Causation and standard of proof from an economic perspective

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1 Introduction

The aim of this note is to analyze to the extent to which causation requirement is consistent with the provision of efficient incentives to potential tortfeasors. Specifically, we study focus on the role of the well-known "but for" or "*sine qua non*" test. According to the "but for" test, an action is a "*sine qua non*" condition of an accident if, given the state of the world, the accident would not have occurred had another action been taken. Thus, the "but for" test seems to isolate something we care a lot about in explaining events and in assessing responsability: the idea that the defendant's act makes a difference. Reaching beyond the sole "metaphysical" interest of this causation concept, the theoretical analysis developed in this paper investigates to what extent the "but for" causation requirement has a deterrence effect on the behavior of potential tortfeasors, particularly in situations where the tort system may provide sub-optimal incentives. Already Pigou (1920) emphasized that if the purpose of tort law is to force the economic agents to pay the true costs of their activities, including damages incurred to others, a robust use of the concept of causation is needed. Accordingly, we show to what extent the "but for" test is useful for making the potential tortfeasors internalize the social costs of their activities.

This study falls into the framework of Law and Economics (hereafter "L&E") - remarkably, L&E

provides a unified framework, using tools from decision theory and statistics to expound the definitional issues of causation and its potential consequences on human behavior.[1] Nevertheless, it is not a commonplace in L&E to claim that the causation requirement may have incentive effects. Indeed, L&E is primarily interested in how the law and institutions provide or should provide incentives for efficient behavior, and as underlined by Ben-Shahar (1999), a part of the literature in L&E has disregarded the possibility of a distinct role of causation in shaping incentives for potential tortfeasors. For example, Landes and Posner (1983) indicate that the discussion on causation is fruitless, because "*the key factors in the economic analysis are not cause but the probability of accident and the costs of legal administration.*"[2] Consequently, the choice of a particular notion of causation could be disregarded as a crucial question in L&E. Accordingly, Landes and Posner assert that the "Judge Hand" formula is sufficient, and that a legal concept of causation is not necessary. Indeed, following Landes and Posner, the Judge Hand formula could be viewed "*as an algorithm for deciding tort questions generally – not just issues of negligence*".[3] Similarly, according to Calabresi (1975), liability should be assigned to the injurer if she is the lower-cost avoider, in order to ensure efficiency of preventive measures. Thus, information on causation seems to not affect the result of this cost-benefit analysis, and the assignment of legal cause can be reduced to a normative evaluation of the economic efficiency of the preventive measures undertaken by the involved parties. This skeptism in L&E on causation is also visible on the question of the implementation of legal causation, while other sources of criticism come from the American Legal realists, such as Edgerton (1924), Malone (1956) and Green (1962). Accordingly, it seems difficult to assign liability on the basis of causation as both the injurer and the victim are necessary cause for any harm to occur (Coase, 1960). Therefore, the solution to assign liability to the cheapest cost-avoider seems to overcome this difficulty of implementation and, simultaneously, achieve efficiency. Following Coase (1960), tort law helps to achieve efficient allocation of resources, and this prominent feature of tort law seems feasible whether tort law tracks responsibility or not. Indeed, in the Coasian approach of tort law, if transaction costs are high, it is sufficient to impose the harm on the cheapest cost avoider to achieve efficiency. Hence, if efficiency is the goal to be attained, causation should

[1] For a survey of L&E contributions to the study of causation, see Ben-Shahar (1999)
[2] Landes and Posner, 1983, p.134
[3] Landes and Posner, 1983, p. 111

be assigned to any activity that increases the conditional probability of a harm. [4]

