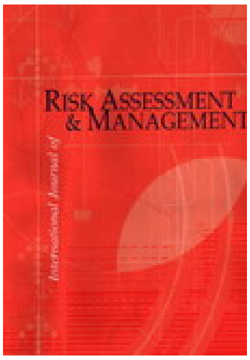

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Lenders' liability and ultra-hazardous activities

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Abstract: The amendments made to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in 1996 reinforced the exemption of lenders that finance ultra-hazardous activities. Then, they become involved in liability only if they manage or own polluting activities. The paper compares strict liability and negligence rule in an agency model of vicarious liability type, and proposes to restore lenders as principal by applying negligence rules to them while operators would resort to a strict liability rule. This scheme leads the lender to propose to the borrower the most favourable loan level that induces the latter to provide the socially optimal security level.

Keywords: strict liability; negligence rule; moral hazard; judgement-proof; lenders; risky activities.

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1 Introduction

Under rising environmental distress, public opinion deems that banks, factoring institutions, and lenders who finance ultra-hazardous activities carry some significant responsibility for harm to health and the environment. This point of view was reinforced after the adoption of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) in 1980 in US and some significant cases in law that followed. Then, for almost fifteen years, the Courts involved the institutional lenders' responsibility. Implicitly, the Environmental Protection Agency (EPA) was seeking out creditworthy institutions to finance environmental clean-up costs as substitutes for impecunious and defaulting operators. Simultaneously, scholars began to theorise the necessary involvement of lenders (Summers, 1983, Shavell, 1986).

Initially, CERCLA did not accurately distinguish between these three activities. However, since 1996, corrective amendments exempt lenders from any responsibility if they limit their involvement at securing their loan.[1] Consequently, now, CERCLA harshly differentiates between lending activities and management and/or ownership activities. Thus, the lenders can escape responsibility even if their loan contributes at increasing the pollution scale.[2] Moral and legal responsibilities belong to different worlds.[3]

Legitimately, the early ante 1996 CERCLA jurisprudence deeply influenced economic theory (see Boyer and Laffont, 1995; Boyer and Laffont 1997; Pitchford, 1995 among others). However, the recent economic analysis seems underestimating the consequences of the 1996 amendments for economic theory (Hiriart and Martimort, 2006; Dionne and Spaeter, 2003; Boyer and Porrini, 2009) for instance. Consequently, whatever their solutions' relevancy, the legal framework's rigidity and stickiness make them ineffective.

Hence, this paper analyses how to restore bridges between academic views and legal practices, despite the 1996 amendments. Particularly, it insists on the opportunity to extend negligence to lending activities rather than confining it to both the owning or the direct managing of hazardous facilities. For this purpose, within an agency relationship where bank and borrower face, we compare two responsibility regimes: strict liability and negligence. This type of analysis is typically vicarious liability i.e., the liability of one party, generally the 'principal' for the wrongdoing of another party, the 'agent' (here the operator).[4] Newman and Wright (1990) show that in the presence of moral hazard, strict liability induces the principal to offer a contract which gives rise to a socially optimal level of care. For Demougin and Fluet (1999) when the agent earns a positive rent, strict liability generates an under-provision of safety while negligence rule leads to optimality. Boyer and Laffont (1997)[5] studied the involvement of banks in case of environmental damage. Following them, strict liability induces lenders to abandon highly risky projects. Hence, a second-best level of efficiency entails enforcing a kind of partial liability.

Under the US CERCLA, generally, when EPA discovers brownfields, it must have them cleaned at the injurer's expense. Alternatively, if the polluters are unknown, it must identify responsible owners and operators and oblige them paying back the incurred costs. Originally, however, CERCLA did not clearly define the field of lenders' liability.[6] This weakness opened the door to divergent law cases about lenders' involvement. After several cases where the wrongdoers were revealed to be insolvent, the law became more stringent (see for instance "United States v. Mirabile' case",[7] "United States v. Maryland Bank & Trust Co".[8] United States v. MC Lamb, O. Skipper and Wachovia Bank and Trust Company[9]). If duly extended, without modifying the law, this jurisprudence would have become commonplace and changed the whole policy of the financing system. Hence, the banks considered that CERCLA jurisprudence was burdening them with an unbearable level of responsibility (Greenberg and Shaw, 1992). Consequently, they threatened to restrict their involvement in environmental risky projects (Burke, 1998, p.16 notes) and, obviously, this could 'kill the investment' (Boyer and Laffont, 1997).

Several Acts followed that until now restrained the meaning of the notion of 'participation in management' that may help involve lenders in liability. For instance, in 2002, the above restrictive tendency increased with the adoption of the "Small Business Liability Relief and Brownfields Revitalization Act" (the Brownfields Amendments) that limits still further the retrospective liability of owners and operators. Consequently, going beyond the legal safety requirements is legally risky. Under CERCLA, strict liability applies to owners, operators, and negligence rule to lenders (Feess, 1999). After a pollution occurrence, the banks have to prove that their actions remain within the exemption field area. Hence, it is particularly difficult to establish a causal link between the harm and the loan, except to say that, without said loan, the scale of the damage would have been of lesser magnitude. As a consequence, the lenders do not seriously check the borrowers' compliance to safety rules when, by law, their action is limited to securing their loans. This situation is inefficient because, as principal, the lenders cannot play an active role. Contrary to what literature says, nowadays the banks are imperfect principals. They cannot be regarded as principals in the same way as a legal regulator (the State, for instance, or regulatory agency). This point will be analysed through the following model.

This paper develops a model based on asymmetric information. It presents how to involve the lenders' liability without discouraging them from financing the risky activities. The model presents a contractual relationship between a principal (the lender) and an agent (the borrower that develops the risky activity). Hence, when the Courts adopt the regulator's standard care level, then the ex-ante contract that binds together principal and agent leads the last one to supply the socially first-best level of care. This is no longer the case when the court and the regulator diverge about it. Furthermore, the paper shows that a negligence rule regime applied to lenders for lending is better than strict liability that discourages the lending effort. Consequently, comparing negligence and no-responsibility for lenders, as it is nowadays, the case cannot be done on simple efficiency criteria. Justice among wrongdoers and the necessity for the regulator to dispose of more regulatory instruments pleads for enforcing negligence on lenders. A third part discusses the results and concludes.

