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ON THE OPTIMAL SCOPE OF NEGLIGENCE

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ABSTRACT

This article studies the optimal scope of negligence, considering which of the parties' precautionary measures should be included in the determination of negligence and which instead should be omitted. The analysis shows that the optimal scope of negligence balances the reduction of accident costs with the administrative costs of the system. This approach also provides insights on the notions of care and activity level and their boundaries, and on the choice between strict liability and negligence.

JEL classification: K00, K13.

Keywords: activity level, care, precaution, negligence, evolution of liability.

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Stat rosa pristina nomine, nomina nuda tenemus^{**}

1. Introduction

Thus far, economic analysis of tort liability has focused on the problem of defining optimal *levels* of due care, as, for example, the maximal speed on the road. However, reality and law are more complex than that. In fact, motorists can prevent accidents not only by moderating their speed, but also by controlling the good functioning of their brakes, correctly using the rearview mirror, avoiding driving when tired, driving their car less often, and so forth. Interestingly, only some of these precautionary measures are relevant for a finding of negligence.

Under any fault-based liability rule, the law or the courts determine due *levels* of precautions, and define the *scope* of negligence, determining which of all possible precautionary measures should enter the negligence inquiry. Until now, economic analyses have disregarded the multidimensional nature of precaution and thus have not studied the optimal composition of the bundle of precautionary measures that, if untaken, amount to negligent behavior.¹

To use a metaphor, the set of precautions may be analogized to a school of fish. When one employs a fishing net (the negligence criterion) some fish will be caught (care) while some will swim away (activity level). This paper is concerned with the optimal size of the fishing net (the optimal scope of negligence), which balances the (administrative) cost of having a bigger net with the benefit of catching more fish (improved incentives to take precaution).

I will demonstrate that setting the scope of negligence is conceptually equivalent to defining the boundary between the notions of care and activity level, the two most fundamental concepts in the economic analysis of tort liability. According to their initial definitions in Shavell (1980a), these notions exclusively depend on the determination of negligence, that is, they are *endogenous* to the legal system.² Nevertheless, all formal models of tort law have

^{**} “The primordial rose still exists through its name; it is naked names we cling to.” As quoted in Eco, Umberto (1980), *Il nome della rosa*, Milano: Bompiani [English version, (1983) *The Name of the Rose*, San Diego: Harcourt], from Bernard of Morlay, *De contemptu mundi*.

¹ My endeavour is close in spirit to Demsetz (1967), who lamented that economists had only taken into account the price and quantity of goods exchanged in the marketplace, while disregarding how the bundle of rights that is exchanged with the good (or that constitutes the good) is formed.

² See Shavell (1980a) at 2-9, 22, and 23, maintaining that ‘it can be seen that what is important about the variable “activity level” is only that it is not included in the care standard.’ See also Shavell (1987) at 9, 25, 36 (remark 2), 40 (remark 2) and 46 (in the text and in footnote 59), noting that the *only* crucial divide between care and activity level is the fact that negligence rules incorporate care but do not incorporate activity level. Critics of this approach have only partially accepted that the concepts of care and activity level are endogenous in nature: see Donohue (1989) at 1062, Latin (1987) at 503, and Gilles (1992) at 329. See instead Miceli (1997) at 28, and Kaplow and Shavell (2002) correctly distinguishing care from activity level on the basis of the negligence inquiry.

adopted simpler *exogenous* concepts (determined according to some natural and immutable criteria, other than the law), thus completely missing the opportunity to discuss the issues under scrutiny here.

The exogenous approach, although very successful on pedagogical grounds,³ will be shown to be theoretically incorrect and logically inconsistent, besides adumbrating the real endogenous nature of these concepts and the problem of setting the scope of negligence.⁴

In section 2, I will inspect why this additional dimension of the negligence inquiry has surprisingly been neglected in economic analyses. This is due, as I will explain, to a simplistic use of the exogenous version of the concepts of care and activity level. In sections 3 to 5, I will provide a model for the optimal *scope* of negligence and, in section 6, I will show how recognizing the importance of this problem changes our understanding of the *strict liability versus negligence* diatribe and of the related question of who should bear the residual cost of accidents. Section 7 will conclude.

2. The boundary between care and activity level

The distinction between the concepts of care and activity level is fundamental for the law and economics of tort liability. It was emphasized in the early economic analyses of tort⁵ and later brought to its state-of-the-art conceptualization by Shavell (1980a).

Shavell (1980a) asked the question why some precautionary measures – such as the

³ 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”. See also Miceli (2004) at 66. Landes and Posner (1981) at 851, 875-878, and (1987) at 61, and Posner (2003) at 178, remarking that ‘one way to avoid an auto accident is to drive more slowly; another is to drive less,’ adopt the same definitions. Cooter and Ulen (2000), at 332, define activity level as the “amount” of one’s action, while the definition of care is generally a straightforward identification with the common concept of precaution. See also Brown (1998) at 18. The same approach can be found in Epstein (1999), at 97.

