CHAPTER THREE

ON THE DEFINITIONS OF CARE AND ACTIVITY LEVEL AND THE CHOICE OF LIABILITY RULES*

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ABSTRACT

Stat rosa pristina nomine, nomina nuda tenemus
Bernard of Morlay, *De contemptu mundi*[1]

In this chapter, I show that the traditional definitions of care (as precaution) and activity level (as number or frequency of an action) are tautological and difficult to apply, as any precautionary measure always fits both categories. The correct definitions depend on the determination of negligence: precautionary measure included in the negligence criterion are to be defined as care, while precautionary measures that are not included in the negligence criterion are to be defined as activity level. As controlling parties' precaution through the negligence inquiry triggers an administrative cost, it is efficient to limit the extent of the negligence criterion to some precautionary measures only. This framework explains the evolution of liability systems over time and the choice of liability rules in different areas of modern tort law and permits us to reinterpret the two basic theorems of tort law and economics (the efficiency-equivalence theorem and the activity-level theorem) and the traditional argument concerning "strict liability vs. negligence".

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Keywords: tort, liability, activity level, care, precaution, negligence, historical development.

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[1] As quoted in Eco, Umberto (1980), *Il nome della rosa*, Milano, Bompiani.

3.1. Introduction

When both the injurer and the victim of an accident can reduce the expected accident loss, legal systems usually adopt a negligence rule in order to provide an appropriate incentive to both of them. One party is subject to a negligence inquiry and will pay the accident loss only if found negligent, while the other party bears the loss in the residual cases.

I will present a model that considers accidents between two parties who can take many different precautionary measures in order to reduce the expected accident loss. The optimal liability rule is defined as that rule which minimizes expected the accident loss, precaution expenditures and administrative costs. As controlling parties' precaution by means of the negligence criterion triggers administrative costs, the optimal extent of the negligence criterion is determined by a balance between those costs and the resulting advantage in terms of improved incentives to prevent accidents. I will demonstrate that it is efficient not to control those precautionary measures which trigger high administrative costs and have little impact on the reduction of the expected accident loss.

Such an approach permits us to redefine the concepts of care and activity level, to interpret the evolution of liability systems and to explain the choices made by modern legal systems between different liability rules in specific cases. These are my points:

- The decision of which precautionary measures should be controlled under the negligence inquiry generates the definitions of care and activity level: the precautionary measures included in the negligence criterion will be defined as care, while the precautionary measures excluded from the negligence criterion will be defined as activity level. Those definitions are endogenous to the model and are variable with the negligence criterion. The traditional exogenous definitions of care (precaution) and activity level (the number of repeated actions) are tautological and, hence, difficult to apply.
- At an initial stage, liability systems prefer strict rules to negligence rules, as the cost of applying the negligence criterion is too high. The choice between strict liability and no liability can be made by using a dangerousness criterion: the residual bearer should be that party whose actions affect the expected accident loss most.
- At a later stage, the development of the judiciary system and of society in general will result in a decrease of the costs associated with the negligence criterion. Legal systems tend to move towards a broader application of the negligence criterion. The choice between no-liability-based rules and strict-liability-based rules cannot be based only on the dangerousness criterion. As a negligence criterion is usually applied, the verifiability

of parties' behavior should also be taken into account: the residual bearer should be that party whose actions have a greater effect on the expected accident loss and whose precautionary measures are less verifiable before the court.

- In modern societies, we can observe a general application of no-liability-based negligence rules, such as simple negligence, as this solution economizes compensation costs; however, many areas of torts are still subject to strict liability. Those cases do not always concern dangerous activities and cannot be easily explained in terms of the dangerousness criterion only, as it has been attempted in the literature. They prove to be consistent with my approach and can be justified by the verifiability criterion mentioned above.

The next section criticizes the traditional definitions of care and activity level. Sections 3.2 to 3.4 present the reader with a formal model, which differs from the traditional model in two respects: first, it considers many different precautionary measures and not a unique and homogeneous form of precaution; second, it considers administrative costs while determining the extent of the negligence criterion. Section 3.5 discusses the new definitions of care and activity level, as generated by the model itself. Section 3.6 applies the model to the study of the evolution of liability systems over time, with two specific applications: the evolution of Roman and common law and a discussion of the industry-subsidy argument for early industrial negligence-based liability. Section 3.7 applies the same framework to an analysis of the choice between different liability rules in modern tort law. In section 3.8, I will provide a synthesis of my findings, their relation to the literature and some concluding remarks.

3.1.A. A criticism of the traditional definitions of care and activity level

In the Law and Economics literature on tort law, accident losses are said to be determined by parties' care and activity level. Care is defined as precaution reducing the expected accident loss at a certain cost, while activity level is defined as the number of repeated actions yielding a benefit but increasing the occurrence of accidents[2].

[2] The distinction between care and activity level was originally introduced by Shavell (1980a), and somewhat sketched by Posner (1973) at 208. Shavell (1987), at 5, provides the following definition: "The number of miles an individual drives, for instance, might be interpreted as his level of activity, and the precaution he takes when on the road (slowing for curves, paying attention to the presence of bicyclists) as his level of care. Similarly, how often a bicyclist rides where there is automobile traffic might be regarded as his level of activity, and his precaution when riding (staying close to the side of the road, using a brightly colored vest) as his level of care". Similar descriptions have been explicitly or implicitly adopted in the literature. Miceli (1997), at 27, defines activity level as "how frequently or intensively to engage in a risky activity", and writes, "For example, the driver of an automobile decides how carefully to drive, but also how often and how many miles". Landes and Posner (1981) at 851, 875-878, and (1987), at 61, and Posner (1998) adopt implicitly the same definition. Cooter and Ulen (2000), at 311, define activity level as the "amount" of one's action. The same approach can be found in Epstein (1999), at 97. The definition of care is generally a straightforward identification with the common concept of precaution.

The literature further assumes that the court cannot verify the activity level[3] and concludes that, under any of the negligence rules, both parties take optimal care (efficiency-equivalence theorem[4]) but only the residual bearer chooses optimal activity level (activity-level theorem[5]).

Table 1: The traditional definitions of care and activity level and a criticism thereof

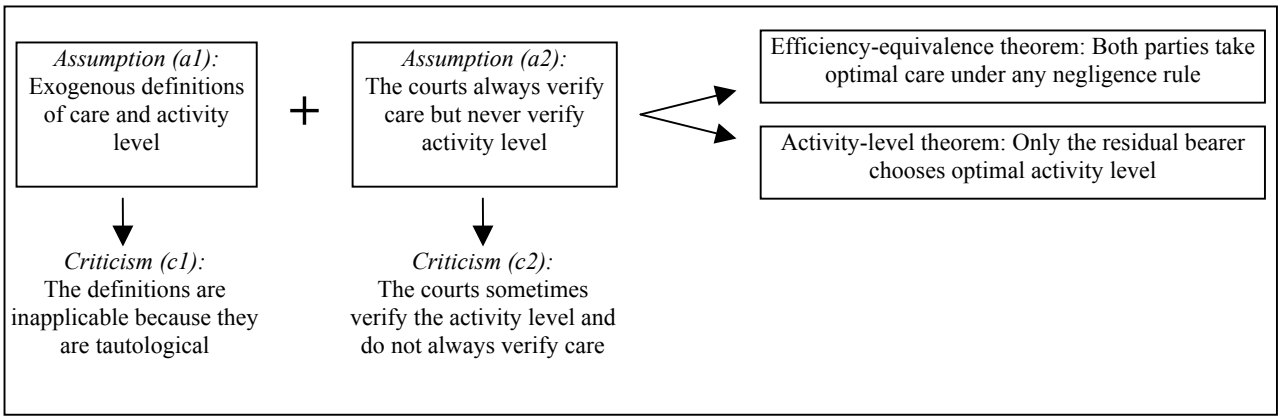

Table 1 summarizes such a line of reasoning: (a1) define care and activity level on the basis of the (exogenous) characteristics of the parties' actions (care as precaution and activity level as the number of repeated actions); (a2) assume that the court cannot verify[6] the activity level. Hereafter, I will show the shortcomings of these two steps and will propose defining care and activity level endogenously, on the basis of the negligence criterion[7].

[3] The court cannot verify the activity level, or measure the cost of reducing it, or it is prevented from making a statement on activity level for some other reasons (Shavell, 1987, at 25, 50, 56, and 57, Landes and Posner, 1987, at 66-67, Miceli, 1997, at 28). The same justification applies to the measures of care excluded from the determination of negligence. See Gilles (1992) for a criticism of this assumption.

[4] Landes and Posner (1980).

[5] Shavell (1980a). Only the residual bearer, that is the party who bears the accident costs when both parties are non-negligent, has an incentive to internalize that cost in the decision on his activity level, and will decide optimally. The other party escapes liability by simply taking due care and will be likely to engage in too high a level of activity, for the reason that he does not bear any cost. Strict-liability-based negligence rules spur injurer's optimal activity levels, whereas no-liability-based negligence rules induce victim's optimal activity levels. Decoupling liability would give both parties the appropriate incentive with respect to care and activity level (Polinski and Che, 1991).

[6] Latin (1987) and Donohue (1989) criticize the analysis of activity level in Shavell (1980a and 1987) and Landes and Posner (1987), but they do not dispute the plausibility of step (a2). Gilles (1992) criticizes step (a2) by demonstrating that the courts actually base their decisions not only on care, but also on precautionary measures, which are generally considered to fall within the definition of activity level. However, by doing so, he implicitly accepts that step (a1) can, in one way or another, be a valid basis for analysis. He recognizes, at 329 to 336, that activity level and care are not mutually exclusive concepts *when* there is a close substitute for the activity (e.g. using a bicycle instead of using a car); I go somewhat further and argue that they are *always* interchangeable. This permits me to discuss the problem put forward by Gilles (the courts sometimes consider precautions commonly understood as activity level), and its mirror twin (the courts do not always consider all those precautions, which are ordinarily regarded as care, see Shavell, 1987, at 9 and 17). Gilles argues that the assumption made in step (a2) is unrealistic; I argue that it is unnecessary, as the real drawback lies hidden in step (a1). This is the crucial point of my analysis as the endogeneity and variability of the definitions follow from the rejection of step (a1).