Another part of the L&E literature acknowledges that causation can have effects on human behavior, but cast into doubt the role that causation requirement could play regarding the efficiency objective. It rather seems that the doctrinal requirement of causation serves goals other than efficiency. [5] For instance, Calabresi (1975) suggests that causation is a functional concept in the sense that different notions of causation may further different human goals, which are the deterrence, spreading and distributional goals. To demonstrate this proposition, Calabresi differentiates between three different notions of causation: the "but for" causation (also called "cause in fact"), the "proximate cause" and the "causal link".[6] Calabresi concludes his study by showing that " *(...) in the law "cause in fact" (as it was once called), like proximate cause, is in the end a functional concept designed to achieve human goals.*", which means that the use of specific notions of causation is tailored to meet specific objectives.[7] Therefore, one cannot once and for all choose a definitive notion of causation to be uniformly applied to all tort cases. Earlier, Edgerton (1924) has given a similar view point, by pointing out that "*the solution of cases depends upon a balancing of considerations which tend to show that it is, or is not, reasonable or just to treat the act as the cause of the harm - that is, upon a balancing conflict interests, individual and social (...)*".[8] That means that the choice of a particular causation notion seems to be less a matter of efficiency than a matter of justice, and that the decision to choose a particular causation notion is likely to be context-dependent. Like Calabresi and Edgerton, Shavell (1980) adopts an instrumental approach to causation, which means that he analyzes this component of law with the aim to understand "*how law functions to promote postulated social goals, given assumptions about the behavior of individual parties*".[9] Therefore, he compares the incentives provided by two different causation notions, which are the "but for" cause and the "probability cause".[10] However, Shavell acknowledges that such an instrumentalist approach can face one major criticism: *"Questions about causation are to an important extent resolved by resort*

[4] Moore (2011)

[5] Epstein (1973), Ben-Shahar (1999)

[6] There is a causal link between an act and an injury if the recurrence of that act or activity will increase the chances that the injury will also occur. Whereas with the proximate cause, one must remember, in the chain of events that could have caused the damage, the one that is closest to its realization.

[7] Calabresi, 1975, p.107

[8] Edgerton, 1924, p. 211

[9] Shavell, 1980, p. 464

[10] The probability cause is close to the German school theory of "adequate cause". An act is considered to be a probabilistic cause of an injury relative to another act if the probability of occurence of this injury would have been lower, had the other act been taken.

to intuitions about the justness of applying a rule of liability. In practice (...) it is not asked how liability would affect incentives or otherwise influence the attainment of certain basic social goals".[11] Hence there is a gap between the L&E debate on the efficiency of causation and the legal practice, which may disregard efficiency when evaluating the cause requirement. Indeed, the cause requirement could be simply considered as a matter of justice, and as Edgerton suggests, it may depend on "*(...) our free and independant sense of justice and - perhaps - the interest of society*".[12]

Notwithstanding these different approaches of causation, a third path in the L&E literature considers that the understanding of causation is determinant to set the socially optimal level of care or activity of the potential tortfeasor. Our paper is in line with this sub-part of the literature. In this line of argument, Shavell defines an action, such as the level of care or activity, to be "*the 'necessary cause' of a consequence relative to another action if, given the state of the world, the consequence would have been different had the second action been taken*".[13] Building on this notion of "necessary cause", Shavell shows that the socially optimal level of care or activity is determined only by the states of the world in which the injurer's action would be the necessary cause of harm. It follows directly that the "scope of liability" can be more or less restricted to these "necessary causes". The "scope of liability", presented by Shavell (1980), can be understood as the set of the states of the world under which the tortfeasor is held liable. This scope of liability can be restricted to necessary causes, or unrestricted - in which case the injurer is held liable even in the event that the harm would have occured in the absence of the injurer's activity, or finally overly restricted - which leaves outside the scope of liability some cases of necessary causes. Hence a well defined scope of liability may be determinant to achieve the socially optimal level of care or activity.[14] Moreover, in this strand of the literature, the effect of the causation requirement in negligence-based liability regimes is the object of an in-depth analysis by Grady (1983, 1989), Kahan (1989), Marks (1994) and Hylton and Lin (2013). Specifically, these authors show that the causation test removes the discontinuity in the incentives to provide care. Indeed, as highlighted by Hylton and Lin (2013), "*in a negligence regime that does not incorporate the factual causation inquiry, there would be a discontinuous jump in liability once a potential injurer adopts a precaution level slightly below the rea-*