⁴ This study also relates to the literature on how accurate legal rules should be. See Kaplow and Shavell (1994), discussing mistakes in determining who committed a harmful act, Kaplow and Shavell (1996), studying accuracy in the assessment of damages, Craswell and Calfee (1986), discussing the effect of uncertainty in determining the *level* of due care, and Ganuza and Gomez (2002), discussing the tailoring of the injurer’s *level* of due care to heterogeneous victims’ types. See also Kaplow (1995), discussing in general the optimal degree of complexity of legal rules. To my knowledge, issues concerning the *scope* of negligence have not been discussed in the literature.

⁵ See Calabresi (1970) at 108-109, 259-261. Posner (1973) at 208-209 noticed that precautionary measures that are not taken into account by the courts in determining negligence will only be taken by the residual bearer. He describes the choice between railroad and canal transportation and notices that even when they are carried out with optimal care there will nevertheless be a certain number of unavoidable accidents. He assumes that the frequency of unavoidable accidents is higher for the railroad. Hence some of those accidents ‘are not unavoidable. In fact, they could be avoided by the substitution of canal for railroad transportation.’ He further notices that ‘in principle a negligence standard would require the railroad to bear the cost of those accident [...] But perhaps courts are incapable of making interindustry comparisons in applying the negligence standard’. The latter remark is in line with my contention that the divide between different classes of precautionary measures is based on whether or not they are verified before the court. Diamond (1974a) at 146 distinguishes between 3 different sets of precautionary measures: 1) (a reduction in) the time devoted to the activity, 2) precaution that affects the magnitude of the harm and 3) precaution that affects the probability of an accident. In the analysis, he assumes that courts do not consider the former two and only base their judgment on the latter. Besides some differences in the formalization of the problem and in the terminology used, such conceptualizations are substantially endogenous.

frequency with which motorists use their cars or the correct use of the rear-view mirror – are not always incorporated into the determination of negligence, although they are relevant for accident prevention, and found that the reason is the excessive cost of observing these precautionary measures or else calculating their optimal levels.⁶

Stated differently, the complete set $P = \{p_1, ..., p_z\}$ of all possible precautionary measures may be ideally subdivided into two subsets: *care*, the subset C of those measures that are included in the determination of negligence, and *activity level*, the residual subset A of those measures that are omitted from it.

Accordingly, whether a specific precautionary measure p_i belongs to the subset C or to the subset A only depends on how the negligence inquiry is defined and thus it is a mere matter of law. In this sense, the notions of care and activity level are entirely *endogenous* to the legal system and, more precisely, to the determination of negligence.⁷

It is easy to see that, according to these definitions, care and activity levels are complementary subsets of P , $C \cup A = P$, and that their intersection is empty, $C \cap A = \{\emptyset\}$. In other words, a precautionary measure p_i belongs either to C or to A , that is, any precautionary measure is either to be defined as care or as activity level, *tertium non datur*.

Furthermore, since care is precisely what enters the negligence inquiry, the scope of negligence and the definition of care are identical notions and, if the determination of negligence changes, the definition of care and, as a result, the complementary definition of activity level also change.⁸

Although it is clear from Shavell's (1980a) analysis that the notions of care and activity levels are endogenous to the legal systems, in order to exemplify these concepts, Shavell refers to care as the precaution used while exercising a certain activity, and to activity level as the frequency of such an activity.⁹ These pedagogical simplifications are substantially different

⁶ See also Shavell (1987) at 25, 50, 56, and 57, Landes and Posner (1987) at 66-67, and Miceli (1997) at 28. There is, nevertheless, an inconsistency in Shavell's own literature. In fact, if one accepts the endogenous definitions, one must also concede that if no negligence inquiry applies, the distinction between care and activity level simply does not exist. Thus, under strict liability, the subsets themselves cannot be defined for the lack of a criterion to do so, because, since no precaution enters the negligence inquiry, all the parties' precautionary measures have to be defined as activity level. Shavell (1980b) at 476, which analyzes the issue of causation, states that in order to understand how the scope of liability should be determined 'we must consider the effect of strict liability on the injurer's decision whether to engage in an activity and, if so, on his decision about care.' His subsequent analysis is based on such a distinction. The problem is how to define the concepts of care and activity level in this case, since no negligence inquiry applies.

⁷ See *supra* footnote 2.

⁸ Shavell (1980a) at 11 and 22-23, and (1987) at 26 and 46 acknowledges that the negligence criterion could in theory encompass all of the parties' precautionary measures; in this case, the negligence rule would not fail to provide optimal incentives with respect to all of them, and the subset A would be empty. See also Calabresi (1970) at 111.

⁹ 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

from the original definitions, as they depict care and activity level as exogenous concepts, defined on the basis of some natural characteristics, which are independent of the law.

These exogenous simplified definitions have been more successful than the original endogenous ones and have pervaded law and economics textbooks¹⁰ and the mathematical models written so far.¹¹ It is clear that moving from endogenous to exogenous notions adumbrates issues concerning the optimal scope of negligence. Moreover, the exogenous definitions are only valid as examples. On both the theoretical and the empirical level, they are incorrect and logically inconsistent. Thus, they should be used with caution.