[7] This point is not controversial, as the literature has always implicitly recognized that the distinction between care and activity level depends on the negligence criterion (Shavell, 1980a and 1987, at 9 and 17, Miceli, 1997, at 28, Kaplow and Shavell, 2002), but it has never investigated the effect of making such an implicit definition explicit. This is my aim in this chapter.

The first step (a1) is bound to fail. A decrease in the activity level reduces the expected accident loss at the cost of some foregone benefits; however, an action that reduces the occurrence of accidents and produces costs has been defined above as care. By starting with a case of activity-level reduction, we end up with care. We do not need to show that care can be reinterpreted similarly as activity level. In general, any precautionary measure, which is taken to reduce the expected accident loss, can be regarded both as care and as activity level[8].

Example 1. Consider the case of a man returning home from work by bicycle. He can take a safe but long cycle track or can choose the shorter but more dangerous route along the highway. The frequency with which he chooses the second option can be interpreted both as a lack of care or as an excessive activity level. In fact, taking the shorter route is indeed an activity yielding a utility and increasing the occurrence of accidents; therefore, taking the longer path more frequently can be considered as a reduction of the activity level. However, taking the longer path is certainly a form of precaution reducing the expected accident loss at a certain opportunity cost (the additional time required); hence, it can be defined as care. The traditional definitions of care and activity level do not assist us in clarifying whether a particular action belongs to one category or the other.

It is clear that the definitions given above do not permit us to distinguish between care and activity level[9]. The reason is that they are tautological: they state that care is precaution (a synonym of care) and that the activity level is the number of repeated actions (a paraphrases for activity level).

Even if we assumed that step (a1) succeeds in distinguishing care from activity level, step (a2) would result in an ad hoc assumption to support the activity-level theorem. It is obvious that the court, on the one hand, can sometimes verify the activity level while, on the other hand, it is not always able to verify care[10].

I argue that the real distinction between care and activity level depends on the negligence criterion. Both care and activity level are forms of precaution, which is an expensive way of reducing the expected accident loss. Care denotes those precautionary measures which are

[8] See also Diamond (1974) at 110, "The distinction [between care and activity level] is somewhat artificial in that we could define negligent driving as a different activity from non-negligent driving". Nevertheless, Diamond adopts slightly different concepts of care and activity level from those adopted by Shavell (1980a).

[9] They are not mutually exclusive concepts, see Gilles (1992), supra note 6.

[10] Shavell (1980a) at 354-355 answers the question of why "activity level isn't usually considered in the formulation of the due care standard" by recognizing the courts' difficulty in doing so and accounts for measures of precaution excluded from the standard of due care, which are to be considered as activity level. See Landes and Posner (1987) at 70-71, on the fact that the courts actually condition negligence on the number of repeated actions when it is possible to do so. Terry (1915) quotes the case of a man, who, after taking any (other) possible precaution, went upon the tracks to save a child but was killed by an oncoming train. The jury found him not guilty of contributory negligence (Eckert vs. Long Island R. R. Co., 43 N.Y., 1871). An opposite decision would have been taken were the creature a kitten (Terry, 1915, at 43-44, see also Posner, 1992, at 252-253). Not attempting a rescue is indeed a form of precaution, at the cost of a life's value. Going upon the tracks is hence considered in the negligence inquiry, although at first sight we would say that it is an activity level. Gilles (1992) constructs a strong argument on this point and gives many examples. He shows that "the courts should be able to regulate many activity-level choices by developing rules concerning reasonableness or unreasonableness of particular activities as well as their timing, place and extent" and indeed "modern American negligence law regulates activity levels to a considerably greater extent than has previously been recognized" (Gilles, 1992, at 320). See also Grady (1983).

included in the determination of negligence, while activity level denotes those precautionary measures which are omitted from the negligence inquiry[11].

Care ≡ precautionary measures included in the negligence criterion

Activity level ≡ precautionary measures omitted from the negligence criterion

Example 2. Let us consider again the situation described in example 1. The problem of defining activity level and care becomes easy to solve. If the court takes the fact of cycling along the highway into consideration in the determination of negligence, then that is to be considered as care. Otherwise, it is to be considered as activity level[12].

3.2. The model: assumptions and notation

We consider accidents between a victim and an injurer, strangers to each other, rational and risk neutral. They minimize the sum of precaution costs and expected accident loss that they bear under a given liability regime. The victim is the party that suffers harm; the injurer is the other party. Both parties can reduce the expected accident loss[13] by taking many different precautionary measures, among which they allocate their expenditures optimally[14].

Let:

P = vector of injurer's precautionary measures, $P=\{p_1,\ldots,p_z\}$, $p_n \in [0,\infty)$, $n=1,\ldots,z$.

R = vector of victim's precautionary measures, $R=\{r_1,\ldots,r_s\}$, $r_m \in [0,\infty)$, $m=1,\ldots,s$.

x_n = injurer's expenditure when the injurer takes the first n precautionary measures from the vector P, $x_n \in [0,\infty)$.

y_m = victim's expenditure when the victim takes the first m precautionary

[11] Gilles (1992) distinguishes between case-specific (ex post) and rule-based (ex ante) techniques to determine negligence, and argues that the choice between the two depends on the cost of evaluating precaution. As information costs become higher, "the courts are more likely to employ the techniques of rule-based negligence to make such inquiries possible" (Gilles, 1992, at 336). For this reason, as precautionary measures traditionally regarded as activity level are likely to be more costly to verify, they are usually dealt with through rule-based negligence (Gilles, 1992, at 337).

[12] Other examples might be easily thought of. Is the number of trains running between two cities to be considered as an activity level, or is the appropriate reduction of the train traffic on a specific track to be regarded as care? We could argue that this amounts to activity level, as it is clearly the case of a repeated action; but we could also argue that this is care, as the number of accidents can be reduced by reducing the frequency of trains, which is indeed a costly precaution to take. Similarly, is the frequency of traveling by car (instead of by bus) an activity level or is the decision whether to take a bus or to travel by car inherent to the level of care? An answer to those questions will always depend on the extent of the negligence criterion.

[13] The model applies to the most general case in which both parties can take precautions (typically referred to as joint-care accidents). However, it is also suitable for describing unilateral-care and alternative-care accidents, in which one party's optimal precaution will always be zero.

[14] We assume that the parties allocate the expenditure among a certain number of precautionary measures so that the expected accident loss cannot be further reduced, given the level of expenditure and the precautionary

measures from the vector R, $y_m \in [0, \infty)$.

$l(x_n, y_m)$ = expected accident loss; $l' < 0$, $l'' > 0$, with respect to x and y.

$L(\bullet)$ = allocative loss, $L' \leq 0$[15]: the difference between the total accident costs (expected accident loss plus precaution expenditures) when both parties take all their precautionary measures at the optimal level and the total accident costs when some precautionary measures are not taken. The more precautionary measures are taken, the more the allocative loss decreases. We will refer respectively to the injurer and to the victim by using the subscripts $_j$ and $_v$.

$I(\bullet)$ = information costs; $I' \geq 0$: the administrative costs of ascertaining parties' precaution. Information costs increase the more precautionary measures the court has to verify. We will refer respectively to the injurer and to the victim by using the subscripts $_j$ and $_v$.

K = compensation costs: the administrative costs of damage compensation.

3.3. Torts in a world with no administrative cost

The model is identical to the standard model adopted in the literature[16], except for one aspect: it explicitly considers the possibility that injurers and victims might be able to take more than one precautionary measure, among which they allocate their precautionary expenditures optimally[17]. A precautionary measure is any action that parties can take in order to reduce the expected accident loss. We also refer, therefore, to those measures that under the traditional view would be regarded as activity level (as for example a reduction in the frequency of an activity).

The vector of the injurers' precautionary measures is denoted by P. The vector contains z different precautionary measures given in a certain order[18]. We make no assumption on the relationship between them: they may be substitutes, complements or simply independent measures. The injurer's precaution expenditure is denoted as x_n. The subscript $_n$ indicates how many precautionary measures are taken by the injurer: x_3 means, for example, that he spends a certain amount of money, x, and that he allocates x among precaution 1, precaution 2 and

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measures taken.

[15] $L' \leq 0$ follows from the proof of proposition 1.

[16] See Landes and Posner (1980), Shavell (1980a), Miceli (1997) and Cooter and Ulen (2000).

[17] See footnote 14.

[18] The problem of how to order precautionary measures in the vector does not affect my results and it is easily dealt with in footnote 30.

precaution 3.[19]

The same applies to the victim, who selects his *m* precautionary measures from a different vector, *R*, composed of *s* precautionary measures, and allocates an expenditure *y* optimally among them.

3.3.A. The social cost in a world with no administrative cost

There are two choices to be made: *how many* precautionary measures to take, and *how much* to spend on precaution in order to minimize the social cost (the sum of both parties' precaution expenditures and expected accident loss).

Proposition 1. When there are no administrative costs, the total social cost is at its minimum if both parties choose the optimal level of precaution expenditures with respect to all their precautionary measures. The total social cost increases (or remains constant) if fewer precautionary measures are taken.

Proof.