2 Notations and assumptions

This model studies the relationships between a regulator, a lender (he), an operator-borrower (she) and a court. The operator borrows funds from the lender for financing their ultra-hazardous activities. She possesses no initial wealth. The regulator enforces a given liability regime and the court estimates the tortfeasor's liability after an accident occurrence. It is a unilateral accident situation i.e., the potential victims have no own care technology that influences the expected harm. The operator is potentially solely responsible for any accident.

- The indexes 'SL' and 'NR', respectively, stand for 'Strict Liability' and 'Negligence Rule', while the indexes 'P' and 'A' point out respectively the 'Principal' and the 'Agent'.
- The operator (the Agent) borrows the amount t from the lender (the Principal) and she spends x to guard against the risks of accident: $t \geq x \geq 0$, hence, $t - x \geq 0$ is used for productive activities. $G(t,x)$ is an increasing function of t but a decreasing function of x. For a borrowed amount t, she expects a net receipt $G(t,x) \geq 0$, (with $G'_t(t,x) > 0$, $G'_x(t,x) \leq 0$, $G''_{xx}(t,x) \leq 0$, $G''_{tt}(t,x) \leq 0$).

- Under a normal state of affairs (no accident) the expected wealth of the principal is W_P plus the expected gains from the lending to the agent $R(t)$ (where $R(t) \geq t$). The functions $G(t, x)$ and $R(t)$ will be more precisely defined below.
- The occurrence of D corresponds to the damage costs due to a major hazard.

Assumption 1: *The principal and the agent are risk-neutral.*

Assumption 2: *The study focuses for the values of $t \in T, T \subset \mathbb{R}$, such that $G(t,x) < D$, (the borrower is judgement-proof).*

Assumption 3: The lender's wealth W_P can cover the damage D, i.e., $W_P > D$ and he is never judgement proof for D, (hence $D > t$).

Assumption 4: Let $\pi(x)$ be the probability of a major accident. This one diminishes as the safety effort increases, then, ($1 \geq \pi(x) \geq 0$, $\pi^{'}(x) < 0$ and $\pi^{''}(x) \geq 0$).

Assumption 5: The borrower is subject to strict liability.

Theoretically, the regulator chooses one responsibility regime among several possible and enforces it. The model compares the following situation:

- a strict liability regime applied on both borrower and lender
- a negligence rule associated to the lending act while the borrower answers to strict liability (Assumption 5).

To deal with the question, we develop a general asymmetric information model that compares the mentioned situations. The lender does not know the borrower's true nature and this is source of asymmetric information. This typically adverse selection case induces the lender defining a contractual relationship between him and the borrower. The purpose is to prompt her supplying an optimal care level and deterring inefficient borrowers.

3 Asymmetric information, general framework

The model background is vicarious liability. Then, when potentially involved in liability because of his lending activity, the lender has to induce the borrower supplying the socially first-best care level. However, the lender exerts only a partial control because he can only determine the loan amount but not the borrower's its efficient use. The lender's first task is forming an ex-ante contract that determines both the optimal loan and the expected first-best care level. Under this background, the lender can escape to any liability and lets the borrower bearing the burden of responsibility if he succeeds by shaping and enforcing an optimal contract. In spite of the fact that, implicitly this model is based on negligence, it gives sufficient foundations for extending it to strict liability and allowing comparisons.

3.1 Timing of the game

The game timing is threshold.

1. The principal decides on the amount (t^*) he is willing to lend to the agent, conditioning it to a care level (x^*).
2. The agent decides if she agrees with the proposition. Since she has no wealth of her own, she divides the loan between prevention (x) and ($t - x \geq 0$) as productive investment.
3. Nature decides whether an accident occurs with probability $\pi(x)$ or not.

3.2 The borrower's payoff function

As simplification the borrower's payoff function is assumed linear in terms of the loan t and the safety amount x :

$$G(t,x) = \beta t - \gamma t - \sigma t - x \tag{1}$$

where βt is the gross receipt ($\beta > 1$), γt is the share of t let to acquire inputs ($\gamma \leq 1$), σt is the whole loan charge (the amount of the loan plus the set of financial charges and interest) ($\sigma > 1$), (β, γ,σ) are parameters. Note that $R(t)$, the above interest charge corresponds to σt, $(R(t) = \sigma t)$. As, $\beta >$ σ > 1 and $t = \gamma t + x$. This last expression means the loan is used to pay both the production costs γt, and the safety costs x, then:

$$t = \frac{x}{1-\gamma} \tag{2}$$

Using (2), $G(t,x)$ transforms as:

$$G(t,x) = \beta t - \theta x \tag{3}$$

where $\theta = \dfrac{1+\sigma}{(1-\gamma)}$

The 'cost' factor θ is built from the financial cost σ, the production cost γ and the safety cost x. Hence, for given β and σ, the higher the cost input parameter γ, the higher θ is. θ corresponds to the borrower's financial capacity to comply with the lender's safety requirement. Indeed, given a $\overline{t}$ loan level, considering two borrowers characterised by their costs where $\gamma^{'} > \gamma'' > 0$ $(\Rightarrow \theta^{'} > \theta'')$, then,

$$\overline{t} = \frac{x'}{1-\gamma'} = \frac{x''}{1-\gamma''} \Rightarrow x^{'} < x''$$

The θ'' type dedicates more means to protection than the $\theta^{'}$ one. Then, from (1), we write, the agent's expected payoff function as:

$$EW_A = (1-\pi(x)) + \pi(x)0 = (1-\pi(x))(\beta t - \theta x) \tag{4}$$

As by assumption the agent has no wealth, she uses all her revenues $G(t,x)$ for repairs in case of an accident occurrence while she pays the amount due to the lender σt .