[11] Shavell, 1980, P.502
[12] Edgerton, 1924, p.347
[13] Shavell, 2009, P.106
[14] Shavell(1980, 2009); Landes and Posner (1987)

sonable care level. When the factual causation test is incorporated, there is no longer such a discontinuous jump".[15] Furthermore, this strand of the literature has focused on the role of causation requirement in both strict liability and negligence-based liability regimes, in situations where causation is ambiguous. Our paper departs from this approach by investigating the role of causation in situations in which causation is unambiguous i.e. there is no uncertainty over causation. We focus on situations where the tort system may provide sub-optimal incentives because of (i) limited liability problems or, (ii) other sources of uncertainty, as particularly the uncertainty about the injurer's actual level of care. We ask whether information about causation then plays a useful role to achieve efficiency. The understanding of the potential effects of the "but for" test in these settings is particularly important, given that the "but for" test is a widespread causation test in both civil law and common law countries on the one hand, and given the relative frequency of limited liability and informational issues in tort cases on the other hand.[16] The remaining of the paper is as follows. Section 2 introduces the hypothesis and the notations of the model. Section 3 presents the results of our theoretical analysis under the assumptions of the standard model, as well as the results for the special cases of limited liability and imperfect observability of care. Section 4 concludes the paper.

2 The model

This theoretical analysis relies on a standard model of unilateral accident. In this setting, an agent - the potential injurer - can engage in a risk generating activity; that is, in some circumstances, the activity is likely to generate a harm of amount L to some third party. Nevertheless, when he engages in the activity, the agent can invest in preventive measures which may have an effect on the occurence or non occurence of harm. We define below the states of the world under which the decision to engage in the activity and the level of care are necessary causes of the occurence of the harm, under the "but for" notion of causation.

[15] Hylton and Lin, 2013, P.80
[16] Hart and Honoré (1985)

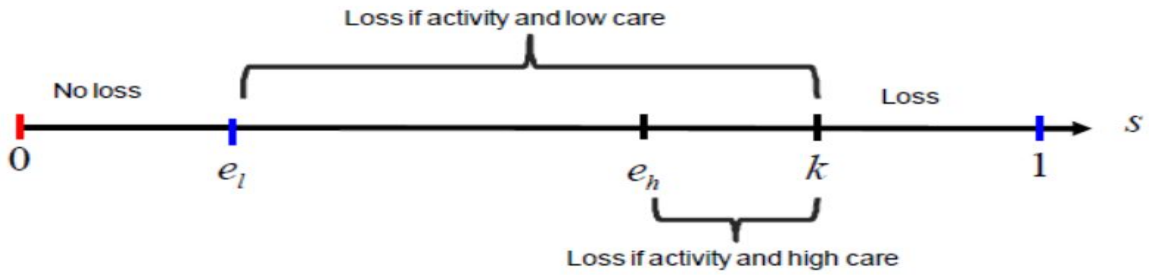
Level of care as a necessary cause of harm Suppose a continuum of possible states of the world $s \in S = [0,1]$ with a cumulative distribution function $F(s)$. The occurence of the harm depends on both the values of s and the level of care provided by the agent, denoted e. Let $\varphi(e,s) \in \{0,1\}$ denote respectively the non occurrence and the occurrence of the harm L when the agent has engaged in the risk generating activity. A given level of effort e produces different effects in terms of occurence of harm, given the state of the world. There are two possible care levels, which are e_l and e_h, with $0 < e_l < e_h < 1$. The level of care is chosen by the agent before the realization of the state of the world. After realization of the state of the world, the outcome is

$$\varphi(e,s) = \begin{cases} 1 & \text{if } s > e \\ 0 & \text{if } s \leq e \end{cases}$$

Thus, the probability of accident is $p(e) = 1 - F(e)$ for $e \in \{e_l, e_h\}$.
Consequently, in the event that $s \leq e_l$, a low level of care e_l is sufficient to avoid the occurence of harm - and no harm occurs whether e_l or e_h is chosen by the agent. Similarly, if the agent engages in the activity and s is such that $0 < e_l < s \leq e_h$, then a low level of care is the necessary cause of the occurence of the harm.