The exogenous definitions are incorrect because it is not true that the repetition of a risky activity necessarily escapes the negligence inquiry, but it does so only for some activities and not for others. Gilles (1992) found that American courts often consider such issues under negligence.¹²

Likewise it is not true that the way in which a dangerous activity is conducted is always considered while determining negligence; there are many precautionary measures that have nothing to do with the repetition of risky actions and that nevertheless are omitted from the negligence inquiry. Shavell (1987) at 9 refers, for example, to the use of the rear-view mirror as a typical precautionary measure that is not taken into account while deciding on a motorist's negligence.¹³ The exogenous definitions are thus both over-inclusive and under-inclusive, and they fall short of proper conceptualization and of actual judicial practice.

They are also logically inconsistent, because they are not mutually exclusive. In other words, any precautionary measure defined as care according to the exogenous definitions can be reinterpreted as a level of activity and vice versa.¹⁴ For example, riding a bike on a dangerous road may be seen as a lack of care, if emphasis is put on the fact that the cyclist could have rode on a safer trail. However, one could interpret this form of precaution as the frequency of the activity 'riding on dangerous paths', which is a different activity from 'riding of safe paths'.¹⁵

This exercise can be easily repeated for any other precautionary measure: speed may be seen as care or, alternatively, driving fast may be seen as a different activity from driving

of the road, using a brightly colored vest) as his level of care". Consider also the prose of Shavell (1980a) at 2 ff..

¹⁰ See *supra* footnote 3.

¹¹ The standard model derives from Shavell (1980a). Shavell himself models care as a one-dimensional variable x for the injurer or y for the victim. Likewise, activity level is modeled as a one-dimensional variable s for the injurer or t for the victim. This mathematical formulation and those that followed do not address the problem of choosing which precautionary measures to put in x and which to put in s .

¹² See also Shavell (1987) at 9 and 26 in the text and in footnote 33, and Landes and Posner (1987) at 70-71.

¹³ Shavell (1980a) at 23, making the point that not only the frequency of an activity escapes the determination of negligence, notices that 'Any other variable omitted from the standard would also be inappropriately chosen in many of the circumstances in which we said the same of the level of activity.' See also at 10, footnote 14 and (1987) at 9, where he speaks of several dimensions of care.

¹⁴ See Gilles (1992) at 329 to 336 recognizing this point.

¹⁵ Diamond (1974a) at 110 observes that '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

slowly; taking one's car less often and switching to public transportation may be seen as care or, alternatively, mileage may be seen as a level of activity; and so forth.¹⁶

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? This and similar questions cannot be unambiguously answered within the exogenous approach, while they have a univocal solution in the endogenous one. A precautionary measure is care if the court considers this aspect while deciding on the issue of negligence, while it is activity level otherwise.

Other distinctions are often proposed in the literature, such as durable v. instantaneous precautions, frequency claims v. choice-of-activity claims, avoidable v. unavoidable accidents,¹⁷ and similar categorizations. Some of these notions might indeed succeed in describing what in fact courts consider relevant for a finding of negligence. However, there is a difference between mere correspondence with facts and the explanatory power of a theory.

The basic question of why the courts only include some precautionary measure remains unanswered under all such approaches. The reason might be that the courts suffer from some a priori bias against, say, frequency claims, but a better explanation is that bringing frequency claims into the determination of negligence would often entail prohibitively high administrative costs (acquisition of information, determination of causation, and so forth). Thus, it is crucial to assess the administrative costs of evaluating the parties' behavior, rather than the nature of their precautionary measures.

3. A model of the optimal scope negligence

We consider accidents between a victim and an injurer, strangers to each other, both 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. Causation is assumed to be satisfactorily established. Contrary to the standard model, parties' precaution is multidimensional: both parties can reduce the expected accident loss by taking many different precautionary measures.

adopts slightly different concepts of care and activity level from those adopted by Shavell (1980a).

¹⁶ 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, 2003, at 169-170). 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 scope" and indeed "modern American negligence law regulates activity levels to a considerably greater scope than has previously been recognized" (Gilles, 1992, at 320). See also Grady (1983).

In vectors, subscripts denote the position of the element in the vector. Subscripts denote partial derivatives elsewhere. When applicable, functions will be assumed to be continuous and continuously differentiable to any desired order. In order to simplify notation we will use normal letters for the injurer and the same letters with an upper bar for the victim. All the assumptions and notation will only be stated for the injurer and will automatically apply to the victim as well. For example, p_i will denote one of the injurer's precautionary measures; hence, $\bar{p}_i$ will denote one of the victim's. Let:

- P = row vector of all the injurer's possible precautionary measures, $P = [p_i]_{1 \times z}$,
 $p_i \geq 0, i=1, \dots, z$;
 l = expected accident loss, l is a decreasing and strictly convex function of each of the parties' precautionary measures.