3.3 The lender's wealth function

Under strict liability applied to the lenders, the repairs correspond to $D - G(t, x)$ (i.e., the harm total costs minus the operator's gain used for repairs). Hence, the lender's expected wealth writes as:

$$EW_P = \left(W_P - \left(D - G(t,x)\right) + \sigma t\right)\pi(x) + \left(W_P + \sigma t\right)\left(1 - \pi(x)\right) \tag{5}$$

$$= W_P + \sigma t + \left(G(t,x) - D\right)\pi(x)$$

And his expected wealth writes as:

$$EW_P = \sigma t + W_P - \pi(x)\left(D - (\beta t - \theta x)\right) \tag{6}$$

From equations (4) and (6) we deduce the social expected wealth function:

$$EWS = EW_P + EW_A = \sigma t + W_P - \pi(x)\left(D - (\beta t - \theta x)\right) \tag{7}$$

$$+(1-\pi(x))(\beta t - \theta x) = W_P - x\theta + \sigma \frac{x}{1-\gamma} - D\pi(x)$$

From the first order conditions and by (2) and (3) we infer the socially optimal level of care x^* :

$$\frac{\partial EWS}{\partial x}(x^*) = \left(\frac{\beta - 1}{(1-\gamma)}\right) - D\pi'\left(x^*\right) = 0 \tag{8}$$

Or, still:

$$\pi'\left(x^*\right) = \frac{1}{D}\left(\frac{\beta - 1}{(1-\gamma)}\right), \text{ for } (x^* > 0). \tag{9}$$

This result is conform to the standard accident theory. That means that the socially optimal care should be x^* .

3.4 Contract equilibrium and information rent

As the model implicit liability regime is based on fault, the principal's own interest is to comply with the regulator's requirement. The adverse selection model determines both the first-best care level and the first best level of loan. Under asymmetric information, can the principal induce the borrower to supply the socially first-best care level x^* ? The agent is all the more likely to comply with this requirement that she feels efficient. Efficiency means that the agent's marginal costs are lower than the inefficient agent. Here, $\underline{\theta}$ corresponds to the efficient agent's marginal cost and $\overline{\theta}$ the one of the inefficient one, with $\underline{\theta} < \overline{\theta}$. Indeed, from (3), we verify that $\underline{\theta} < \overline{\theta} \Rightarrow \underline{\gamma} < \overline{\gamma}$. The lender does not know whether he faces an efficient or an inefficient agent. Under complete information, the principal can induce a level of safety corresponding to the capabilities of each category of agent:

$$\pi'\left(\underline{x}^*\right)=\left(\frac{\beta-1}{(1-\underline{\gamma})}\right)\frac{1}{D}, \text{ for the efficient agent and,} \tag{10}$$

$$\pi'\left(\overline{x}^*\right)=\left(\frac{\beta-1}{(1-\overline{\gamma})}\right)\frac{1}{D}, \text{ for the ineffective one.} \tag{11}$$

Under symmetric information, informational rents are null. Consequently, if $\underline{U}^*$ and $\overline{U}^*$ represent these rents, then:

$$\underline{U}^*=\beta\underline{t}^*-\underline{\theta}\underline{x}^*=0 \text{ (a) and } \overline{U}^*=\beta\overline{t}^*-\overline{\theta}\overline{x}^*=0 \text{ (b).} \tag{12}$$

Under information asymmetry, information rents are positive and express as:

$$\underline{U}=\left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t}-\underline{\theta}\underline{x}\right) \text{ (a), and } \overline{U}=\left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t}-\overline{\theta}\overline{x}\right) \text{ (b)} \tag{13}$$

Consequently, the regulator cannot implement the complete information optimal contracts and he has to define incentive for that. To deal with the point, we inspire from Laffont-Martimort (2002)'s definition:

Definition 1: A menu of contracts $\left\{\left(\underline{t},\underline{x}\right),\left(\overline{t},\overline{x}\right)\right\}$ is incentive compatible when $\left(\underline{t},\underline{x}\right)$ is weakly preferred to $\left(\overline{t},\overline{x}\right)$ by agent $\underline{\theta}$ and $\left(\overline{t},\overline{x}\right)$ is weakly preferred to $\left(\underline{t},\underline{x}\right)$ by the agent $\overline{\theta}$.

At this point, it is important to note that the lender cannot restrict the borrower by supplying an insufficient level of loan. Consequently, the following constraints must be respected:

$$\begin{cases}\left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t}-\underline{\theta}\underline{x}\right)\geq 0 \; (a)\\ \left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t}-\overline{\theta}\overline{x}\right)\geq 0 \; (b)\end{cases}, \text{ and,} \tag{14}$$

These constraints look like usual participation constraints. The difference comes from uncertainty expressed by $\pi\left(\underline{x}\right)$.Taking into account the information rents, the expected participation constraints express as:

$$\begin{cases}\underline{U}=\left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t}-\underline{\theta}\underline{x}\right)\geq 0 \; (a)\\ \overline{U}=\left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t}-\overline{\theta}\overline{x}\right)\geq 0 \; (b).\end{cases} \tag{15}$$

The allocations must satisfy the following expected incentive compatibility constraints:

$$\begin{cases}\left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t}-\underline{\theta}\underline{x}\right)\geq\left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t}-\underline{\theta}\overline{x}\right) \; (a)\\ \left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t}-\overline{\theta}\overline{x}\right)\geq\left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t}-\overline{\theta}\underline{x}\right) \; (b)\end{cases} \tag{16}$$

Or still, in the information rents terms:

$$\begin{cases} \underline{U} \geq \overline{U} + \left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x} \ (a) \\ \overline{U} \geq \underline{U} - \left(1-\pi\left(\underline{x}\right)\right)\Delta\theta\underline{x} \ (b) \end{cases} \tag{17}$$

(Where, $\Delta\theta = \overline{\theta} - \underline{\theta}$).