The total social cost, when no administrative costs are taken into account, is the sum of expected accident loss and precaution expenditures. The proposition states

$$(1) \qquad \min_{x,y,n,m}\left[l\left(x_n, y_m\right)+x_n+y_m\right]=\min_{x,y}\left[l\left(x_z, y_s\right)+x_z+y_s\right]=l\left(x_z^*, y_s^*\right)+x_z^*+y_s^*.$$

The first step (going from the first to the second part of the expression) refers to the choice of *how many* precautionary measures should be taken and states that the social cost is minimized when the parties' expenditures are allocated among *all* their precautionary measures. The reason is that, by reallocating the same expenditure among more precautionary measures, the parties can further reduce the expected accident loss[20].

The second step (going from the second to the third part of the expression) refers to the choice of *how much* should be spent on precautionary measures. The solution can be found by applying ordinary minimization techniques and denoted as (x^*_z, y^*_s)[21].

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[19] The allocation of the sum *x* among those three precautionary measures is left to the injurer and we assume that he will allocate it optimally, i.e. any different allocation will result in a higher (or the same) expected accident loss. Clearly, the outcome might be precaution 1 absorbing the whole expenditure *x*, while precautions 2 and 3 are taken at a level equal to zero. See also footnote 14.

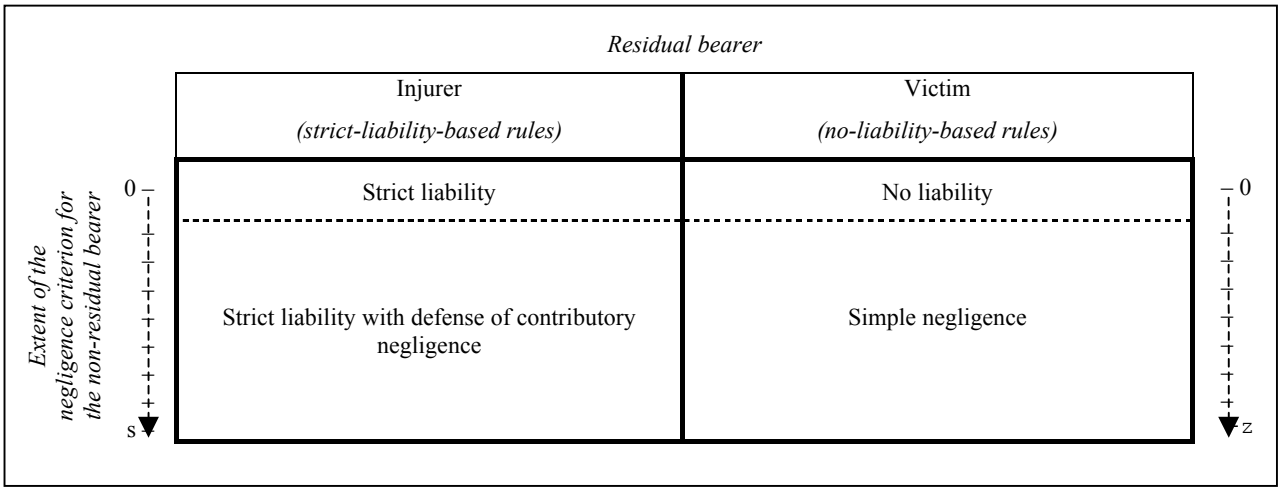
[20] It is obvious that the expected accident loss never increases if the same precautionary expenditure is allocated among a greater number of precautionary measures, because if the new precautionary measures are not worth taking, then the parties will continue to spend only on the old ones. Taking an additional precautionary measure is equivalent to using better (or at least equivalent) accident-prevention technology.

[21] The solution is internal and unique, as it follows from the assumptions made.

3.3.B. Liability rules in a world with no administrative cost

If there are no administrative costs, the optimal liability rule is that rule which induces both parties to take all their precautionary measures and to select the socially optimal level of expenditure. Here we consider four possible rules: two strict rules (strict liability and no-liability) and two negligence rules (strict liability with defense of contributory negligence, which is a strict-liability-based negligence rule, and simple negligence, which is a no-liability-based negligence rule). The analysis can be simplified as indicated in table 2.

Table 2: The choice of the optimal liability rule



The legal system makes two choices. First, it decides whether to implement a strict rule or a negligence rule (vertical choice in the table). In the latter case, the legal system controls the behavior of the non-residual bearer through negligence and has to determine the extent of the negligence inquiry. It is a choice of the *degree* to which the legal system verifies the parties' behavior. The legal system can verify none (strict rule), one (a very limited negligence rule), two, or even all of the parties' precautionary measures (omni-comprehensive negligence rule). The analysis determines the optimal extent of the negligence criterion in the hypothesis that the victim is the residual bearer (optimal no-liability-based rule) and in the hypothesis that the injurer is the residual bearer (optimal strict-liability-based rule).

Second, the legal system selects either the victim (no-liability-based rules) or the injurer (strict-liability-based rules) as the residual bearer (horizontal choice in the table). Hence, it chooses between the optimal no-liability-based rule and the optimal strict-liability-based rule.

3.3.B.I. Vertical choice: allocative loss and determination of the optimal extent of the negligence criterion under no-liability-based rules (the victim is the residual bearer) in a world with no administrative cost

Under no liability, the legal system makes the victim bear the expected accident loss

irrespective of his (negligent) behavior. The victim is the residual bearer. A negligence criterion can be added in order to control the injurer's behavior (simple negligence[22]). The negligence criterion lists the precautionary measures that the injurer has to take in order not to be found negligent as well as their level. We denote the vector of such precautionary measures as due care, C_n. The subscript $_n$ refers to *how many* precautionary measures are included in the vector. The superscript ^{c} refers to their due *level*.

(2) $$C_n = \{p_1^c, ..., p_n^c\}.$$ [23]

The non-negligent injurer is supposed to take all the precautionary measures listed at the required level[24]. We denote as x_n^c the expenditure triggered by due care. A motorist, for example, has to fulfill a detailed list of requirements: speed, the condition of the car, the use of headlights and indicators, traffic lights, and so forth. For each of them a certain level is required. If the motorist fails to fulfill one of these requirements, he will be found negligent. Simple negligence results in the injurer being liable if he fails to fulfill the due-care requirements and non-liable otherwise.

For the sake of simplicity, we assume that the *level* the *n* precautionary measures included in the negligence criterion is set optimally[25] and that the injurer will take due care. The victim is the residual bearer and we denote the victim's precaution expenditure as y_s^c [26]. Therefore, under simple negligence, a negligence criterion set accordingly to Exp. (2) yields parties' precautionary expenditures equal to $\left(x_n^c, y_s^c\right)$ [27].

We define as the allocative loss of a liability rule the difference between the total social cost under that liability rule and the minimum social loss as defined in Exp. (1). Let us consider the allocative loss associated with the no-liability-based rule under examination. The

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[22] Although contributory negligence and comparative negligence also subject the victim's behavior to a negligence inquiry, the victim is the residual bearer, and he will hence take precaution with respect to all his precautionary measures (as shown by Shavell, 1980a). As a result, there is no difference with respect to simple negligence and only with respect to injurers does a distinction between activity level and care have a meaning.

[23] The negligence criterion targets some specific actions on the part of the injurer. In theory, the court could verify directly expenditure *x*, instead of verifying the injurer's behavior as regards many different precautionary measures. However, the cost of precaution if often non-monetary, and although it can sometimes be estimated, it is very difficult to verify. When it is possible to verify directly the costs, the problem becomes easier to solve.

[24] The problem of ordering the precautionary measures does not affect the results of the analysis. See footnote 30.

[25] We define as the optimal level that level which minimizes total accident loss (precaution expenditures plus expected accident loss), given *n* and the reaction of the victim. Hence, the due level of the *n* precautionary measures included in the negligence criterion is optimal if x^c_n minimizes $l(x_n,y^c_s)+x_n+y^c_s$.

[26] It follows for proposition 1 that the victim will take all *s* precautionary measures. Hence, the victim takes such a level of the *s* precautionary measures that $l(x^c_n,y_s)+y_s$ is minimized. Let y^c_s denote the solution to the former problem. That solution is internal and unique for the assumptions made on the functional form.

[27] This conclusion holds both under the traditional interpretation of the negligence criterion (a negligent injurer pays damages for any accident loss, which might occur) and under a causation-corrected model of negligence (a negligent injurer pays damages only for those accident losses, which would not have occurred had he been non-negligent, see Grady, 1983, and Kahan, 1989).

subscript $_j$ indicates that the loss occurs because the injurer does not take all his precautionary measures.

(3) $$\underset{j}{L}(n) = \left[l\left(x_n^c, y_s^c\right) + x_n^c + y_s^c\right] - \left[l\left(x_z^*, y_s^*\right) + x_z^* + y_s^*\right].$$

From proposition 1, it follows that the first part of the right-hand side is greater than or equal to the second part and decreases or is constant in n. Hence, $L_j(n) \geq 0$, and $L_j' \leq 0$.

If $n=0$, then the rule is no liability and the allocative loss is maximal, as only the victim takes precaution. If $n>0$, then the rule is simple negligence, the injurer takes n precautionary measures and the allocative loss tends to decrease. The broader the negligence criterion (the more the injurer's precautionary measures included therein), the smaller the allocative loss tends to be. If $n=z$, the rule is an omni-comprehensive simple negligence rule, as all the injurer's precautionary measures are included in the negligence criterion; the allocative loss is zero.

Therefore, the task of the legal system is to set the negligence criterion as broad as possible, in order to reduce the allocative loss. The first best would be C_z, hence the optimal no-liability-based rule is omni-comprehensive simple negligence. The allocative loss is equal to zero, $L_j(z)=0$.

3.3.B.II. Vertical choice: allocative loss and the determination of the optimal extent of the negligence criterion under strict-liability-based rules (the injurer is the residual bearer) in a world with no administrative cost

The same analysis can apply to strict-liability-based rules. In this case, the negligence criterion targets the victim's behavior. Let us define the negligence criterion under strict liability with defense of contributory negligence as $G_m = \{r_1^g, ..., r_m^g\}$.