Let the social objective be the minimization of the sum of expected accident loss and the parties' precautions:

$$(1) \quad \min_{p_i, \bar{p}_i} [l(p_1, \dots, p_z, \bar{p}_1, \dots, \bar{p}_z) + p_1 + \dots + p_z + \bar{p}_1 + \dots + \bar{p}_z].$$

From the assumptions made, it follows that there will be unique optimal levels p_i^* of each of the parties' precautionary measures that minimize Exp. (1). We will now rewrite this model in an equivalent yet simpler way.

Let us separate the parties' choice over precaution into two distinct steps: the decision of whether or not to take a precautionary measure, and, if so, the choice of the appropriate level. The latter choice will still be expressed by the vector P . Concerning the former, let:

- E = column vector of the injurer's choice of whether or not to take a precautionary measure, $E = [e_i]_{z \times 1}$, $e_i \in \{0, 1\}$, $i=1, \dots, z$; if $e_i=0$, then $p_i=0$; if $e_i=1$, then $p_i \geq 0$.

The column vector E describes the choice of whether or not to take a certain precautionary measure out of the row vector P ; e_i equals 1 if precaution p_i is taken and 0 if it is not. The vector E is a redundant element: it is easy to show that $e_i p_i = p_i$.¹⁷ Therefore, the social objective may be rewritten in the following way, which is equivalent to Exp. (1).

$$(2) \quad \min_{p_i, e_i, \bar{p}_i, \bar{e}_i} [l(e_1 p_1, \dots, e_z p_z, \bar{e}_1 \bar{p}_1, \dots, \bar{e}_z \bar{p}_z) + e_1 p_1 + \dots + e_z p_z + \bar{e}_1 \bar{p}_1 + \dots + \bar{e}_z \bar{p}_z].$$

Let us now simplify Exp. (2). The injurer's total expenditure in precaution and the number of

¹⁷ See Gilles (1992) at 327 for a critical account of different views.

¹⁸ In fact, a positive level of p_i implies $e_i=1$, hence $p_i e_i = p_i$. If $p_i=0$, $p_i e_i = 0 = p_i$ for any value of e_i .

the injurer's precautionary measures can be denoted by scalars as follows. Let:

- x = level of precaution, the injurer's total expenditure in precaution,
 $x = P \times E$.
- n = scope of precaution, the number of precautionary measures that the injurer takes, $n = E^T \times E$.

Note that x is simply the sum of each taken p_i . Since the order of the precautionary measures is arbitrarily given, we can assume without loss of generality that the elements in the vectors P and E are always ordered so that, $e_i=1$ for $i=1,\dots,n$ and $e_i=0$ for $i=n+1,\dots,z$. In other words, the taken precautionary measures are listed before the untaken ones.

In addition, from the assumption of rational and wealth maximizing parties, it follows that:

- (I) Each party allocates optimally his precautionary expenditure x among the n precautionary measures that he takes, so that the expected accident loss cannot be further reduced without increasing x or n .¹⁹

Given a pair (x, n) , the individual level of each precautionary measure can be regarded as automatically determined according to assumption (I). It follows that each pair (x, n) uniquely²⁰ determines a certain level of the expected accident loss, which results from the optimal allocation of the expenditure x among the n precautionary measures taken. Given optimal internal allocation of x , the problem of determining the optimal level of each p_i is transformed into the problem of determining the optimal x . Thus, the expected accident loss of Exp. (1) can be redefined as follows. Let:

$$l = \text{expected accident loss, } l = l(x, \bar{x}, \bar{n}).$$

The expected accident loss depends on *how much* parties spend on precaution (the level x) and on *how many* precautionary measures they take (the scope n). For example, $l(10,3,25,2)$ indicates the expected accident loss when the injurer spends in total 10 on precautionary measures p_1, p_2 , and p_3 , and the victim spends 25 on precautionary measures $\bar{p}_1$ and $\bar{p}_2$.

From the assumption that l is a decreasing and strictly convex function of p_i , it follows that l is also a decreasing and strictly convex function x for any given n ;²¹ hence, the expected

¹⁹ Assumption (I) is equivalent to saying that the taken levels of $p_1, \dots, p_n$ are those levels that minimize l subject to $p_1 + \dots + p_n = x$, which directly follows from the assumptions of rationality and wealth maximization.

²⁰ It can be noted that any pair (x, n) yields a unique level of l , which is the lowest level of l attainable by allocating x among the n precautionary measures.

²¹ Note that, as x is defined as the sum of all p_i , a variation in one p_i , being all the others constant, yields an equal variation in x . Therefore, the assumption that l is strictly convex in each p_i , which is the extension to the multidimensional case of the assumption usually made in the standard model, yields that l is strictly convex in x , as we assume.

accident loss decreases (at a decreasing rate) if parties' precaution expenditures increase. Moreover, given assumption (I), it follows that when the number n of taken precautionary measures increases, the expected accident loss decreases or remains constant, because any additional precautionary measure can always be taken at a level equal to zero if it worsens accident prevention. Adding precautionary measures is equivalent to broadening accident prevention, while preserving the option not to invest in them. To summarize, from the assumptions of the standard model on the shape of l , we can derive two properties:

- (II) l is a decreasing and strictly convex function of x ;
- (III) $\Delta l / \Delta n \leq 0$.