Activity as a necessary cause of harm There are cases where a harm can occur without the activity or without the level of care of the agent being its necessary cause. Let $k \in S = [0,1]$ be a threshold defining when the activity is a *sine que non* condition of the occurence of the harm. If $s > k$, the harm occurs even if the agent does not engage in the activity. Consequently, if $s > k$, the activity is not considered to be the cause of the harm. Conversely, according to the "but for" notion of causation, the activity is the cause of harm when $s \leq k$. Hence, if the scope of liability is restricted to instances of necessary causes, the agent may be held liable for harm only if $s \leq k$.
Note that for $k = 1$, the activity is always a necessary cause of the occurence of the damage, as the "but" for condition $s \leq k$ is fulfilled for all s in $S = [0,1]$. Observe also that for $k = 1$, the model corresponds to the famous example of the cricket game and fence developped by Kahan (1989). In this example, the level of care e would represent the height of a fence surrouding a stadium in which a cricket game takes place. The state of the world s represents the height at which a ball

Figure 1: Occurence of harm depending on the state of nature and the level of care



flies. In this example, no accident occurs if no cricket game takes place - which corresponds to the hypothesis of the activity as a necessary cause of harm. If the ball flies higher than the fence and harms someone, that is if $s > e$, the level of care is a necessary cause of harm.

Occurence of harm To summarize, the timing of the game is as following. At the first stage, the agent chooses whether to engage in the activity or not. If she enters the activity, she chooses her level of care $e \in \{e_l, e_h\}$. At the second stage, "Nature" chooses the state s in $[0, 1]$. Hence, four different situations can be observed: (a) $s \geq k$: harm occurs even in the absence of activity. The activity and the level of care of the agent are not causes of harm. Conversely, if $s < k$, harm occurs only in the presence of the activity. The activity is the cause of the harm. Under this latter condition, we have the three following remaining cases: (b) $s \leq e_l$ and $s < k$: for any level of care exercised by the agent, no harm occurs. (c) $e_l < s \leq e_h$ and $s < k$: harm occurs if and only if the agent engages in the activity with a low level of care e_l. (d) $e_h < s$ and $s < k$: for any level of care exercised by the agent, harm occurs. The activity is then the cause of harm, but not the level of care exercised by the agent. Figure 1 summarizes the combined role of the engagement in the activity, the level of care and the state of the world in the occurence of the harm. It shows a situation where $0 < e_l < e_h < k < 1$. Depending on the location of s on the graph, the activity and the level of care may or may not be the cause of the harm.

At the third stage of the game, if harm has occured, the case is examined by the court and liability is assigned.

Social optimum For simplicity, we assume in the following computations that the situation described in figure 1 holds, i.e. we have $0 < e_l < e_h < k < 1$. Let c denote the cost of high care. The cost of low care is normalized to zero. Let b denote the benefit from engaging in the activity. Suppose also that c differs between potential injurers. Let c be distributed according to the cdf $H(c)$ with support $[0, \bar{c}]$. We know that high care is socially efficient when $\forall c \in [0, \bar{c}]$, $Lp(e_l) \geq Lp(e_h) + c$, equivalently when

$$L\left[F(e_h) - F(e_l)\right] > c, \tag{1}$$

and engaging in the activity is socially efficient if

$$b \geq L\left[F(k) - F(e_h)\right] + c. \tag{2}$$

Liability regimes Three different liability regimes are considered: the strict liability regime, the negligence rule with causation requirement and the negligence rule without causation requirement. Under the strict liability regime, the liability is assigned in all cases where the activity is the cause of the harm, i.e. if $s < k$ - which includes situations (b), (c) and (d) previously described. Under the negligence rule with causation requirement (NC), liability is assigned to the tortfeasor only if the harm would not have occured but for inappropriate care. Therefore, under (NC), liability is assigned only if the case (c) is met ($e_l < s \leq e_h$ and $s < k$) and the agent has chosen e_l. By contrast, under the negligence rule without causation requirement (NN), liability is assigned if the activity caused the harm and low care was exerted. In other words, liability is assigned whenever the level of care is e_l and $s < k$ (cases (b), (c) and (d)).