The allocative loss takes the form of $L_v(m)$ and is a function of the number of the victim's precautionary measures included in the determination of negligence. If $m=0$, the rule is strict liability and $L_v(m)$ is maximal. If $m>0$, the rule is strict liability with defense of contributory negligence; $L_v(m)$ decreases if m increases. We can draw the same conclusion as before: the optimal strict-liability-based rule is strict liability with defense of omni-comprehensive contributory negligence, G_z. The allocative loss is equal to zero, $L_v(s)=0$.

3.3.B.III. Horizontal choice: the choice of the residual bearer in a world with no administrative cost

As the optimal no-liability-based rule and the optimal strict-liability-based rule trigger an

allocative loss equal to zero, they are both efficient[28].

This result can be summarized in the following proposition.

Proposition 2. When there are no administrative costs, the optimal negligence criterion includes all the non-residual bearer's precautionary measures. The optimal no-liability-based negligence rule is equivalent to the optimal strict-liability-based negligence rule.

3.4. Torts in a world with positive administrative cost

3.4.A. Administrative costs

In this section, we will introduce administrative costs into the model. We will consider two types of administrative costs: information costs and compensation costs.

3.4.A.I. Information costs

Information costs are those costs which result from the introduction of a negligence criterion on a strict-rule framework. They consist not only of the costs of gathering information concerning one party's behavior but also of the costs due to a higher likelihood of errors and increased litigation. They include the costs of judicial proceedings, lawyers' fees and any indirect costs borne by the parties.

We denote information costs as $I_f(n)$ for no-liability-based rules and as $I_v(m)$ for strict-liability-based rules. Information costs increase with n or m: if the negligence criterion expands, more information is needed, the likelihood of errors increases and further litigation might arise. $I'>0$ in both cases.

3.4.A.II. Compensation costs

Compensation costs are the costs of transferring damage compensation from the injurer to the victim. In equilibrium, compensation costs arise only under strict-liability-based rules. In fact, under no-liability-based rules, the injurer's dominant strategy is to behave accordingly to the negligence criterion, and, hence, he never pays compensation. In addition to that, compensation costs are constant: they do not vary with m. Under strict-liability-based rules, the injurer always pays compensation to the victim, as the victim's dominant strategy is to

[28] Landes and Posner (1980) also proved that any sharing of the damages between the parties is equivalent. Hence, we can extend the result to other rules, such as contributory and comparative negligence, strict liability with defense of dual contributory negligence and strict liability with defense of comparative negligence. However, my formulation underlines that Landes and Posner's result completely holds only when the negligence criterion is fully comprehensive and when administrative costs are equal to zero.

behave non-negligently, given any appropriate negligence criterion, G_m. Let K denote compensation costs.

3.4.B. Social cost and liability rules in a world with positive administrative cost. Genesis of the distinction between care and activity level

In a world with positive administrative cost, the determination of the social cost cannot be disjoined from the choice of the liability rule, as administrative costs depend on the latter.

3.4.B.I. Vertical choice: determination of the optimal extent of the negligence criterion and genesis of the distinction between care and activity level under no-liability-based rules (the victim is the residual bearer) in a world with positive administrative cost

In section 3.3.B.I, we have defined the allocative loss, $L_j(n)$, as the measure of the relative performance of no-liability-based rules with respect to the minimization of the social cost. $L_j(n)$ decreases with n. In a world with no administrative cost, $n=z$ is optimal; in a world with positive administrative cost, the application of the negligence criterion triggers information costs $I_j(n)$, increasing with n.

The optimal extent of the negligence criterion for the injurer's behavior minimizes the total social cost under no-liability-based rules[29], and is denoted by n^*, which solves:

$$\min_n \left[L_j(n) + I_j(n) \right]. \tag{4}$$

n^* can assume any value between 0 and z[30].

- $n^*=0$. If information costs are high, the cost of applying a negligence rule might be too high when compared with the reduction in the allocative loss it would entail. The legal system might find it optimal to adopt no liability.
- $n^*=z$. When information costs are negligible (the injurer's behavior is easily verifiable), the optimal negligence criterion might be omni-comprehensive, all the injurer's precautionary measures are included in the determination of negligence. This is indeed an extreme case, and is unlikely to occur in practice[31].
- $0<n^*<z$. In intermediate cases, the negligence criterion includes only some of the

[29] The total social cost in a world with positive administrative cost is the sum of expected accident loss, precaution expenditures and administrative costs associated with the liability rule in use. Under no-liability-based rules, the minimization problem is $\min_{x,y,n,m}[l(x_n,y_m)+x_n+y_m+I_j(n)]$. Given a negligence criterion C_n, the problem is to define n so that $n=\text{argmin}[l(x_n,y_s)+x_n+y_s+I_j(n)] = \text{argmin}[l(x_n,y_s)+x_n+y_s-l(x^*_z,y^*_s)-x^*_z-y^*_s+I_j(n)] = \text{argmin}[L_j(n)+I_j(n)]$.

[30] The solution is not necessarily internal and unique. Placing the injurer's precautionary measures in a different order might provide different level of n^* as a result. We take into consideration the order that triggers the lowest total cost $L_j(n^*)+I_j(n^*)$.

[31] See Shavell (1987) at 30 on this point.

injurer's precautionary measures, while the rest are omitted as being too expensive to verify and/or not affecting the allocative loss to any substantial extent.

The set of the injurer's precautionary measures included in the negligence criterion, $C_{n^*} = \{p_1, ..., p_{n^*}\}$, can be defined as care. The residual set of the injurer's precautionary measures excluded from the negligence criterion can be defined as the activity level, $A_{n^*} = \{p_{n^*+1}, ..., p_z\}$. Care and activity level are just two subsets of the set of the injurer's precautionary measures, and their respective extent depends on the negligence criterion, $C_{n^*} \cup A_{n^*} = P$ and $C_{n^*} \cap A_{n^*} = \{\varnothing\}$. The injurer takes precaution only with respect to care, as once he takes due care, any additional precaution will increase his precautionary expenditure without reducing his exposure to liability[32].

In the extreme case of $n^*=0$ (no liability), none of the injurer's precautionary measures is included in the negligence criterion. Hence, $C_{n^*} = \{\varnothing\}$ and $A_{n^*} = P$. In the other extreme case of $n^*=z$ (omni-comprehensive simple negligence), all the injurer's precautionary measures are included in the negligence criterion. Hence, $C_{n^*} = P$ and $A_{n^*} = \{\varnothing\}$.

In any case, no distinction between care and activity level can be claimed with respect to the victim's precautions, as the victim is the residual bearer and will allocate his precaution expenditure among all his precautionary measures[33].

3.4.B.II. Vertical choice: determination of the optimal extent of the negligence criterion and genesis of the distinction between care and activity level under strict-liability-based rules (the injurer is the residual bearer) in a world with positive administrative cost

Under strict-liability-based rules, the optimal extent of the negligence criterion for the victim's behavior is denoted by m^*, which solves:

$$\min_m \left\lfloor L_v(m) + I_v(m) + K \right\rfloor. \tag{5}$$

m^* can assume any value between 0 and s. The logic is the same as in the former section.

- $m^*=0$: strict liability.
- $m^*=s$: strict liability with defense of omni-comprehensive contributory negligence.
- $0<m^*<s$: strict liability with defense of contributory negligence.

The set of the victim's precautionary measures included in the negligence criterion,

[32] See Shavell (1980a).
[33] See footnote 26 for a proof.

$G_{m^*} = \{r_1, ..., r_{m^*}\}$, can be defined as care. The residual set of the victim's precautionary measures, which are excluded from the negligence criterion, can be defined as activity level, $B_{m^*} = \{r_{m^*+1}, ..., r_s\}$. Care and activity level are just two subsets of the set of the victim's precautionary measures, and their respective extent depends on the negligence criterion, $G_{m^*} \cup B_{m^*} = R$ and $G_{m^*} \cap B_{m^*} = \{\varnothing\}$. The victim takes precaution only with respect to care[34].

In the extreme case of *m*=0* (strict liability), none of the victim's precautionary measures is included in the negligence criterion. Hence, $G_{m^*} = \{\varnothing\}$ and $B_{m^*} = R$. In the other extreme case of *m*=s* (strict liability with defense of omni-comprehensive contributory negligence), all the victim's precautionary measures are included in the negligence criterion. Hence, $G_{m^*} = R$ and $B_{m^*} = \{\varnothing\}$.

In any case, no distinction between care and activity level can be claimed with respect to the injurer's precautions, as the injurer is the residual bearer and will allocate his precaution expenditure among all his precautionary measures.

3.4.B.III. Horizontal choice: choice of the residual bearer in a world with positive administrative cost

In a world with positive administrative cost, the optimal no-liability-based rule is not necessarily equivalent to the optimal strict-liability-based rule, as the optimal extent of the negligence criterion might be less than omni-comprehensive in either or both cases.

The optimal liability rule is that rule which triggers the lowest social (allocative and administrative) cost. A no-liability-based rule, as determined in section 3.4.B.I, is the optimal liability rule if

$$(6) \qquad \underset{j}{L}(n^*) + \underset{j}{I}(n^*) < \underset{v}{L}(m^*) + \underset{v}{I}(m^*) + K .$$

Otherwise, a strict-liability-based rule, as determined in section 3.4.B.II, is the optimal liability rule. The previous results can be summarized in the following propositions.

Proposition 3. Where administrative costs are positive, the optimal negligence criterion might not include all the non-residual bearer's precautionary measures: some precautionary measures are efficiently omitted from the negligence inquiry. The optimal no-liability-based negligence rule is typically not equivalent to the optimal strict-liability-based negligence rule.