This section should have convinced the reader that the standard model may be extended to encompass the possibility that parties may take various precautionary measures without adding assumptions or altering its substance, and that such an expanded model may be rewritten in a simpler way without loss of generality, which instead of focusing on each single precautionary measure, focuses on two macro-elements: the *scope* of precaution (the number of taken precautionary measures), and the *level* of precaution (the parties' total expenditure on precaution). We will verify in the next section that the results are exactly the same as in the standard formulation of Exp. (1).

4. The model without administrative costs

We start from the analysis of an ideal world, in which the liability system functions without administrative costs. We will later introduce administrative costs into this framework. This way we will be able to appreciate that the need to distinguish between care and activity level only arises when administrative costs limit the optimal scope of the negligence criterion, rendering it necessary to omit some of the parties' precautionary measures from the negligence inquiry. Proofs of parties' compliance with the negligence standards are given in the appendix.

4.1. The social cost in a world with no administrative cost

If the liability system functions without administrative costs, we simply define the social objective again as the minimization of the expected accident loss and the parties' expenditures in precaution.

$$(3) \quad \min_{x, n, \bar{x}, \bar{n}} [l(x, n, \bar{x}, \bar{n}) + x + \bar{x}] \quad \text{or} \quad \min_{x, \bar{x}} [l(x, z, \bar{x}, \bar{z}) + x + \bar{x}].$$

Let an asterisk mark the optimal values. Given assumption (III), $n^* = z$. Thus, the second part of Exp. (3) is correct. Moreover, given assumption (II), the solution for the injurer is given by a

(unique) level of x^* that solves $l_x + 1 = 0$, as in the standard model. For the victim, the same applies. The result we just obtained can be interpreted as follows: when there is no administrative cost, the social cost is minimized when parties take optimal levels of precaution expenditures and allocate them optimally among all their precautionary measures.

4.2. *Liability rules in a world with no administrative cost*

In this section, we consider four possible rules and compare their outcome with the social objective defined above: 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,²² which is a no-liability-based negligence rule).²³

The legal system makes two choices: it chooses the residual bearer and it decides whether and with what scope a negligence inquiry should apply. With regard to the negligence inquiry, unlike in the standard model, it ought to be specified both *which* precautionary measures the party has to take (the *scope* of the negligence criterion), and the due *level* of each of them.

4.2.1. Setting the negligence criterion when the victim is the residual bearer

No liability and simple negligence may be seen in continuity with each other: no liability is a simple negligence rule where the scope of the negligence criterion is zero. Under simple negligence, the negligence criterion encompasses some injurer's precautionary measures, and sets the due level for each of them. The victim is not subject to a negligence inquiry. Let us define the negligence criterion as determining the level of each of the precautionary measures that the injurer ought to take. The superscript ^d stands for 'due level'. It is worthwhile to note that while in the standard model the negligence criterion is defined as the due level of care, in this model – since precaution is multidimensional in nature – the negligence criterion also ought to be multidimensional:²⁴

$$(4) \quad N = \{p_1^d, p_2^d, \dots, p_n^d\}.$$

In order to simplify the model, let us assume that:

- (IV) For any given n and x , the social planner allocates the precaution expenditure x among the precautionary measures included in the negligence criterion such that

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. The same can be said with respect to the victim under negligence rules based on strict liability.

²³ In this classification, I follow Brown (1973).

²⁴ The negligence criterion targets some specific actions on the part of the injurer. In theory, the court could verify directly the expenditure x , instead of verifying the injurer's behavior as regards many different precautionary measures. However, the cost of precaution is often non-monetary, and although it can sometimes be estimated, it is

the expected accident loss cannot be further reduced without increasing x or n .

As we have done above, the negligence criterion of Exp. (4) can be redefined as a pair of x and n :²⁵

$$(5) \quad N = (x, n).$$

The problem of optimally setting the negligence criterion is therefore reduced to a twofold problem: the determination of the *optimal scope* n and of the *optimal level* x . Again, no liability is a rule in which $n=0$, while simple negligence has $n>0$.

As in the standard model, it is easy to show that if the negligence criterion is set at the socially optimal level and scope, both parties will take the socially optimal precautions. Thus, the optimal scope and the optimal level of the negligence criterion are x^* and $n^*=z$. As a result, the optimal no-liability-based rule is an omni-comprehensive simple negligence rule, under which all the injurer's precautionary measures are verified before the court while deciding the issue of negligence.

4.2.2. Setting the negligence criterion when the injurer is the residual bearer

For the sake of completeness, the same exercise can be repeated for strict liability. The residual bearer is the injurer and the negligence criterion focuses on the victim's behavior, and may hence be described as $\bar{N} = (\bar{x}, \bar{n})$. Likewise, the optimal scope will be $\bar{n}^* = \bar{z}$ and the optimal level $\bar{x}^*$. The optimal strict-liability-based rule encompasses a negligence defense, under which all the victim's precautionary measures are taken into account.