Hence, a menu of contracts is incentive feasible when he fulfils both incentive (18) and participation (19) constraints. The implement ability condition insures that the efficient agent supplies a higher level of care compared to the inefficient one. To see the point, consider the incentive compatibility constraints, then, it is sufficient to add (a) and (b) from (19):

$$\left(1-\pi\left(\underline{x}\right)\right)\underline{x} \geq \left(1-\pi\left(\overline{x}\right)\right)\overline{x} \tag{18}$$

From this expression the monotonicity condition ensues:

Proposition 1: *From the incentive compatibility constraint and the implementability condition* $\left(1-\pi\left(\underline{x}\right)\right)\underline{x} \geq \left(1-\pi\left(\overline{x}\right)\right)\overline{x}$ *, it results that the level of safety supplied by the efficient agent is higher than the one offered by the inefficient agent. This is the monotonicity condition:* $\underline{x} \geq \overline{x}$ *.* □

Proof. If $\underline{x} < \overline{x}$, then, as $\pi(x)$ decreases, $\pi\left(\underline{x}\right) > \pi\left(\overline{x}\right)$ and obviously $\left(1-\pi\left(\underline{x}\right)\right) < \left(1-\pi\left(\overline{x}\right)\right)$, this contradicts the implementability condition. Consequently, $\underline{x} \geq \overline{x}$. □

3.5 *The lender's optimisation program*

The lender ignores the borrower's true nature. He has to define a contract set and induce her to supply the higher level of care keeping in mind that this level should correspond to the social first best. Designing the contract has to be done before knowing the agent's category. The lender's program writes then as:

$$\begin{aligned} \mathcal{L}\left(\left(\underline{t},\underline{x}\right),\left(\overline{t},\overline{x}\right)\right) = Max_{\{(\underline{t},\underline{x}),(\overline{t},\overline{x})\}} & \left\{\vartheta\left(\sigma\underline{t} + W_P - \pi\left(x\right)\left(D - \left(\beta\underline{t} - \theta x\right)\right) - \underline{t}\right) \right. \\ & \left. + (1-\vartheta)(\sigma\overline{t} + W_P - \pi\left(x\right)\left(D - \left(\beta\overline{t} - \theta x\right)\right)\right) \end{aligned} \tag{19}$$

Under the incentive compatibility and participation conditions:

$$\begin{cases} \left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t} - \underline{\theta}\underline{x}\right) \geq \left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t} - \underline{\theta}\overline{x}\right) \\ \left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t} - \overline{\theta}\overline{x}\right) \geq \left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t} - \overline{\theta}\underline{x}\right) \end{cases} \tag{20}$$

And,

$$\begin{cases} \left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t} - \underline{\theta}\underline{x}\right) \geq 0 \\ \left(1-\pi\left(\overline{x}\right)\right)\left(\beta\overline{t} - \overline{\theta}\overline{x}\right) \geq 0 \end{cases} \tag{21}$$

Let us consider from (17) that:

$$\left(\beta\underline{t} - \underline{\theta}\underline{x}\right) - \underline{U} = \pi\left(\underline{x}\right)\left(\beta\underline{t} - \underline{\theta}\underline{x}\right) \tag{22}$$

$$\left(\beta\overline{t}-\overline{\theta}\overline{x}\right)-\overline{U}=\pi\left(\overline{x}\right)\left(\beta\overline{t}-\overline{\theta}\overline{x}\right) \tag{23}$$

Replace respectively $\pi(\overline{x})(\beta\overline{t}-\overline{\theta}\overline{x})$ and $\pi(\underline{x})(\beta\underline{t}-\underline{\theta}\underline{x})$ by $(\beta\underline{t}-\underline{\theta}\underline{x})-\underline{U}$ and $(\beta\overline{t}-\overline{\theta}\overline{x})-\overline{U}$ and $\underline{t}$ and $\overline{t}$, by their corresponding values $\underline{t}=\frac{x}{1-\underline{\gamma}}$ and $\overline{t}=\frac{\overline{x}}{1-\overline{\gamma}}$. The program becomes:

$$\begin{aligned}\mathcal{L}\left((\underline{t},\underline{x}),(\overline{t},\overline{x})\right)=Max_{\{(\underline{t},\underline{x}),(\overline{t},\overline{x})\}}&\left\{\vartheta\left(\sigma\frac{\underline{x}}{1-\underline{\gamma}}+W_P-\pi(\underline{x})D+\left(\beta\frac{\underline{x}}{1-\underline{\gamma}}-\underline{\theta x}\right)\right)\right.\\&\left.+(1-\vartheta)\left(\sigma\frac{\overline{x}}{1-\overline{\gamma}}+W_P-\pi(\overline{x})D+\left(\beta\frac{\overline{x}}{1-\overline{\gamma}}-\overline{\theta}\overline{x}\right)\right)-\vartheta\underline{U}-(1-\vartheta)\overline{U}\right\}\end{aligned} \tag{24}$$

Subject to:

$$\underline{U}\geq\overline{U}+\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x} \tag{25}$$

$$\overline{U}\geq\underline{U}-\Delta\theta\underline{x}\left(1-\pi\left(\underline{x}\right)\right) \tag{26}$$

And $\underline{U}\geq 0$, $\overline{U}\geq 0$

Identifying the binding constraints and checking whether the omitted constraints are strictly fulfilled simplifies the model (Laffont and Martimort (2002, chap.2)). Then, consider the set of contracts with $\overline{x}>0$. The ability of the $\underline{\theta}$-agent to imitate the $\overline{\theta}$-agent implies that the $\underline{\theta}$-agent participation constraint $\underline{U}\geq 0$ is always strictly satisfied. Indeed, $\overline{U}\geq 0$ and $\underline{U}\geq\overline{U}+\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}$ imply immediately that $\overline{x}>0$. If a list of contracts allows an inefficient agent to achieve his status quo utility level, it will be also the case for an efficient agent who can produce at a lower cost. Second, conceiving that $\overline{U}\geq\underline{U}-\Delta\theta\underline{x}\left(1-\pi\left(\underline{x}\right)\right)$ means that an efficient agent would try to become inefficient which is non-sense. Consequently, the number of relevant constraints consists in the $\underline{\theta}$-agent's incentive constraint $\underline{U}\geq\overline{U}+\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}$ and the $\overline{\overline{\theta}}$-agent's participation constraint $\overline{U}\geq 0$. Each constraint must be binding and then:

$$\underline{U}=\overline{U}+\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}\ \text{ and, }\ \overline{U}=0 \tag{27}$$