[34] See footnote 32.

Proposition 4. A distinction between care and activity level can be claimed only with respect to the non-residual bearer's precaution: care is the subset of precautionary measures included in the negligence criterion and activity level is the subset of precautionary measures that are not included in the negligence criterion.

3.4.C. The dangerousness criterion and the verifiability criterion

Exp. (6) provides a criterion for the choice of the residual bearer, given an optimal determination of negligence. In this section, I will decompose such a criterion into three elements:

(i) The *dangerousness criterion*: the residual bearer should be that party, whose activity level triggers greater allocative loss (whose activity is more "dangerous"). $\underset{j}{L}(n^*)$ is the allocative loss due to the fact that some of the injurer's precautionary measures are excluded from the negligence criterion (the injurer's activity level). Therefore, $\underset{j}{L}(n^*)$ can be interpreted as the dangerousness of the injurer's activity. $\underset{v}{L}(m^*)$ is the dangerousness of the victim's activity. If $\underset{j}{L}(n^*) < \underset{v}{L}(m^*)$, the victim's activity is more dangerous: the dangerousness criterion requires choosing him as the residual bearer, and, hence, implementing a no-liability-based rule. Otherwise, a strict-liability-based rule would be desirable.

(ii) The *verifiability criterion*: the residual bearer should be that party, whose precautionary measures are more expensive to verify under the negligence inquiry. is $\underset{j}{I}(n^*)$ the cost of verifying the injurer's precautionary measures under the optimal no-liability-based negligence rule, $\underset{v}{I}(m^*)$ is the cost of verifying the victim's precautionary measures under the optimal strict-liability-based negligence rule. If $\underset{j}{I}(n^*) < \underset{v}{I}(m^*)$, verifying the victim is more expensive, and hence a no-liability-based negligence rule is to be chosen. A strict-liability-based rule would be desirable otherwise.

(iii) No-liability-based rules do not trigger compensation costs, *K*, while strict-liability-based rules do so. Therefore, choosing the victim as the residual bearer saves administrative costs.

It is clear that the choice of the optimal liability rule has to take into account all the three criteria listed supra: neither if them is sufficient alone. Exp. (6) combines them in a unitary criterion. In section 3.6, I will exploit this framework in order to investigate the evolution of

liability systems over time. In section 3.7, I will show that the traditional explanation of the choice between strict-liability-based rules and no-liability-based rules, as provided in the literature, is incomplete because it is based on the dangerousness criterion only and does not accounts for the verifiability criterion.

3.5. Characteristics of the new definitions of care and activity level: endogeneity and variability

By recognizing that the definitions of care and activity level are a byproduct of the negligence criterion, we can dispense with two assumptions at the same time. We have an endogenous distinguishing criterion for care and activity level, therefore we do not need to search for a natural distinction between them *out of* the model. The negligence criterion is indeed a non-tautological and effective criterion to distinguish care from activity level.

In fact, the model produces mutually exclusive definitions. No precautionary measures can be defined at the same time as care and as activity level, because the intersection between the set of precautionary measures defined as care and the set of precautionary measures defined as activity level is always empty (see sections 3.4.B.I and 3.4.B.II). Hence, it completely solves the problem of defining those concepts and overcomes the shortcoming of step (a1) of the traditional definition (see table 1 and section 3.1).

In addition, we also avoid incurring a second theoretical problem, due to step (a2) of the traditional definition (see table 1 and section 3.1). Once we have defined as activity level those precautionary measures that are not taken into account by the court while deciding issues of negligence, the assumption that the court cannot verify the activity level becomes superfluous[35]. The system turns out to be based on fewer assumptions, and this is indeed an improvement[36].

As the definitions of care and activity level are generated by the model itself and are, hence, endogenous to it, they depend on the negligence inquiry concerning the non-residual-bearer's precautions. Few consequences follow:

- It is logically incorrect to distinguish between care and activity level with respect to the

[35] Such an assumption would instead be indispensable in order to justify the activity-level theorem if activity level and care were defined exogenously. See Shavell (1980a) at 354 and Shavell (1987) at 25.

[36] For several hundred years, mathematicians tried to reduce the number of axioms on which the whole geometry is constructed from five (as listed by Euclid around 300 BC) to four, by demonstrating from the existing four that two parallel lines never intersect (a rough description of the fifth axiom of Euclidean geometry). Unfortunately, no one ever succeeded during more than 21 centuries, but, fortunately, after such a collective effort, in 1823 non-Euclidean geometry was discovered, and the number of axioms is still five. What I am trying to do is to eliminate two axioms from the economic theory of torts. By deriving the definitions of care and activity level from other existing concepts, I attempt demonstrating that they are definitions produced *by* the model and not assumptions *of* the model.

residual-bearer's precautions, as he always takes all his precautionary measures, and the negligence criterion applies to the other party[37].

- It is logically incorrect to distinguish between care and activity level under strict rules, such as strict liability and no liability. With respect to the residual bearer, no distinction can be made for the reason given supra. With respect to the non-residual bearer, no negligence criterion is applied in this case and, in theory, all his precautionary measures should be qualified as activity level, because the set of care measures is empty[38].

More in general, the definitions of care and activity level are variable with the extent of the negligence criterion and the choice of the residual bearer, which in turn respond to changes in the administrative costs and the prevention technology. This consideration is extremely important, as it implies that the concepts of care and activity level are relative to a specific legal, economic and juridical situation and can change over time with the extent of the negligence criterion.

When the negligence criterion expands (in the sense that more precautionary measures are verified by the court), the subset of precautionary measures that we define as care expands accordingly, while the subset of activity level shrinks. As the determination of the optimal extent of the negligence criterion depends on the balance between allocative loss and information costs, a change in either of them triggers an adjustment of the negligence criterion[39]. The following sections exploit this characteristic.

3.6. A diachronic perspective: the evolution of liability rules

The foregoing analysis highlights some arguments that will be used here to suggest a theoretical framework for explaining the evolution of liability systems over time[40].

The exemplification made in table 2 permits us to decompose the choice of the optimal

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[37] This result also holds if a negligence criterion is applied on the residual bearer as well, as for example under contributory negligence, comparative negligence and strict liability with defense of dual contributory negligence. See section 3.8 at (i).

[38] Shavell (1980b), while discussing issues of causation, bases his analysis on the distinction between activity level and care, but applies the distinction in a strict-liability framework. From my analysis, it follows that this approach is logically incorrect. I discuss this issue in a separate paper.

[39] See Landes and Posner (1987) at 71: "There is a trade off between the information cost of considering the injurer's activity level as an aspect of due care and the allocative cost of ignoring the activity level. And although […] strict liability eliminates the problem of having to determine whether particular changes on the injurer's activity level would have been cost justified, it does so at the price of relaxing the victim's incentive to avoid the accident through a change in his own activity level."

[40] It is clear that allocative efficiency is not the only goal pursued in ancient (and modern) tort law systems, and sometimes it is not the principal one. Therefore, we might expect deviations from the pattern that we would draw in a theoretical evolution toward efficient rules. This is true not only for ancient law but also for more recent periods. My aim here is to suggest a possible additional way in which to examine the problem. For a law and economics analysis of the genesis of liability in ancient law see Parisi (2001).

liability rule into two components: the choice between a strict rule and the corresponding negligence variant (moving vertically in table 2, see sections 3.4.B.I and 3.4.B.II), and the choice of the residual bearer (moving horizontally in table 2, see section 3.4.B.III). We can describe two stages in the evolution of a liability system.

Proposition 5. At the first stage, liability systems tend to prefer (i) strict rules to negligence rules (vertical choice) and (ii) no-liability-based rules to strict-liability-based rules (horizontal choice).

Corollary: strict liability is chosen when the injurer's actions are more dangerous than the victim's actions and the allocative gain overcomes compensation costs.

Proof.

(i) Exp. (4) and (5) show that the choice of the extent of the negligence criterion under no-liability-based rules and strict-liability-based rules depends on the balance between information costs and allocative loss. In the early stage of the development of liability systems, information costs are likely to be extremely high for two reasons. Negligence is difficult to prove due to the lack of a good understanding of the laws of nature, systems of writing and records[41] and a sufficient judicial expertise. The application of the negligence criterion increases litigation as it creates animosity[42]. Therefore, strict liability is likely to be preferred to strict liability with defense of contributory negligence as much as no liability is likely to be preferred to simple negligence.

(ii) Therefore, the choice of the residual bearer is mainly a choice between no liability and strict liability. Exp. (6) then becomes:

(7) $$\underset{j}{L}(n=0) < \underset{v}{L}(m=0) + K \ .$$[43]

The decision of the residual bearer depends on compensation costs. If the parties' precaution affects the expected accident loss to the same extent, no liability will be preferred as it saves compensation costs. In early liability systems compensation costs are likely to be particularly high for reasons which are similar to the ones already provided for information costs, and, therefore, the argument for no liability is strengthened. Strict liability will be adopted only in those areas of torts where the advantage of making the injurer take precaution instead of the victim overcomes compensation costs (when the difference between $\underset{j}{L}(n=0)$

[41] Posner (1980).
[42] Parisi (1992) at 33-34, and 56-58.
[43] Information costs are zero if strict rules are implemented.

and $\underset{v}{L}(m=0)$ is greater than *K*). This criterion can be referred to as the dangerousness criterion: the legal system targets the most dangerous party, the one who affects the accident loss the most[44].

Proposition 6. At a later stage, (i) liability systems tend to move from strict rules to negligence rules (vertical choice) but (ii) they still tend to prefer no-liability-based rules to strict-liability-based rules (horizontal choice).

Corollary: strict-liability-based rules are chosen when the injurer's actions are more dangerous and less controllable than the victim's actions and the allocative gain overcomes compensation costs.

Proof.

