an ambitious nuclear program that would increase India's capacity from 4120 MW to 10,000 MW by 2020. Until 2010, India was in the peculiar position of having neither a national nuclear liability legislation nor membership in any of the international conventions. Accordingly, a standard strict liability regime administered all ultra-hazardous activities, including the

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[1] We refer notably to Coase (1960), Calabresi (1970), Brown (1973), Shavell (1984), Landes and Posner (1987).

[2] See Calabresi (1970).

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nuclear sector, and, in case of accident, this regime made the operator fully liable.

Besides, Indian nuclear industry development needs international cooperation with competent countries such as the Russian Federation, France and the US. However, these countries have different ways of covering the foreign investments of their national firms, thus making competition between them unfair. For instance, France and Russia tend to favor their companies by providing free insurance, while it is mandatory for US operators to insure their electro-nuclear reactors. The Price–Anderson Nuclear Industries Indemnity Act mandates operators to jointly finance a fund and pays up to $10 billion. Hence, after a nuclear disaster, the plant's insurer pays the first $375 million. Consequently, restoring equitable market conditions needed changes in the Indian tort law. After tumultuous debates, the Indian Parliament adopted the 2010 Nuclear Liability Act, which applies strict liability to the operator, with a ceiling on the level of repairs. This institutional change opened the competition door to US companies.

This paper considers that any hazardous activity (petrochemical facilities, nuclear power plants, agricultural fertilizer factories, oil products transportation, etc.) may generate sufficient harm to require suitable liability regimes. Hence, a per sector analysis fits better than a global but ill-adapted one. Then, the reasons that explain our choice for the electronuclear sector are threefold. First, this industry potentially generates large-scale and long-lasting disasters such as that of Fukushima in 2011, Chernobyl in 1986 and Three Mile Island in 1979. Second, generally, standardized unit-reactors generate power, and this calibration makes it possible to compare and combine them in a unified perspective. Third, electro-nuclear park management is a main topic of concern. In Europe (Russia and Ukraine included) this kind of park amounts to 195 nuclear power plant units corresponding to a 170 Giga-Watt (GWe) installed electric net capacity in operation. Additionally, there, nineteen 16.9 GWe units are presently under construction in six countries.[3] Consequently, choosing the optimal nuclear park's size in the European area (Russia excepted) is a significant issue.

Given the broad range of the electro-nuclear economic field, I must specify here the theme of this research, which is to compare neither the economic efficiency from different energy sources MIT (2003, 2009), Bickel and Rainer (2005), nor its operating conditions under price uncertainty Gollier et al. (2005), Linares and Conchado (2009). Furthermore, it does not take into consideration issues concerning decommissioning plants and the reprocessing of nuclear waste. However, the argument borrows features from the well-known debate on civil liability in this sector. Most of these contributions (Dubin and Rothwell (1990), Heyes and Liston-Heyes (1998, 2000a, 2000b), Faure and Borre (2008), Faure and Fiore (2009), Rothwell (2001)) show that establishing a ceiling on damage leaves unpaid the potential external costs which implicitly subsidize this industry.[4] Here, however, the study aims at finding out how the nuclear specific liability regime influences its organization scheme.

The analytical framework relies on the contestable market theory of William Baumol, John Panzar and Robert Willig (in Baumol et al. (1982)), Baumol (1985), but it extends it to uncertainty. Formally, this paper compares the accident cost structure of centralized and decentralized nuclear parks under the control of a regulator who considers both the expected cost of a nuclear accident and the operators' care level.

The first section describes the main feature of liability regimes in the electronuclear industry. A second one compares the cost structures of both organizations in a simple model with only two plants. A third section integrates both the insurance premium and the care effort. A fourth section extends and generalizes the study to several reactors, while a fifth section analyzes the results and a last one concludes.

2. Why cap the repair level in a nuclear industry?

In 1986, the Soviet Union eluded its duty of compensating its neighbors in spite of the damages caused to the health and agriculture of national and international economies by the Tchernobyl disaster. Indeed, before 1988, this country the Soviet Union had signed no nuclear conventions and had no national nuclear liability law. Consequently, in order to avoid future adverse situations, the International Atomic Energy Agency in Vienna and the Nuclear Energy Agency (NEA under OECD in Paris) amended the existing international nuclear conventions.[5] The 1988 Joint Protocol linked together the IAEA's Vienna Convention on Civil Liability for Nuclear Damage of 1963 and the OECD's Paris Convention on Third Party Liability of 1960. Protocols amending the Paris Convention and the Brussels Convention were signed on February 12, 2004. Hence, under the Joint Protocol, the operators of civil nuclear facilities are strictly liable for damage resulting from nuclear accidents, but the amount of repair is limited. Furthermore, operators are required to contract insurance policies or financial guarantees up to the fixed liability amounts. The object is to guarantee the availability of funds. This disposition depends on the approval of the Members States (OECD (2003) and OECD (2006)).

Why do States choose the ceiling of redress rather than applying some "standard" strict civil liability regime? In fact, without caps, coupling huge nuclear hazard repairs and strict liability constitutes an insurmountable obstacle to market access (Schwartz (2006, p. 39) notes that: "With no protection against a liability that was potentially unlimited both in time and amount, nuclear plant owners/operators, builders and suppliers were understandably hesitant to commit to the development of the industry."). Therefore, the development of the nuclear industry has involved relieving nuclear operators from the burden of ruinous liability claims.[6] However, public opinion has been expressing increasing fears about the dangers of the electro-nuclear industry, and under their pressure, governments have increased the repair ceiling. For instance, until 2004, in France, an operator's liability was limited to €91.5 million per nuclear accident and per facility and, to €22.9 million per nuclear accident during transportation. The State in which the accident occurred was liable for the compensation of victims up to a maximum of €228.6 million. Above this amount, the signatory members of the Brussels Convention contributed collectively to compensation up to a ceiling of €381.1 million. Since the 2004 protocol, the amounts of compensation availability have increased and now cover a greater number of victims and broader collateral damage, with an operator's liability amounting to €700 million per nuclear accident and €80 million per nuclear accident during transportation. Nuclear damage makes States liable for repairs for sums that range from €700 million up to a maximum of €1200 million. Beyond this amount, States that are a party to the Brussels Convention have to contribute up to €1500 million (See European Commission (2005) and International Energy Atomic Agency, 2013.

In the USA, the Price–Anderson Act of 1957 administrates civil liability for damages caused by nuclear accidents. Since the 1988 amendments, nuclear power plant licensees must purchase the maximum amount of commercial liability insurance available at a reasonable price on the private market. This is currently 200 million dollars per plant. In addition, all nuclear power plant licensees must participate in a joint-insurance pool. In case of a nuclear accident the costs of which exceed the first layer of private insurance coverage, each nuclear plant is obligated to make payments of up to 88 million dollars to cover any additional costs up to about 9.3 million dollars. The compensation provision of both the first and the second layers of insurance are "no fault" and are not subject to civil liability litigation. The financial cap corresponds to $9.5 billion. Beyond this limit, there are no further financial obligations.

[3] European Nuclear Society October 1, 2010, http://www.euronuclear.org/info/encyclopedia/n/nuclear-power-plant-europe.htm.

[4] See also the synthesis achieved by Carroll and Froggatt (2007).

[5] See for instance, Faure and Fiore (2009).

[6] More explicit still is The "*Exposé des Motifs*" for the 1960 Paris Convention that considers that "unlimited liability could easily lead to the ruin of the operator without affording any substantial contribution to compensation for the damage caused" (*Exposé des Motifs*, Motif 45) (see also Trebilcock and Winter (1997)).