We replace these values in the ongoing program that expresses then only in $\underline{x},\overline{x}$ terms:

$$\begin{aligned}\mathcal{L}\left(\underline{x},\overline{x}\right)=Max_{\{(\underline{x},\overline{x})\}}&\left\{\vartheta\left(\sigma\frac{\underline{x}}{1-\underline{\gamma}}+W_P-\pi\left(\underline{x}\right)D-\underline{\theta x}\right)\right.\\&\left.+(1-\vartheta)\left(\sigma\frac{\overline{x}}{1-\overline{\gamma}}+W_P-\pi\left(\overline{x}\right)D-\overline{\theta}\overline{x}\right)-\vartheta\left(\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}\right)\right\}\end{aligned} \tag{28}$$

Considering the efficient type, we see that the expected rent is given up and does not depend on his level of care x. The following proposition ensues:

Proposition 2: *Under the program* $\mathcal{L}\left(\underline{x}, \overline{x}\right)$, *there is no alteration of the first-best level of care concerning the efficient borrower:*

$$\underline{x}^{SB} = \underline{x}^{*}. \tag{29}$$

However, there is a downward care distortion concerning the inefficient borrower:

$$\overline{x}^{SB} < \overline{x}^{*} \tag{30}$$

□

Proof (in appendix).

Under asymmetric information, the efficient agent supplies the first-best level of care if the principal sacrifices an information rent to deter the efficient borrower to mimic the inefficient agent. The rent level corresponds to that benefit that she would get playing this mimetic strategy. Under a second best-optimum, the $\overline{\theta}$ -agent gets no rent as the above proposition shows it. The information rent allocated to the efficient agent depends on the level of due care demanded from the $\overline{\theta}$ -agent. Then, the results are as follows. The principal must be able to show to the judge that he put in place an effective incentives mechanism. These incentives consist in determining a loan level that should allow the borrower to define a sufficient care level.

Proposition 3: *The optimal contract involves that the optimal transfers are:*

- For the efficient agent:

$$\underline{t}^{SB} = \frac{1}{\beta}\frac{\left(1-\pi\left(\overline{x}^{SB}\right)\right)}{\left(1-\pi\left(\underline{x}^{*}\right)\right)}\Delta\theta\overline{x}^{SB} + \frac{1}{\beta}\underline{\theta x}^{*},$$

- For the inefficient agent:

$$\overline{t}^{SB} = \overline{\frac{1}{\beta}}\theta\overline{x}^{SB}$$

- Then, the efficient agent gets an information rent equivalent to:

$$\underline{U} = \left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}$$

□

Proof. (in Appendix).

A contractual scheme that allows the lender to comply with both the regulator and Court requirements is possible. The principal proposes an optimal contract that involves granting a loan that integrates a rent information to the efficient agent only. Because of this contract, theoretically, the efficient borrower is induced to supply the socially first-best level of care.

4 Negligence rule: full agreement between the judge and the regulator concerning the socially optimal care level

The above model also applies to negligence. More elements are needed.

4.1 The equilibrium conditions

Here by assumption, both the regulator and the court agree on the level of the socially first best of care.

Proposition 4: *If* $(\underline{t}^{SB},\underline{x}^{*})$ *is the ex-ante contractual set between the lender and the borrower, then, in case of an accident, the lender's wealth is:*

$$H\left(\underline{t}^{SB}\right)=\sigma\underline{t}^{SB}+W_{P} \tag{31}$$

□

Proof. The lender may escape to any liability if he can show that he has offered the agent an efficient contract (Propositions 2 and 3). The contract terms should deter her to deliberately fail and induce her complying with the first-best level of care. Consequently, the lender considers this data, his expected wealth is:

$$EW_{P}^{NR}=\begin{cases}\sigma\underline{t}^{*}+W_{P}\,if\,t\geq\underline{t}^{*}\\ \sigma\underline{t}^{*}+W_{P}-\pi\left(\underline{x}^{*}\right)\left(D-G\left(\underline{t}^{*},\underline{x}^{*}\right)\right)if\,t<\underline{t}^{*}\end{cases} \tag{32}$$

Finding the conditions $(t<\underline{t}^{*})$ and $(t\geq\underline{t}^{*})$ rather than conditions on the level of safety may seem surprising. This is due to vicarious liability situation where the lender controls only partially the borrower's behaviour. Indeed, in the standard accident model, Shavell (1980, 1987) shows that the regulator can only endorse the socially optimal care level and the potential tortfeasor has the option to comply or not with this requirement. His self-interest and rationality involve that he will conform and adapt safety level to the first best level. The same argument applies only partially in the present vicarious liability scheme. Indeed, considering the contract that he proposes to the lender, he supplies $\underline{t}^{*}$ knowing that he offers to the borrower sufficient means to let her implement $\underline{x}^{*}$. By doing so, he knows that it is a necessary condition to escape any liability in case of a harm occurrence. However, regardless the lender's determination of enforcing $\underline{x}^{*}$, complying or not with the socially first best of care depends on the borrower's will.

4.2 Enforcing the level of care $\underline{x}^{*}$: a monitoring process

At this stage, after an accident, first, the judge must verify whether the lender funded enough the borrower for reaching the first best of care and, second, whether the latter reached this level. This double checking is necessary to determine the lender's effective liability. This is typically a moral hazard problem because the borrower could use a fraction of $\underline{x}^{*}$ to increase her production scale. Consequently, the lender has to monitor the borrower. Obviously, this monitoring is costly and a share α of the interest parameter σ is included in the interest charge σ.[10] However, developing here a monitoring system could lead too far without added value.