(i) Given the allocative superiority of negligence rules (they spur both parties' precaution), legal systems will move in their direction as soon as the information costs decrease below the allocative gains[45]. Information costs decrease when literacy and knowledge develop, resulting in increased judicial expertise. This justifies a move away from strict rules. However, information costs also depend on the complexity of the parties' actions, which hinges upon social and technological development. In those areas of torts where the parties' actions become more complex (as for example in the production of certain goods), information costs might increase and thereby justify strict rules[46]. Negligence rules become more common, although strict rules survive in some specific areas[47].

(ii) The reason for preferring no-liability-based rules is the same as under the former proposition: the legal system saves compensation costs. However, the choice of the optimal liability rule becomes more complex, as the negligence criterion is usually applied. The dangerousness of the parties' actions (i.e. the importance of their precaution in determining the allocative loss) should be balanced with the verifiability of their precautionary measures. Exp. (6) shows that both allocative loss and information costs now enter the comparison. Therefore, the dangerousness criterion alone does not provide an explanation for deciding between no-liability-based and strict-liability-based rules, and it has to be integrated with a verifiability criterion: the legal system considers both dangerousness of the activity (*L*) and

[44] See section 3.4.C.
[45] See also Landes and Posner (1987).
[46] Isaac (1918) singles out three periods of dominant strict liability in English law: (i) the 11th century, around the time of the Norman conquest, (ii) the 14th century, at the time of Edward I, and (iii) the beginning of the 20th century. Fault was the dominant criterion for liability in between those periods. He justifies such cyclical dynamics as a strive of law for approaching the goals of ethics.
[47] Isaac (1918) at 967 speaks of the "swinging of the pendulum between strict rules and negligence rules".

costs of controlling parties' precautionary measures (I)[48]. In addition, even when the injurer happens to be more dangerous and less controllable (hence a strict-liability-based rule is optimal), the resulting rule does not necessarily have to be strict liability, as it might be profitable to embark on a negligence inquiry concerning the victim's behavior, which would trigger strict liability with defense of contributory negligence.

Legal systems tend to adopt a general no-liability-based negligence rule and to confine strict-liability-based rules to specific areas of torts and no liability to those instances in which compensation is denied.

3.6.A. A historical case for proposition 5: Roman and English legal history

Roman law confirms the theoretical pattern of evolution described above as it first developed a strict liability regime, gradually evolving towards negligence. In addition, at the beginning, the Roman tradition produced liability rules based on strict liability only for specified wrongs; the rest would fall under no liability. The *lex XII tabulorum* and the *lex Aquilia* listed a series of wrongs that had to be restored through compensation. The requirement of *damnum iniuria datum* for those wrong which triggered liability at the beginning literally meant "a wrong committed against the law". Hence, only those wrongs admitted by the law could entitle the victim to compensation.

Limitations also followed from the application of the *corpore corpori* principle, which gave rise to compensation only for those wrongs materially committed by the injurer and resulting in material harm for the victim. These limitations on the types of wrongs triggering liability served the economic goal of reducing the administrative cost of the (not yet well developed) legal and judicial system, by *de facto* using strict liability as an exception to no liability[49].

English and American legal history seems to confirm this pattern too, as it developed from the strict-liability formant and slowly evolved towards negligence[50]. Not until the nineteenth century was there any general acceptance of the fault principle. The early common law's main concern was with intentional torts and, even later, the attention was drawn to the nature of the victim's harm rather than to the injurer's behavior. Rudimental requirements of causation were used to select accident losses for which the victim should be entitled to compensation, regardless of the negligence of either party[51].

The English writ system was similar to the early Roman system of *actiones*: a victim was entitled to compensation only for specified kinds of accident losses for which a procedural

[48] See section 3.4.C.
[49] See Parisi (1992) for a discussion of the problem and a vast bibliography.
[50] See Fleming (1983) at 300.

remedy existed and it was not necessary to prove fault on the part of the injurer.

3.6.B. A historical case for proposition 6 and a criticism of the application of the dangerousness criterion in order to explain the choice of liability regimes in modern societies: liability for industrial accidents and product liability from no-liability-based rules to strict-liability-based rules

The joint application of the dangerousness criterion and the verifiability criterion determines the choice of the optimal liability rule in modern societies, where the application of a negligence criterion is usually possible. This will immediately become clear with a theoretical example.

Example 3. Imagine that an accident occurs between an injurer carrying on a very dangerous activity, whose precautionary measures are all easily verifiable before the court (running a railway in the nineteenth century). On the contrary, victim's contribution to the accident is less dangerous but not as easily verifiable (crossing a railway in the nineteenth century).

A strict-liability-based rule will provide the injurer with an incentive to take all his precautionary measures (the injurer is the residual bearer), whereas it will provide the victim with only little incentives to take precaution, as the extent to which the court can consider the victim's precaution under the negligence criterion is limited, and therefore the extent of the victim's activity level will result large. On the contrary, simple negligence (a no-liability-based rule) will result in more efficient accident prevention. On the one hand, the victim is in fact led to take precaution with respect to all his precautionary measures, as he is the residual bearer. On the other hand, as the court can easily verify all the injurer's precautionary measures, the extent of his activity level is reduced to zero (more correctly, to the empty set), all his precautionary measures are to be considered as care, and thus he will take precaution with respect to all of them.

Although the injurer's actions influence largely the expected accident loss, the legal system attains a more efficient result by targeting the victim (simple negligence), as the victim's precautionary measures are less verifiable.

The example highlights two important points. First, dangerous injurer's activities do not necessarily require a strict liability regime, as also the verifiability test should be employed. Secondly, even injurer's activities that are not excessively dangerous can require a strict liability regime, if the injurer's precautionary measures are not readily verifiable (as would be evident by simply reversing the positions of the injurer and the victim in the example above)[52].

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[51] White (1980) at 3 ff. and Fleming (1983) at 97.

[52] Gilles (1992), at 362, after showing that the courts do consider precautionary measures traditionally regarded as

This argument might provide an efficiency justification for the adoption of a no-liability-based negligence regime for industrial accidents in the 19th century[53]. It has been said that the adoption of a no-liability-based regime (mainly implemented with the application of a negligence criterion for the injurer) was meant to favor the development of industry in its early stages, by making the victims the residual bearers. However, my framework can provide a different interpretation of this problem.

In the nineteenth century, industrial activities were of rather simple a kind. The hazards created by them did not constitute any such subtle danger to escape anyone's notice[54]. Products were also rather simple. Our previous discussion suggests that it was probably easier to control the injurer's behavior than victim's behavior in such situations, which could provide a justification for placing the residual loss on victims.

With the development of technology, industrial processes have become more complex and the cost of acquiring information over them has risen enormously. Hence, controlling injurers through negligence has become more expensive a task. The verifiability criterion suggests that the residual bearer should be the injurer[55].

Therefore, the parallel move in industrial and product liability from no-liability-based rules to strict-liability-based rules can be justified by the increasing information costs associated with the application of the negligence criterion to the injurer's behavior. No-liability-based rules are efficient in the early stages of industrial development, when production techniques are simple and therefore easily verifiable. During the following stages, when complexity increases, strict-liability-based rules become a more efficient solution[56].

In addition to that, another point should be clarified. If, in principle, primitive tort law systems tend to implement strict rules, we cannot state that modern tort law systems tend to negligence in all areas of torts. The persistence or the reappearance of strict rules (mainly strict liability) in specific areas of tort law can be explained by the relevant (or increasing)

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activity level in the determination of negligence, concludes that "activity levels may be less important as a factor bearing on the choice between negligence and strict liability than has previously been thought". Although, this conclusion is correct, it is one-sided. In fact, the courts do not include many precautionary measures, traditionally regarded as care, in the negligence inquiry. A correct definition of the concepts of care and activity level, as linked to the negligence criterion, brings an informational argument into the discussion but does not necessarily undermine the importance of the activity level in the choice between strict-liability-based rules and no-liability-based rules. I simply argue that the activity level is something different from what the literature has always claimed. So is care.

[53] See Posner (1972 and 1998), Schwartz (1981), and Landes and Posner (1987) at 116 for a critical discussion.

[54] As noted by Posner (1992) at 257.

[55] See section 3.4.C. Posner (1992) at 256-258 recognizes that the hazards created by nineteenth century industrial production were of a simple and discernible kind and the cost of acquiring information thereon was particularly low. He applies this logic to accidents between parties to a contract, but not to accident between strangers, in which he generally accepts the subsidy argument. My analysis is somewhat broader, as I reinterpret the argument in both contractual and non-contractual settings and show that the verifiability argument can explain both situations.

[56] Landes and Posner (1987) at 284-285 suggest a similar solution with respect to product liability.

complexity of the parties' activities, which increase the costs and reduce the benefit of negligence, as in the case just discussed.

3.7. A synchronic perspective: "strict liability vs. negligence", an analysis of liability rules in modern legal systems

The literature[57] has traditionally approached the problem of choosing between strict-liability-based rules (traditionally referred to simply as "strict liability", the injurer is the residual bearer) and no-liability-based rules (traditionally referred to simply as "negligence", the victim is the residual bearer) in modern tort law systems by applying the dangerousness criterion only. "If it is more important to control injurers' level of activity than victims'" the rules that result in greater social welfare are strict-liability-based rules[58]. The legal system should otherwise adopt no-liability-based rules. In turn, the "importance" of controlling one party's activity can be seen in terms of riskiness or dangerousness of that party's activity[59].

This criterion has provided a classical and broadly accepted explanation for the choice between strict liability and negligence. However, not all strict liability regimes can be justified in terms of dangerousness. "Is the chance of a wild animal escaping from a zoo and doing harm, for which strict liability would probably result in the United States, greater than that of an automobile running down a pedestrian, for which the negligence rule would govern?"[60]. The criterion is indeed "somewhat rough"[61]. Many actual legal solutions are unclear, as "the choices made between strict liability and negligence rules are not always easy to explain on the basis of differences in riskiness"[62]. I will provide here an alternative explanation, which elaborates upon our previous discussion in section 3.4.C: the verifiability criterion should also be considered.