3 Results

3.1 Standard model

Suppose that (1) holds for all possible cost levels among the population of potential injurers, meaning that high care is always socially warranted when one has engaged in the activity. Suppose further that the benefits from the activity are "large", in the sense that they they always

satisfy (2). The issue is then simply to induce high rather than low care from those who engage in the activity (rather than to regulate entry in the activity).
We now compare the different liability rules, assuming that an injurer can be found liable only if the harm was caused by the activity.

Strict liability Let C_l denote the injurer's expected cost if he exerts low care, C_h his expected cost if he exerts high care. We have $C_l = L\left[F(k) - F(e_l)\right]$, indeed liability is assigned only for $s < k$, and $C_h = L\left[F(k) - F(e_h)\right] + c$. Given the benefits b, the incentives provided by a liability regime are given by the difference in the expected costs of care. The agent is induced to choose e_h if $C_h - C_l < 0$. Under strict liability, we have

$$C_h - C_l = c + [F(e_l) - F(e_h)]L < 0$$

This expression is indeed negative if equation 1 holds.

Negligence rule with causation requirement Similarly, if the (NC) regime is implemented, the difference in the expected costs of care is

$$C_h - C_l = c + [F(e_l) - F(e_h)]L < 0$$

Indeed, we have $C_l = L\left[F(e_h) - F(e_l)\right]$ and $C_h = c$.

Negligence rule without causation requirement Conversely, under the (NN) regime, we have

$$C_h - C_l = c + [F(k) - F(e_h)]L < 0$$

This is explained by the cost structure under (NN), which is $C_l = L\left[F(k) - F(e_l)\right]$ and $C_h = c$.

Choice of a liability regime Given equations 1 and 2 are met, ensuring that engaging in the activity and choosing a high level of care optimal, the achievement of the social optimum can be done equally well with strict liability or with a negligence rule setting due care at e_h and assigning

liability only when inadequate care is the cause of harm. Indeed, the strict liability and the (NC) regime both leads to incentives corresponding to equation 1.

Now that we have presented the effects of the causation requirement in the standard model of civil liability, we investigate what are the efficiency incentives provided by the "but for" test in situations that usually provide sub-optimal incentives: the presence of limited liability on the one hand, and imperfect information about care on the other hand.

3.2 Limited liability

The above results presumed that injurers pay fully for the harm caused when they are held liable. Suppose now that, due to limited liability (or because legal damages are capped), the damages actually paid are in fact $D < L$. Let us assume

$$D\left[F(e_h) - F(e_l)\right] < \overline{c}. \tag{3}$$

Combining (1) and (3) yields

$$D < \frac{\overline{c}}{F(e_h) - F(e_l)} < L. \tag{4}$$

Consequently, some injurers, those with larger costs, will not exert efficient care and this will be true either under strict liability or under the negligence rule.

Moreover, to abstract from inefficient incentives to engage in the activity, let us also assume that

$$b \geq L\left[F(k) - F(e_l)\right]. \tag{5}$$

Thus, engaging in the activity is socially warranted even when low care is exerted.

We now compare the three different liability rules under analysis. Given the cap on damages, the incentives provided by a liability regime are given by the difference in the probability of being found liable when one exerts low rather than high care. Denote this difference by Δ, which we will refer to as *deterrence.* Note that in the present context, the best regime is the one that maximizes deterrence. Specifically, an injurer exerts adequate care if $c \leq D\Delta$. The proportion of injurers exerting adequate care is therefore $H(D\Delta)$.

Strict liability We have $C_l = D\left[F(k) - F(e_l)\right]$, $C_h = D\left[F(k) - F(e_h)\right] + c$. Under strict liability, we have

$$\Delta_{SL} = F(e_h) - F(e_l),$$

Negligence with causation requirement (NC) Under the (NC) regime, we have $C_l = D\left[F(e_h) - F(e_l)\right]$, $C_h = c$. The incentives satisfy

$$\Delta_{NC} = F(e_h) - F(e_l)$$

and are the same as under strict liability.