4.2.3. Choosing the residual bearer when there are no administrative costs

From the former analysis emerges the notion that both simple negligence and strict liability with defense of contributory negligence achieve the social optimum, as they both induce the victim and the injurer to take the optimal level of all their precautionary measures. Whether the injurer or the victim is the residual bearer is irrelevant for the efficiency of the rule.

5. A model of liability with positive administrative costs

In this section, we will introduce administrative costs in the functioning of liability.²⁶ We will

very difficult to verify. When it is possible to verify the costs directly, the problem becomes easier to solve.

²⁵ The ordering of the precautionary measures is relevant at this point. However, since it is merely arbitrary, it can always be adjusted so to be consistent with the results of the analysis. See also footnote 29.

²⁶ The literature has mainly been concerned with two problems: the effect of litigation costs on the levels of precaution actually taken by the parties – see Shavell (1987), chapter 11, Polinsky and Rubinfeld (1988a and 1988b), Hylton (1990) and Miceli and Segerson (1991), see also Polinsky and Che (1991), Kahan and Tuckman (1995) and Kaplow (1993) – and the desirability of liability when litigation is costly – see Shavell (1982), Menell (1983), Kaplow (1986) and Rose-Ackerman and Geistfeld (1987). On these grounds the relative advantages of different

consider two types of administrative costs: information costs and compensation costs.

Let:

- $I(n)$ = information costs in the case of simple negligence and no liability;
 $\bar{I}(\bar{n})$ = information costs in the case of strict liability with or without defense of contributory negligence;
 K = compensation costs in the case of strict liability with or without negligence defense.

Information costs are the *variable* costs that result from the introduction of a negligence criterion into a strict-rule framework. They may consist not only of the costs of gathering information needed to verify one party's behavior, but also of the costs due to a higher likelihood of errors and increased litigation, including the costs of judicial proceedings, lawyers' fees and any indirect costs borne by the parties.²⁷ Thus, let us assume:

$$(V) \quad \Delta I / \Delta n > 0, I(0) = 0.$$

Compensation costs K are the *fixed* 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 according to the negligence criterion, and he therefore never pays compensation.²⁸ Under strict-liability-based rules, the injurer always pays compensation to the victim, as the victim's dominant strategy is to behave non-negligently.

5.1. Social cost in a world with positive administrative costs

In a world with positive administrative costs, social costs encompass not only the cost of taking precaution and the expected accident loss as before, but also the administrative costs of the liability system. Exp (3) becomes:

$$(6) \quad \min_{x, n, \bar{x}, \bar{n}} [I(x, n, \bar{x}, \bar{n}) + x + \bar{x} + I(n)],$$

liability rules have been compared, see Goldberg (1984), Shavell (1987) at 264 and Miceli (1997) at 44 for an assessment. The perspective taken in this study is different: I analyze the problem of how the liability rule should be designed in the first place in response to the presence of litigation costs. In particular, I examine the novel problem of how the optimal scope of negligence (and consequently its level) changes as a function of litigation costs. Subsequently, I employ my findings to inquire into how the choice among different liability rules is affected by litigation costs. Moreover, while the literature has traditionally compared strict liability with simple (or comparative or contributory) negligence, my analysis is extended also to strict liability with defense of negligence.

²⁷ The fact that parties may settle might reduce the magnitude of information costs but does not eliminate the need for negligence criteria to be at least potentially verifiable before the court, and hence does not eliminate information costs; see Ordovery (1978) and Hylton (1990) on this point. On the fact that the possibility of settlement does not eliminate the presence of litigation costs, as the parties will incur them during the settlement bargaining, see also Miceli (1997) at 39-44.

²⁸ In reality, some cases are litigated (and adjudicated) also under simple negligence. This point might bear on the magnitude of K . Negative values of K would depict a situation in which in equilibrium more cases yield victims'

for simple negligence and no liability, and

$$(7) \quad \min_{x, n, \bar{x}, \bar{n}} [l(x, n, \bar{x}, \bar{n}) + x + \bar{x} + \bar{I}(\bar{n}) + K],$$

for rules based on strict liability with or without negligence defense. For any n , Exp. (6) is minimized by unique values of x and $\bar{x}$ that can be written as $x(n)$ and $\bar{x}(n)$. Furthermore, let:

$$L(n) = \text{total accident costs in the case of simple negligence and no liability,} \\ \text{where } L(n) = l(x(n), n, \bar{x}(n), \bar{n}) + x(n) + \bar{x}(n).$$

It is easy to show that $L(n)$ is minimized by $n^*=z$, which follows directly from assumption (III). Thus, Exp. (6) can be rewritten as:

$$(8) \quad \min_n [L(n) + I(n)].$$

Let n^j denote the level of n that solves Exp. (8), and hence solves $L'(n) = -I'(n)$.²⁹ The interpretation is straightforward: the optimal scope of the negligence rule balances decreasing accidents costs with increasing administrative costs. n^j may assume any value between 0 and $n^*=z$. If $n^j < z$, it is efficient to let some injurer's precautionary measures untaken in order to save information costs. If $n^j = 0$, no liability is superior to simple negligence, and it is efficient to let the injurer not take precautions. For the sake of completeness, let $x^j = x(n^j)$ and $\bar{x}^j = \bar{x}(n^j)$ denote the (unique) optimal levels of x and y when the victim is the residual bearer, which minimize Exp. (6), given n^j and $\bar{n}^*$.