3.7.A. The general application of negligence

Proposition 6 *(i)* shows that legal systems tend to move from strict rules towards negligence when parties' precautionary measures can be verified more easily. This leads to greater allocative gains (more precautionary measures can be included in the negligence criterion) and less cost (information costs due to the negligence criterion).

In addition, in proposition 6 *(ii)*, we have been provided with a reason why legal systems

[57] Shavell (1980a) and Schäfer and Schönenberger (2000).
[58] Shavell (1987) at 29. See also Landes and Posner (1987) at 70.
[59] Shavell (1987) at 31-32.
[60] Shavell (1987) at 31.
[61] Shavell (1987) at 32.
[62] Shavell (1987), at 31-32. See also Landes and Posner (1980) and Schäfer and Schönenberger (2000).

tend to prefer no-liability-based negligence rules to strict-liability-based negligence rules, in order to reduce compensation costs.

These two findings, once combined, can explain why modern societies, where judicial expertise is quite well developed and the cost of acquiring information concerning many parties' precautionary measures tend to be low, adopt a general fault-based regime of tort liability, which holds the injurer responsible only if negligent. This choice saves the higher compensation costs due to a corresponding negligence regime based on strict liability, as formalized in the model by Exp. (6).

3.7.B. The implementation of strict liability in specific areas of torts

Let us first consider unilateral-precaution accidents, where the injurer is the only party who can take some precaution in order to reduce the expected accident loss and the domain of strict liability is incontestable, given the fact that this rule provides optimal incentives to injurers[63]. The traditional argument is that a negligence rule will be defective in that it does not spur injurer's optimal activity level.

Nevertheless, I have already shown that this is precisely due to the cost associated with verifying some of the injurer's precautionary measures (those which are to be classified as activity level) and, therefore, if information costs are lower than compensation costs plus allocative costs, then a simple negligence rule might be preferable. In an extreme case, an omni-comprehensive negligence criterion (one in which all the precautionary measures are taken into consideration) will have the same allocative effect as a strict liability rule (providing the same incentives for the injurer). The choice between the two depends on the comparison between the higher compensation costs under strict liability and the information costs due to a simple negligence rule.

In bilateral precaution cases, we shall add that the introduction of strict liability triggers an allocative cost because of the reduction in victim's incentives to take precaution. Often the rule in force is not exactly a strict liability rule but a no-liability-based negligence rule[64] with inversion of the burden of proof[65]. In such a case, the residual bearer is the victim[66]. This

[63] See Cooter and Ulen (2000).

[64] The severity of the negligence criterion only slightly affects this conclusion, as it concerns only with the balance between costs and benefits of precaution, and such a balance could well lead to the conclusion that it would have been optimal for the injurer to take maximal precaution.

[65] The Italian civil code is a good example as it clearly indicates where the burden of proof lies in each case. It comprises a detailed list of provisions of presumed fault or presumed responsibility, in which the burden of proof is placed on the injurer, see artt. 2047, 2048, 2050, 2053 and 2054 cc. The French system has mostly reached the same results through jurisprudence and doctrine. German law also provides many examples of inversion of the burden of proof through the doctrine of *prima facie proof*, which is similar to the common law solution of *res ipsa loquitur*, except that the latter cannot be rebutted.

[66] The case of presumed fault should be distinguished from that of presumed responsibility, the latter being a form of strict liability as, in the case of both parties being non-negligent, the injurer is the residual bearer.

observation strengthens the information argument, as it shows that the result reached by a strict liability rule, can be sometimes obtained by a no-liability-based rule, if inverting the burden of proof can lower the cost of verifying the injurer's precautionary measures. Nevertheless, I will consider some of those cases in the following analysis together with cases in which a truly strict liability rule is regularly implemented, not only for their proximity to that rule, but in particular for they can be justified within the same informational perspective[67].

Ultra-hazardous activities

In order to support the dangerousness criterion for strict liability, the case of ultra-hazardous activities is used to prove that, at least in most cases, the dangerousness of the activity triggers strict liability. This is the hypothesis of the most general and open application of strict liability by American courts[68], and by the courts in civil law countries as well[69].

Strict liability, however, is not justified by dangerousness alone, but rather by the *abnormality* of the activity. The activity must not be *in common use*. Activities that imply a high but *typical* risk (as motoring in American law) are excluded[70]. The criterion seems to be rather focused on what is well known as a distinguishable category from what is not well known and controllable. It seems that the injurer is "punished" by strict liability, not because he has embarked on a dangerous activity but rather because he has carried out an activity that goes beyond what all the others do, and hence he has to bear the *unknown consequences* of

[67] Landes and Posner (1987), at 107-122, consider strict liability regimes. They provide several efficiency justifications for strict liability, an analysis of which goes beyond the scope of this chapter. I will focus on two main aspects of their argumentation. Their claims are all based on the supposed natural dichotomy between care and activity level, which is criticized here. While Shavell (1987) limits his consideration to the dangerousness of the activity, they step forward and often consider the utility of the activity and compare it with the accident cost generated by the activity itself. Consequently, they derive a justification for strict liability when the utility is lower than the cost (as in the case of vicious dogs at 109). However, if costs and benefits can be confronted, the activity level will be easily considered in the determination of negligence, as shown by Gilles (1992). Hence, this cannot be a justification for strict liability. A second recurrent argument seems to confirm the thesis defended here, that the choice of the residual bearer depends on the verifiability of parties' behavior. With respect to employer's vicarious liability, at 121, they provide as the only argument for vicarious liability to be strict that "there are a number of activity measures (as distinct from care measures) that an employer can take to reduce accident behavior by his employees". The point is indeed the distinction between "care measures" (that also simple negligence would enhance) and "activity measures" (for which strict liability is needed). The only meaningful interpretation of such a distinction which I can think of is the one I provide in the text. However, once this step is taken, the argument becomes the one of verifiability that I discuss. They adopt the same justification at 115. "During the early stage of the development of a new product or activity, the legal system lacks sufficient experience to be able to determine whether the benefit of the product exceeds its full cost […] One way to generate such information is to hold the producer or the user strictly liable". It is indeed a problem of information. Nevertheless, Landes and Posner (1987) do not consider one crucial consequence of such an approach: that the concepts of care and activity level expand and shirk depending on the cost of acquiring information concerning the parties' precaution. This is a central point of my analysis.

[68] Fleming (1983) at 302. Restatement Second of Torts, 520.

[69] See for example art. 2050 of the Italian civil code, which represents an advance over earlier continental codes, Stone (1972).

[70] In *Rylands v. Fletcher* (1866) L.R. 1 Ex. 265, affd. (1868) L.R. 3 H.L.330, the reference is to *non-natural* use.

having done so.

It does not seem strange to conclude that also the informational characteristics of the activity, and not only its dangerous potential, contribute to triggering strict liability[71].

Further examples will corroborate this view, but first it is worth commenting on the legal definition of an *abnormally dangerous activity* as that activity which cannot be made safe by ordinary precaution. It is hard to find any economic justification for such a statement, as any activity, even those which are less risky, will result in some *efficient* accidents, given that the optimal level of precaution is not necessarily the level of precaution that results in no accidents at all. In these terms, no activity is safe. Moreover, the optimal level of precaution for a specific activity depends on the balance between its costs and benefits, and can well be higher or lower than the ordinary level (i.e. the optimal level of precaution for most of the activities).

Vicarious liability

Even under its many different applications (liability of the supervisor for the harmful actions of a child or an adult under supervision, liability of the employer for the actions of employees, within the scope of the employment), vicarious liability usually triggers either the application of strict liability[72] on the defendant vicariously liable or the allocation to him of the burden of proof under the ordinary negligence regime[73].

In principle, vicarious liability is applied to a party (the principal) who can control the action of another party (the actual injurer). Such responsibility is usually considered as deriving from the principal's failure to select, direct, educate or bring up the other party, and could well be claimed under the general principle of negligence. Here it is even clearer that the application of the general negligence rule is rendered difficult by the high cost of verifying the injurer's precautionary measures, because it is inherently cumbersome to prove that the harm caused by a child is due to the bad education imparted by his parent, or that the harm caused by certain schoolchildren is due to a lack of teacher's discipline[74]. The dangerousness criterion alone is clearly no appropriate explanation for these cases.

Damages caused by things

With respect to damages caused by things, a broad variety of legal solutions can be found,

[71] See section 3.4.C.

[72] Italian, French and American systems in general opt for strict liability in the case of liability of the employer for the actions of employees. The German system sometimes reaches the same result but only through a complicated interpretation of the general principle of negligence (Eörsi, 1975).

[73] Liability of the supervisor for the harmful action of a child or an adult under supervision is governed by a presumption of fault on the part of the supervisor in most legal systems (Le Gall, 1976).

[74] "Generally faulty supervision would be difficult of proof" (Le Gall, 1976, at 6).

partially due to national traditions and particular beliefs, as is evident in the case of damages caused by animals. Although, in some instances, the general principle of fault is applied, most legal systems make a broad use of strict liability or of the inversion of the burden of proof.

Damages caused by wild animals are generally dealt with under a strict rule, irrespective of the dangerous nature of the particular animal or of its domestication[75], and even non-dangerous species sometimes[76] fall under such a regime, merely because they are *unusual* in a particular country or region.

Ruinous buildings trigger the application strict liability in most cases[77], and so do thrown[78] or falling[79] things, as "in many cases, the activity or negligence of some person cannot be demonstrated"[80].