Negligence without causation requirement (NN) Under the (NN) regime, we have $C_l = D\left[F(k) - F(e_l)\right]$, $C_h = c$. Incentives are now

$$\Delta_{NN} = F(k) - F(e_l)$$

The rule maximizing deterrence is the negligence rule (NN), implying that one should disregard whether inadequate care was the cause of harm. The reason is straightforward: from the point of view of incentives, a negligence rule amounts to a monitoring system with stochastic audit. An agent's behavior is audited following the occurrence of harm. If the agent is then found to have complied with due care, he is not sanctioned. If the agent is found not to have complied, he should then be sanctioned if the objective is to maximize deterrence. The probability of sanctioning "deviant" behavior (conditional on being audited) is larger under the negligence rule NN than under the rule NC, hence incentives are greater under NN.

If D is sufficiently large, even though (4) holds, a switch to the negligence rule NN may yield first-best incentives. Indeed, we could have $c \leq D\Delta_{NN}$ and equation (4) simultaneously fullfilled. Otherwise, one could go a step further.

No causation requirement regarding the activity Suppose one drops the requirement that the activity be the cause of harm. Under strict liability we would then have $C_l = D\left[1 - F(e_l)\right]$, $C_h = D\left[1 - F(e_h)\right] + c$ and deterrence would remain the same. Under the rule NC, nothing would change either. However, under the rule rule NN we now have $C_l = D\left[1 - F(e_l)\right]$, $C_h = c$ and

incentives are

$$\widehat{\Delta}_{NN} = 1 - F(e_l).$$

Thus disregarding all causation issues increases deterrence still further. When he is "audited", a non-complying injurer is then *always* sanctioned.

3.3 Imperfect information about care

Now suppose that care is unobservable. Under this assumption, the strict liability regime remains feasible, as well as the negligence rule (NC). Indeed, after the realization of the state of the world, s and k remain perfectly observable, moreover the possible values of care e_l and e_h are also public information. Hence, even if the level of care actually implemented is unobservable, , it is possible to implement the "but for" test to the injurer's choice to engage in the activity, by comparing s and k. Moreover, inadequate care can be inferred from the occurrence of harm and the comparison of s with e_l and e_h. However, the negligence rule (NN) is not implementable. For instance, if we have $e_l < e_h < s < k$, harm occurs, but it is impossible to infer if e_h or e_l has been chosen by the agent.

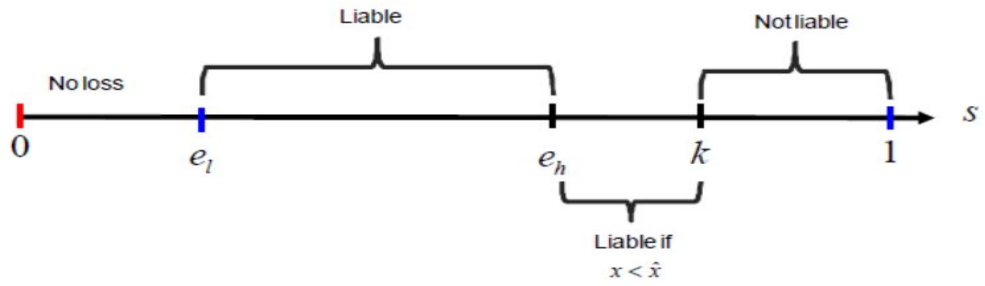
Suppose next that care is imperfectly observable. One observes a signal x with the conditional densities $g(x \mid e_l)$ and $g(x \mid e_h)$ and common support $[\underline{x}, \overline{x}]$. Without loss of generality, suppose the signal satisfies MLRP with the likelihood ratio $g(x \mid e_l)/g(x \mid e_h)$ strictly decreasing in x. The available evidence is then the occurrence of harm and the observation of s and x. Let $\psi(s, x) \in [0, 1]$ denote the court's decision, defined as the probability of holding the injurer liable given the available evidence.