4.2.1 Negligence rule applied to the lender with no compliant judge

For a long time, contemporaneous literature develops the theme of errors made by Court (Calfee and Craswell, 1984, 1986; Goetz, 1984; Polinsky and Shavell, 1989; Kahan, 1989, etc.). These errors stem from the Court's lack of information about the nature and the extent of losses induced by victims, information asymmetries about the nature of technologies, production and safety costs, etc. Here, by assumption, both lender and borrower know that Courts can make mistakes and the lender assesses this probability. Consequently, even if the latter correctly behaves, the probability of being involved in liability is not null. This paper mainly aims at knowing, whether, in spite of disadvantages induced by vicarious liability, a contractual relationship could result in the enforcement of the socially first-best care level. Applying this to the model involves that when he designs the optimal contract: $\left\{(\underline{t}^{SB},\underline{x}^{*}),\ (\overline{t}^{SB},\overline{x}^{SB})\right\}$, the lender does not know exactly whether he will gain $H\left(\underline{t}^{SB}\right)=\sigma\,\underline{t}^{SB}+W_P$ with a probability μ, (where $\mu, 1\geq\mu\geq 0$ is the probability of no-mistake from the court's side.) Or, on the contrary, if he has to expect $EW_P=\sigma\,\underline{t}^{SB}+W_P-\pi\left(\underline{x}^{*}\right)\left(D-G\left(\underline{t}^{SB},\underline{x}^{*}\right)\right)$ with a probability of $(1-\mu)$. As expected, this contract will be affected by such an indetermination. Hence, the loan supplied by the principal corresponds to his program internal solution but not to the socially first-best level. Furthermore, even if the principal cannot enforce this level, he can induce the borrower conforming to the safety level he considers as sufficient. To show this, it is sufficient to see that the lender wealth's function is a convex combination of EW_P and $H(t)$ in terms of μ. The new lender's expected payoff $EV_P^{NR}(t,x)$ becomes:

$$EV_P^{NR}\left(\underline{t}^{SB},\underline{x}^{*}\right)=H\left(\underline{t}^{SB}\right)-\mu\pi\left(\underline{x}^{*}\right)\left(D-G\left(\underline{t}^{SB},\underline{x}^{*}\right)\right) \tag{33}$$

This amounts to modifying the probability distribution of accident and, consequently the care equilibrium level. As this does not change the lender's situation, he can define a credible ex-ante contract for deterring the efficient borrower from failure and defining an accurate safety level. Therefore, even, if the probability to enforce the first-best care is very low, the lender offers the agent the means for higher safety. Despite this caveat, negligence remains a better regime than strict liability.

Is this argument naïve? Indeed, the agents could induce lenders to provide funds but then cheat them as to their ultimate object. However, in developed economies, resorting to civil liability does not prevent the victims from invoking criminal law. For instance, the lender may prove that the agent has voluntarily veiled information (Copland, 2010) and sue the facility's owners or managers on grounds of criminal law. However, contrary to Demougin and Fluet (1999), the lender cannot easily modulate incentive tools to encourage the operator supplying the highest safety effort. Indeed, the lender can only expect a given level of return (interest rates). Hence, the function is highly dependent on the lending conditions. The lenders could adapt some premium for compliant operators.

Here, the Laffont and Boyer's 'partial liability' means that the banks are liable when they imperfectly monitor their loan. They escape from liability if they may prove that they have correctly monitored the complying with law agent. Compared to the current situation in CERCLA, the advantage is obvious. First, the probability of full internalisation increases because, potentially, the lenders can be involved in the repair process. Second, the lender fully acts as a principal by requiring from his client a full compliance with safety rules.

4.2.2 Strict liability applied on lenders

Whether negligence or strict liability regimes, the lender disposes of few means to induce the operator complying with the optimal care level. However, under negligence the lender may escape any liability if he shows that he induced the borrower conforming to Law. This is not the case under strict liability where the lender has to repair whatever his involvement in prevention. Without specific assumption, the lender cannot observe the agent's care effort. In Demougin and Fluet (1999), the principal can reward at random (probability given) the agent's most favourable result and penalises her with a corresponding probability. Here, the agent feels no incentives to inform the principal about her care effort. The situation is clearly moral hazard. Even if considering the loan as a reward (because it allows the agent to achieve her gain), nothing prevents her from cheating and breaching the contract terms without further specification. Under strict liability, the Banks have to induce the borrowers supplying the highest level of effort. However, the agents could prefer to become judgement-proof because the lender will be responsible for them (Shavell, 1986; van't Veld, 1997, 2006). The latter author shows that imposing strict liability rules induces changes in the composition of the firm's capital as in the oil shipping sector before the enactment of the U.S. Oil Pollution Act of 1990 (Van't Veld, 2006). Consequently, oil companies subdivided the tanker into single ships companies (the same occurred in the taxi sectors (Spear and Che, 2008)).

When strict liability applies to borrowers and lenders, the regulator can hardly implement the socially first-best safety level. The lender occupies an intermediary position between the regulator and the operator. Hence, when he faces the regulator, the lender acts as an agent because the regulator is the principal. Then, when facing the borrower, the lender becomes the principal. This is the root of vicarious liability and under this conjecture, the borrower 'leads the game' (i.e., she fixes the care level to maximise her profit). This conception is the 'shadow' proposal of Laffont and Boyer (1997). Indeed, these authors show that full repairing damages involve making banks as liable as the firms they finance. However, this involves a thorough and complete check of the borrower by the lender, which is true neither in the model nor in reality.

Then, how can the agent comply with the socially first-best level of care x^* ? Every player follows his own interest and without incentive, he achieves his individual objectives independently from the regulator's requirement. Under strict liability, the government cannot directly influence the relationship between the lender (principal) and the agent (borrower). This prevents reaching the optimal prevention level. Furthermore, the lenders might be reluctant financing risky projects because, whatever their effort for insuring a high care level, any harm engages their liability. This leads to 'kill' the investment.