Likewise, Exp. (7) can be rewritten as:

$$(9) \quad \min_{\bar{n}} [\bar{L}(\bar{n}) + \bar{I}(\bar{n}) + K],$$

where:

$$\bar{L}(\bar{n}) = \text{total accident cost in the case of strict-liability-based rules.}$$

Let $0 \leq \bar{n}^v \leq \bar{z}$ denote the value of $\bar{n}$ that solves the Exp. (9). Let x^v and $\bar{x}^v$ denote the (unique) optimal levels of x and $\bar{x}$ when the injurer is the residual bearer, which minimize Exp. (7), given n^* and $\bar{n}^v$.

We can now compare the results attained under the two separate hypotheses in order to ascertain whether it is socially efficient that the victim or the injurer be the residual bearer. It is socially desirable to choose the setting that yields the least social costs, the criterion being:

$$(10) \quad L(n^j) + I(n^j) <> \bar{L}(\bar{n}^v) + \bar{I}(\bar{n}^v) + K.$$

compensation under simple negligence than under strict liability with defense of contributory negligence.

²⁹ The solution is not necessarily unique. In this case, any of the resulting levels of n will be socially efficient and hence the lawmaker may choose either of them as a benchmark for policy decisions. Moreover, placing the injurer's precautionary measures in a different order might provide different level of n as a result. We take into consideration the ordering that triggers the lowest total cost $L(n) + I(n)$.

5.2. Liability rules in a world with positive administrative costs

Let us now analyze how different liability rules can be defined in order to achieve the social objective indicated in the previous section.

5.2.1. Setting the negligence criterion when the victim is the residual bearer

In a world without administrative costs, $n^*=z$ was optimal. If administrative costs are introduced the scope of the negligence criterion might be optimally restricted to n^j , in order to save information costs. Let us discuss the three possible outcomes:

- $n^j=0$. If information costs are very 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.
- $n^j=z$. 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 when administrative costs are positive.³⁰
- $0 < n^j < z$. In intermediate cases, the negligence criterion includes only some of the 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 scope.

Once the scope of the negligence criterion has been optimally set at n^j , the level of precaution expenditure should also be set at the socially optimal level x^j .³¹

5.2.2. Setting the negligence criterion when the injurer is the residual bearer

Under strict-liability-based rules, the negligence criterion may be straightforwardly set at the optimal scope $\bar{n}^v$ and at the optimal level $\bar{x}^v$. As before, three major cases might result with respect to the scope of negligence:

- $\bar{n}^v = 0$: strict liability.
- $\bar{n}^v = \bar{z}$: strict liability with defense of omni-comprehensive contributory negligence.
- $0 < \bar{n}^v < \bar{z}$: strict liability with defense of contributory negligence.

³⁰ See Shavell (1987) at 30 on this point.

³¹ Nevertheless, contrary to the conventional wisdom, a negligence criterion set at the optimal level does not necessarily imply the injurer's compliance with the rule. Indeed, injurers might find it advantageous not to comply with the due level and pay damage compensation, as this outcome might be privately optimal, even though socially inefficient. We will discuss the problem of an injurer's not complying with an optimally set negligence criterion under simple negligence and its implications for the analysis in appendix C.

5.2.3. Choosing the residual bearer when administrative costs are positive

In a world with positive administrative cost, the optimal simple negligence (or no liability) rule is not necessarily equivalent to the optimal strict-liability-based rule, as the optimal scope 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 least social (allocative and administrative) costs. Thus, the residual bearer should be optimally chosen in order to minimize three different costs: the total accident costs, the information costs of verifying either the injurer's or the victim's behavior, and the compensation costs that arise when the injurer is the residual bearer. Exp. (10) has provided with a formal scale to balance these costs.

Figure 1 depicts the former results and shows that, when administrative costs are introduced, the equivalence between liability rules disappears. The optimal scope of the negligence criterion varies in fact depending on whether the residual bearer is the injurer or the victim. In either or both cases, the negligence inquiry may be efficiently limited to some precautionary measures only or a strict rule (no liability, $n=0$, or strict liability, $\bar{n}=0$) may be optimal. The figure depicts the case in which both n^j and $\bar{n}^v$ are positive but lower than z and $\bar{z}$, respectively. Furthermore, n^j and $\bar{n}^v$ do not trigger the same level of total social cost. In the example described in the figure, n^j triggers lower social costs, thus the residual bearer should be the victim.

In addition, the figure also shows how the presence of compensation costs undermines the performance of strict-liability-based rules. In the case described in the figure, without compensation costs K , strict liability with defense of contributory negligence would be superior to simple negligence. The presence of compensation costs K alters the balance between simple negligence and no liability on the one hand and strict-liability-based rules on the other hand, and makes the latter more largely preferable than it would be otherwise.