The injurer's expected cost given his level of care is then,

$$C_l = \int_{e_l}^{k} \int_{\underline{x}}^{\overline{x}} f(s) g(x \mid e_l) \psi(s, x) \, dx \, ds$$

$$C_h = \int_{e_h}^{k} \int_{\underline{x}}^{\overline{x}} f(s) g(x \mid e_h) \psi(s, x) \, dx \, ds + c$$

Figure 2: Assignment of liability when care is imperfectly observable



Deterrence can be written

$$\Delta = \int_{e_l}^{e_h} \int_{\underline{x}}^{\overline{x}} f(s) g(x \mid e_l) \psi(s,x)\, dx\, ds + \int_{e_h}^{k} \int_{\underline{x}}^{\overline{x}} f(s) \psi(s,x) \left[g(x \mid e_l) - g(x \mid e_h) \right] dx\, ds$$

Therefore, choosing $\psi(s,x)$ to maximize deterrence yields $\psi(s,x) = 1$ when $s < e_h$, for all x; and conversely,

$$\text{when } s \in [e_h, k),\ \psi(s,x) = \begin{cases} 1 \text{ if } g(x \mid e_l) > g(x \mid e_h), \\ 0 \text{ otherwise.} \end{cases}$$

In other words, when $s < e_h$, the mere occurence of harm allows to infer that e_l has been chosen by the agent. Thus, negligence is inferred from the occurrence of harm, and the injurer is found liable, under the above decision rule.

Nevertheless, when $s \in [e_h, k)$, the occurrence of harm, once again, provides no information by itself. Under the above decision rule, the injurer is then found negligent if, on the basis of the imperfect evidence x, low care is "more likely" than due care. Given our convention that the likelihood ratio $g(x \mid e_l)/g(x \mid e_h)$ is decreasing in x, negligence is therefore found for some threshold $\widehat{x}$. Our findings are summarized in figure 2. Figure 2 shows that the liability rule amounts to the negligence rule (NC) with the "preponderance of evidence" standard for a finding of negligence. According to this standard, the injurer is held liable if negligence is more likely than not on the basis of the evidence, which consist here of both s and x.

No causation requirement regarding the activity As in the previous section, and for the same reason, deterrence can be increased further by dropping the requirement that the activity caused

the harm. The injurer would then be found liable when $s < e_h$ or when $s \geq e_h$ and $x < \widehat{x}$.

4 Conclusion

In the legal tradition, the notion of cause is needed to make the link between the harmful event and the damage. Indeed, the causation requirement illustrates the simple, and yet highly justice oriented idea that "one who has caused harm must compensate for the harm caused". Pragmatically, economists view the tort system as a victim triggered *ex post* incentive mechanism (i.e. post accident) providing *ex ante* incentives to prevent harm. In this spirit, L&E investigates whether the traditional legal notion of causation yield efficient incentives. This note shows that the answer to this question is nuanced. In simple situations, such as described in the standard model, it seems that the causation requirement, operationnalized with the "but for" test leads to efficient incentives. Indeed, our theoretical analysis shows that both the strict liability and the negligence rule with causation requirement (NC) induce the agent to adopth the socially optimal level of activity and care, if liability is restricted to the cases where the activity is a necessary cause of harm. In situations where there are traditionnaly sub-optimal incentives, the answer is more complex.
First, in the event of limited liability, disregarding all causation issues - concerning the care level or the activity - induces greater incentives to provide care. Thus, under the assumption of limited liability, the implementation of a negligence rule without causation requirement (NN) can be preferred. In our framework, under limited liability, the tort rule (NN) ensures a higher probability of sanctioning negligent behavior.
Moreover, when care is imperfectly observable, dropping the causation requirement may increase the deterrence effect of the liability regime. When the "but for" test is still applied concerning the role of the activity in the occurence of the harm, the model shows that the optimal liability rule amounts to a negligence rule with a causation requirement regarding the level of care (NC), together with the preponderance of evidence standard. Hence, when care is imperfectly observable, the causation requirement would have two aspects: a *sine que non* condition is applied to the level of activity, while the level of care is evaluated with a probabilistic notion of causation. The model also shows that dropping the causation requirement on the activity level induces higher incen-

tives for preventive measures. Hence, while in the literature the discrepancy between liability regimes is often ascribed to uncertainty over causation, this note shows that it may also arise without uncertainty over causation.

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