Formally, under vicarious liability and after a harm occurrence, applying strict liability on both lender and borrower involves that the lender must repair

$\left(D-\left(\beta \underline{t}^{SB}-\underline{\theta x}^*\right)\right)$ and his payoff function is:

$$EW_P^{SL} = \sigma \underline{t}^{SB} + W_P - \pi\left(\underline{x}^*\right)\left(D - \left(\beta \underline{t}^{SB} - \theta \underline{x}^*\right)\right),\ 1 > \pi\left(\underline{x}^*\right) > 0 .$$

Consequently, with strict liability under vicarious liability, the lender is not induced to supply the required level of loan. This regime leads to 'kill' investment in the Laffont-Boyer's words. We can check that this result is independent from a monitoring made by the lender.

5 Conclusion and proposal

Without a shred of doubt, financing ultra-hazardous activities involves sharing a moral responsibility in the accident occurrence with the polluters. However, in most countries, exemption rules prevent it turning out into legal liability. Furthermore, the legal cases show that the lenders' involvement is much more due to their operational than their financing activities. However, extending liability to lenders may come in the forefront at any time under the public opinion pressure.

1 The early experience of CERCLA showed that extending strict liability to lenders could 'kill' the investment. The 1996 amendments reinforced the liability exemption by explicitly further restricting the lenders' involvement. However, this choice removes all possibilities for lenders to play an active role as principals in the environmental protection process except if they explicitly manage or own the facility. Effectively restoring this role entails extending negligence to lending activities. Consequently, lenders may escape from liability if they can prove that, as principal, they did induce the agent complying with law. This change re-establishes the lender as principal and reconnects with recent economic literature. Hence, applying strict liability to the borrower and negligence to the lender for lending activities gives better results than enforcing strict liability on both of them. Under negligence, the principal supplies a more relevant loan than under strict liability where the temptation of under sizing it remains strong.

2 Negligence applied for lending does not preclude involving the lender's liability for ownership or management activities. As far as environmental safety is concerned, lenders partially participate in securing the production, stocking and cleaning-up processes. Negligence applies to them if they supply loans without checking the firms' compliance with safety rules. This scheme gives high capability to the lenders as principals. They can condition their loan to conform to environmental rules. This extends all along the maturity of the loan. This proposal meets and completes the theoretical advances of Pitchford (1995) and Boyer and Laffont (1997) or also Boyer and Porrini (2009). Indeed, in a moral hazard environment, these authors show that limited bank liability is preferable to complete liability. Our model defines a liability framework for both the lender and the operator. It applies negligence to lenders and strict liability to operators and owners. Hence, the lender may evade liability if he can prove that, as principal, he induced the borrower to suitably adhere to environmental and safety rules. Consequently, the polluter bears the repair burden alone.

3 To assess the lenders' liability, Courts need examining three factors. First, they have to check 'in the absolute' the accuracy of the measures that the principal required

from the agent. Second, they appraise the principal's capacity to implement the whole set of measures by evaluating the mutual bargaining power between the agent and the principal (Balkenborg, 2001). Third, the Court looks at the causal link that involves the operator/owner according the strict liability rule. The first two items are essential to determine the principal's liability. Insufficient safety effort will entail the principal's liability.

4 Exempting the lender from liability through negligence rule involves modifying environmental legislations drastically. For instance, CERCLA allocates liability through ownership and/or control motives. Introducing negligence rule for lending entails renewing the safe harbour provision (i.e., the SIE). Hence, to make lenders free from liability, two conditions should be gathered. First, their close monitoring about the borrower's compliance with environmental safety and, second, be sure that exemption about management and ownership has been respected fully.

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Notes

[1]SEC. 2502. CERCLA Lender and fiduciary liability limitations amendments.

[2]See for instance, Lee and Egede (2005).

[3]See the exhaustive study of the (Global Legal Group 2010) or still (OECD 2009).

[4]In this field, the roots of the analysis are offered by the works of Sykes (1984, 1988, 1998). We refer equally to Kornhauser (1982) or Polinsky and Shavell (1993), Schmitz (2000), Dari-Mattiacci, and Parisi (2003), and Dari-Mattiacci (2006). We can also mention Segerson and Tietenberg (1992) and Menell (1991). For a global analysis see also (Larsson 1999).

[5]The literature dedicated to the liability of the lender is currently quite significant. The leading contributions have been supplied by Pitchford (1995), Boyer and Laffont (1995, 1997), Gobert and Poitevin (1998), Balkenborg (2001), Hiriart and Martimort (2006), Heyes (1996), Fees (1999) and Boyer and Porrini (2006).

[6]See for instance Greenberg and Shaw (1992).
[7]N°. 84-2280, 15 ELR 20994 (E.D. Pa; Sept. 4, 1985).
[8]632 F. Supp. 573 (D. Md. 1986).
[9]5 62 USLW 2189, 23 Envtl. L. Rep. 21,500, F.3d 69.
[10]For a complete view see for instance Demougin and Fluet (2001).

Appendix

Proof of Proposition 2: *Under the program* $\mathcal{L}(\underline{x}, \overline{x})$, *there is no prevention alteration concerning the efficient agent:*

- $\underline{x}^{SB} = \underline{x}^*$.

However, there is a downward distortion concerning the inefficient one:

- $\overline{x}^{SB} < \overline{x}^*$ □

a *The efficient agent*

- It is sufficient to look for the first order conditions:

$$\frac{\partial \mathcal{L}(\underline{x}, \overline{x})}{\partial \underline{x}} = 0 \Rightarrow \frac{\sigma}{1-\underline{\gamma}} - \pi'(\underline{x}) D + \left(\beta \frac{1}{1-\underline{\gamma}} - \underline{\theta} \right) = 0$$

and then, it exists $\underline{x}^{SB}$ such that:

$$\pi'(\underline{x}^{SB}) = \left(\left(\frac{\beta - 1}{1-\underline{\gamma}} \right) \right) \frac{1}{D} \tag{A1}$$

and, consequently,

$$\underline{x}^{SB} = \underline{x}^*.$$

b *The inefficient agent*:

- Then considering the inefficient agent, we have to find $\overline{x}^{SB}$ such that:

$$\begin{aligned} \frac{\partial \mathcal{L}(\underline{x}, \overline{x}^{SB})}{\partial \overline{x}^{SB}} = 0 \Rightarrow (1-\vartheta) \left(-\pi'(\overline{x}^{SB}) D + \left(\beta \frac{1}{1-\underline{\gamma}} - \underline{\theta} \right) \right) \\ - \vartheta \Delta\theta \left(1 - \pi(\overline{x}^{SB}) - \pi'(\overline{x}^{SB}) \right) = 0 \end{aligned} \tag{A2}$$

At first sight, it seems difficult to make inferences about the relationships between $\overline{x}^*$ and $\overline{x}^{SB}$. To deal with this point, let us consider that $\mathcal{L}(\underline{x}, \overline{x}) = \mathcal{L}_1(\underline{x}) + \mathcal{L}_2(\overline{x})$.

where

$$\mathcal{L}_1(\underline{x}) = \vartheta \left(\sigma \frac{\underline{x}}{1-\underline{\gamma}} + W_P - \pi(\underline{x}) D - \underline{\theta x} \right) \text{ and} \tag{A3}$$

$$\mathcal{L}_2\left(\overline{x}\right)=\left(1-\vartheta\right)\left(\sigma\frac{\overline{x}}{1-\overline{\gamma}}+W_P-\pi\left(\overline{x}\right)D-\overline{\theta}\overline{x}\right)-\vartheta\left(\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}\right) \tag{A4}$$

We know that: $EWS(\overline{x})=\sigma\frac{\overline{x}}{1-\overline{\gamma}}+W_P-\pi\left(\overline{x}\right)D+\left(\beta\frac{\overline{x}}{1-\overline{\gamma}}-\overline{\theta}\overline{x}\right)$,

And, consequently :

$$\mathcal{L}_2\left(\overline{x}\right)=\left(1-\vartheta\right)EWS(\overline{x})-\vartheta\left(\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}\right) \tag{A5}$$

Then, we express the value of $\frac{\partial\mathcal{L}\left(\overline{x}^*\right)}{\partial\overline{x}^*}$ for $\overline{x}^*$,

$$\frac{\partial\mathcal{L}\left(\overline{x}^*\right)}{\partial\overline{x}^*}=\left(1-\vartheta\right)\frac{\partial EWS\left(\overline{x}^*\right)}{\partial\overline{x}^*}-\vartheta\Delta\theta\left(\frac{\partial\left(\left(1-\pi\left(\overline{x}^*\right)\right)\overline{x}^*\right)}{\partial\overline{x}^*}\right)=$$

$$\vartheta\Delta\theta\left(\left(1-\pi\left(\overline{x}^*\right)\right)-\overline{x}^*\pi'\left(\overline{x}^*\right)\right)\lesseqgtr 0\,, \tag{A6}$$

At first sight we do not know whether $\overline{x}^{SB}\lesseqgtr\overline{x}^*$.

However, as $\frac{\partial EWS}{\partial x}(x^*)=0$, obviously, $\frac{\partial EWS}{\partial x}\left(\overline{x}^*\right)=0$, then,

$$\mathcal{L}\left(\underline{x}\,,\overline{x}\right)=Max_{\{(\underline{x}\,,\overline{x})\}}\left\{\vartheta\left(\left(EWS(\underline{x})\right)+\left(1-\vartheta\right)\left(EWS(\overline{x})-\vartheta\left(\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}\right)\right\}\right.. \tag{A7}$$

$$\frac{\partial\mathcal{L}\left(\underline{x}\,,\overline{x}^*\right)}{\partial\overline{x}^*}=0+\frac{\partial EWS}{\partial x}\left(\overline{x}^*\right)-\vartheta\Delta\theta\left(1-\pi\left(\overline{x}^*\right)-\overline{x}^*\,\pi'\left(\overline{x}^*\right)\right) \tag{A8}$$

$$\frac{\partial\mathcal{L}\left(\underline{x}\,,\overline{x}^*\right)}{\partial\overline{x}^*}=0-\vartheta\Delta\theta\left(1-\pi\left(\overline{x}^*\right)-\overline{x}^*\pi'\left(\overline{x}^*\right)\right)<0 \tag{A9}$$

(Indeed, $\left(1-\pi\left(\overline{x}^*\right)\right)>0,\vartheta,\Delta\theta>0$, $\overline{x}^*\pi'\left(\overline{x}^*\right)<0$).

As $EWS(x)$ is concave $\left(\frac{\partial^2 EWS}{\partial x^2}\le 0\right)$, that means that at $\overline{x}^*$, $\left(1-\vartheta\right)\left(EWS(\overline{x})-\vartheta\left(\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}\right)\right.$ is below $EWS(x)$ and reaches its maximum $\overline{x}^{SB}$ at a lesser value then $\overline{x}^*$. Consequently, $\overline{x}^*\ge\overline{x}^{SB}$. □

Proof of Proposition 3:

a The efficient agent:

- Let us consider:

$\underline{U}\ge\overline{U}+\left(1-\pi\left(\overline{x}\right)\right)\Delta\theta\overline{x}$ and as $\underline{U}=\left(1-\pi\left(\underline{x}\right)\right)\left(\beta\underline{t}-\underline{\theta x}\right)$ and, as $\overline{U}=0$, as binding condition, the result ensues.

$$\underline{t}^{SB} = \frac{1}{\beta}\frac{\left(1-\pi\left(\overline{x}^{SB}\right)\right)}{\left(1-\pi\left(\underline{x}^{*}\right)\right)}\Delta\theta\overline{x}^{SB} + \frac{1}{\beta}\underline{\theta x}^{*},$$

b The inefficient agent:

As $\overline{U} = \left(1-\pi\left(\overline{x}^{SB}\right)\right)\left(\overline{\beta t}^{SB} - \overline{\theta}\overline{x}^{SB}\right) = 0$ and as $1-\pi\left(\overline{x}^{SB}\right) \neq 0$ by definition, then

$$\overline{t}^{SB} = \frac{1}{\beta}\overline{\theta}\overline{x}^{SB}$$

The efficient's agent rent equals $\underline{U} = \left(1-\pi\left(\overline{x}\right)\right)\Delta\theta$ deduces from the fact that $\overline{U} = 0$.

□