As a corollary, it is worth noticing that strict liability can also be used as an inexpensive negligence rule, which assumes that the optimal level of precaution is the maximal level possible. This occurs when the marginal cost of maximal precaution (not acting at all) is equal to or even smaller than the marginal benefit in terms of a reduction in the expected accident losses. On the one hand, an omni-comprehensive negligence criterion will serve the same purpose by making acting injurers liable, but it would bring along greater informational (and plausibly allocative) costs. On the other hand, banning the activity might be a feasible solution, at the price of forbidding some potentially welfare enhancing activities. Strict liability seems to be a good intermediate solution. In this case also, dangerousness alone does not provide a distinguishing criterion. An example is the application of strict liability to harm caused by a domesticated animal, if its keeper was aware of its dangerous disposition[81].

Sometimes negligence defenses are allowed, but often they are not. As we have already noted, this depends on the balance between the information costs and the allocative gains of the negligence rule.

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[75] This is the case under Italian, French, and German law, which employ a rigid distinction between wild (*ferae naturae*) and domesticated animals. On the contrary, common law, and, English law in particular, comprise a very refined and complex distinctive criterion. For domesticated animals the *scienter* is of general use. Stone (1972), Fleming (1983), Epstein (1999).

[76] In Italian law, for instance.

[77] French, Belgian and Italian law adopt a presumption of responsibility; common law makes general use of strict liability, although it employs fault for damages to persons in the premises. German law presumes injurer's fault.

[78] Civil law countries follow the Roman tradition of dealing with these instances under a strict liability regime, while common law requires fault.

[79] In general, strict liability or presumed responsibility are largely applied.

[80] Stone (1976) at 32.

[81] Stone (1976), Fleming (1983), Epstein (1999). The cost of the maximal precaution (not keeping the animal at the cost of a foregone benefit) seems plausibly lower than the expected personal injuries resulting from an accident. See Landes and Posner (1987) at 119.

3.7.C. Room for no liability

Although legal systems provide for a general principle of negligence and do not consider no liability as a liability rule, but rather as a non-rule, no liability is a liability rule in an economic sense, because it allocates the accident loss as any other liability rule does [82]. No liability results when the legal system does not entitle the victim to recover damages, irrespective of the injurer's level of precaution. No liability has a major advantage: it saves both information costs and compensation costs, as no reallocation of accident loss takes place.

Ancient law evolved by producing, at the beginning, tort rules based on strict liability only for specified wrongs, in order to serve the economic goal of reducing the administrative costs. Obviously, this is obtained at the (allocative) cost of no injurer's precaution.

Modern legal systems still limit the scope of their liability regimes in different and more sophisticated ways (by listing the categories of wrongs that give rise to liability or by setting minimum thresholds on the injurer's causal contribution to the accident), but tend to be broader than their ancient predecessors, as the overall cost of administering liability is supposed to be lower.

The discussion on no liability is not as rich as the one on strict liability, as, under the former, the legal system simply denies injurer's responsibility.

3.8. Concluding remarks

In this chapter, I have shown that the definitions of care (as precaution) and activity level (as number or frequency of actions), traditionally employed in the literature, are tautological and therefore difficult to apply, because any precautionary measure always fits both definitions. Hence, they do not provide for a criterion to decide whether a particular precautionary measure should be considered as belonging to one category or the other.

The reason is that the traditional concepts of care and activity level are defined out of the model, as assumptions. On the contrary, I have shown that the appropriate definitions thereof are produced by the model itself: care is the subset of precautionary measures included in the negligence criterion and activity level is the residual subset of precautionary measures that are not included in the negligence criterion.

The determination of the extent of the negligence criterion, i.e. the decision of which precautionary measures should be included in it, follows from a choice made by the legal system and based on efficiency considerations: the balance between the costs of inclusion (information costs of inquiring into parties' precaution) and its benefits (the parties take more

[82] Landes and Posner (1987) at 62.

precaution). The activity-level theorem describes the effect of such a choice: precautionary measures excluded from the negligence criterion will remain untaken.

It has been said that the analysis of "activity level vs. care" and, consequently, the activity-level theorem[83] "undermined the confidence in the efficiency of tort law"[84]. However, the opposite is true. The activity-level theorem does not concern any failure of the tort liability system, but it accounts for the allocative costs of excluding some precautionary measures from the determination of negligence. Since such exclusions can be justified on efficiency grounds as they save information costs, the whole picture should rather be regarded as the result of an efficient balance between costs and benefits.

The aim of this chapter has been indeed to show that the problem of determining the extent of the negligence inquiry, the boundaries of the concepts of care and activity level, and the relevance of the activity-level theorem can be fully understood only if the information costs of determining the parties' precaution are taken into account.

The framework elaborated in this chapter also permits us to reinterpret the other fundamental theorem of tort law and economics: the efficiency-equivalence theorem by Landes and Posner (1980). They show that any negligence rule provides both parties with the same incentives with respect to care. My analysis shows that their result holds (and with respect not only to care, but to precaution in general) only in a world with no administrative cost (proposition 2). When administrative costs are considered, negligence rules yield different outcome, not only because they trigger different administrative costs, as the authors argue, but also because they trigger negligence criteria of different extent (proposition 3).

Besides the determination of the extent of the negligence criterion, the legal system makes a second fundamental choice: it decides whether the victim or the injurer is the residual bearer. This choice has traditionally been analyzed under the label of "strict liability vs. negligence"[85]: under strict-liability-based rules the injurer is the residual bearer, under no-liability-based rules (usually simply referred to as negligence[86]) the victim is the residual bearer. Such a choice has been explained by referring to the dangerousness criterion: the party, whose activity is more dangerous, is to be chosen as the residual bearer, in order to provide him with better incentives.

I have shown that the dangerousness criterion is not a sufficient explanation, as the cost of verifying parties precaution should also be taken into account (verifiability criterion): the party whose precautionary measures are more expensive to verify is to be chosen as the

[83] In their original formulation, by Shavell (1980a).
[84] Donohue (1988), at 1058.
[85] Shavell (1980a). The term "strict liability" refers to what we defined as strict-liability-based rules (with or without negligence defenses); the term "negligence" refers to no-liability-based negligence rules.
[86] See previous footnote.

residual bearer, in order to save administrative costs.

In addition to that, a third element is to be considered: strict-liability-based rules trigger compensation costs, while no-liability-based rules do not, because in the latter case a non-negligent injurer never pays compensation to the victim.

The choice between strict liability (strict-liability-based rules) and negligence (no-liability-based rules) is, therefore, to be analyzed under all those three lenses: neither of them is sufficient alone. I have shown that such an approach can explain the choice of liability rules in modern legal systems also in those cases that Shavell (1987)[87] considers as puzzling, as they cannot be justified by the dangerousness criterion. I have demonstrated that the same approach can explain the evolution of liability systems over time and the tendency of tort law to move from the localized use of strict liability towards the implementation of a general no-liability-based negligence regime.

The forgoing analysis raises some additional related points.

(i) The model considers a limited set of rules: no liability, strict liability and its negligence variants, simple negligence and strict liability with defense of contributory negligence. The latter have in common the negligence applies only to the non-residual bearer.

Legal systems provide other liability rules, by adding an additional negligence criterion to the residual bearer's behavior. Under contributory negligence, both the injurer (the non-residual bearer) and the victim (the residual bearer) are subject to the negligence inquiry: the injurer pays only if he is negligent and if the victim is non-negligent. However, in equilibrium, we expect both parties to behave non-negligently; hence, the victim always bears the accident loss.

This rule has no allocative advantage over simple negligence. The victim has an incentive to take all his precautionary measures (irrespective of the negligence criterion) as he bears the residual loss; the injurer has an incentive to comply with the negligence criterion, as under simple negligence. Nevertheless, contributory negligence triggers higher information costs, as it doubles the negligence inquiry. The application of comparative negligence would increase the information costs even further. My framework suggests that simple negligence should be preferred over contributory or comparative negligence, which may be justified on different grounds[88].

A similar reasoning applies to strict liability with defense of dual contributory negligence, a strict-liability-based negligence rule.

(ii) Risk allocation has not been taken into account. It is a well-established belief that the tort

[87] See Shavell (1987) at 31-32.

system is more expensive than the insurance system as a way to allocate risk. However, the cheapest-cost insurer criterion can play an important role in the decisions concerning the tort law system to implement[89], as the residual bearer is provided with incentives to buy insurance coverage.

(iii) Another dimension for the comparison between different legal rules is provided by an analysis of the incentives to acquire information about risk. In general, the residual bearer has an incentive to do so, and this could serve as a criterion for the choice of liability rules. Strict liability will provide incentives to injurers, simple negligence to victims[90].

(iv) The conclusions reached here for accidents between strangers could be profitably extended to analyzing accidents between parties of a contract, as in the case of product liability discussed in section 3.6.B.

(v) The negligence criterion can be defined ex post by the court, case by case, or be based on an ex ante rule of negligence precisely defined by a regulatory body, the legislature or judicial decisions. Gilles (1992) argues that the choice between case-specific (ex post) and rule-based (ex ante) techniques to determine negligence depends on the cost of evaluating precaution. As information costs become higher, "the courts are more likely to employ the techniques of rule-based negligence to make such inquiries possible" (Gilles, 1992, at 336). For this reason, as precautionary measures traditionally regarded as activity level are likely to be more costly to verify, they are usually dealt with through rule-based negligence (Gilles, 1992, at 337), while care measures are dealt with through case-based decisions. Such an approach is consistent with my framework and confirms that the distinction between care and activity level is endogenous to the model (and to the legal system).

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[88] See Landes and Posner (1980). The literature on comparative negligence is quite extensive.
[89] See Calabresi (1970) and Trimarchi (1961).
[90] See on this point Shavell (1980a) and Shavell (1992).

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