[Figure 1]

6. Policy implications: strict liability versus negligence

Tort law and economics scholarship has stated that strict liability should be implemented whenever the injurer's activity is more dangerous than the victim's.³² My contention is instead that there are at least two other criteria to be implemented which may enable the analyst to

³² See Shavell (1980a). On this point Shavell (1987) at 29 notices that "if it is more important to control injurers' level of activity than victims'" the rule that results in greater social welfare is strict liability (see also Landes and Posner, 1987, at 70, on the same issue). The legal system should otherwise adopt for negligence. In turn, the "importance" of controlling one party's activity is intended in terms of riskiness or dangerousness of that party's activity (Shavell, 1987, at 31-32).

justify the actual (and historical) use of strict liability in cases in which the injurer's activity is clearly not more dangerous than the victim's. In fact, we have seen that the verifiability of parties' behavior and the impact of compensation costs bear on the choice of the liability rule as much as the dangerousness of the activity.

In Exp. (10), I have provided a formal criterion for the choice of the residual bearer, given an optimal determination of negligence. I shall break down this criterion into three components:

- (i) *Dangerousness*: the residual bearer should be the party, whose activity level triggers greater accident costs (whose activity is more "dangerous"). $L(n^j)$ is a measure of the accident costs due to the fact that some of the injurer's precautionary measures are excluded from the negligence criterion (the injurer's activity level). Therefore, $L(n^j)$ can be interpreted as the dangerousness of the injurer's activity. $\bar{L}(\bar{n}^v)$ is the dangerousness of the victim's activity. If $L(n^j) < \bar{L}(\bar{n}^v)$, the victim's activity is more dangerous: the dangerousness criterion requires choosing him as the residual bearer, therefore implementing simple negligence or no liability. Otherwise, a strict-liability-based rule would be desirable.
- (ii) *Verifiability*: the residual bearer should be that party whose precautionary measures are more expensive to verify under the negligence inquiry. $I(n^j)$ is the cost of verifying the injurer's precautionary measures under the optimal (no-liability or) simple-negligence rule, $\bar{I}(\bar{n}^v)$ is the cost of verifying the victim's precautionary measures under the optimal strict-liability-based rule. If $I(n^j) < \bar{I}(\bar{n}^v)$, verifying the victim is more expensive, and hence (no liability) or simple negligence is to be chosen. A strict-liability-based rule would be desirable otherwise.
- (iii) *Fixed costs*. Simple negligence and no liability do not trigger compensation costs, K , while strict-liability-based rules do. Therefore, choosing the victim as the residual bearer saves administrative costs.

Contrary to commonly-held beliefs, neither one of these components is sufficient alone. This approach provides some interesting insights on the comparative statics and the dynamics of liability systems.

6.1. A synchronic perspective: "strict liability vs. negligence" and administrative costs

The dangerousness criterion has provided a classical and broadly accepted explanation for the choice of the strict liability regimes over negligence; however, it is admittedly "somewhat rough,"³³ because, as Shavell (1987), at 31-32, notes, "the choices made between strict liability

³³ Shavell (1987) at 32.

and negligence rules are not always easy to explain on the basis of differences in riskiness.”³⁴

I contend that a more comprehensive explanation may be provided by considering the interplay of the dangerousness element with the other two described above.³⁵ By considering different examples of strict liability, I provide some hypotheses for future comparative analysis.

The case of ultra-hazardous activities is said to represent the most open application of strict liability by English and American courts,³⁶ and by the courts in civil law countries as well.³⁷ Strict liability, however, is not justified by dangerousness alone, but also by the abnormality of the activity. The activity must not be “a matter of common usage”.³⁸ In fact, in support of my hypothesis, activities that imply a high but typical risk (as motoring)³⁹ are excluded.⁴⁰

There are other instances, in which strict liability is implemented for activities that are clearly not dangerous.⁴¹ These cases may be explained by the fact that verifying the injurer’s behavior is, under some circumstances, more difficult than verifying the victim’s.⁴² Legal commentators often explicitly point at this informational aspect as the ratio of the rule.⁴³

It is remarkable that, even in those jurisdictions that do not openly apply strict liability, the negligence rule may be covertly made to approximate strict liability by means of an “objective” standard of negligence, extremely high due care levels, and doctrines such as *res ipsa loquitur*; alternatively, the fault principle might be retained in its entirety and paired with the reversal of the burden of proof.⁴⁴

The fact that similar instances are regulated by strict liability in one jurisdiction and are subject to the reversal of the burden of proof in another suggests that both measures respond to the same problem of gathering information on and verifying the injurer’s behavior, as in the

³⁴ Shavell (1987) at 31: “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?”.

³⁵ Faure (2002) at 372 correctly points out that the informational problem may bear on the choice between strict liability and negligence only if referred to the determination of negligence. If finding information about causation is the problem, the use of strict liability would not help. In the analytical framework of this article, causation is assumed to be satisfactorily established.

³⁶ *Rylands v. Fletcher* (1868) LR 3 HL 330 and 519 (I) Restatement (Second) of Torts (1965). See Fleming (1983) at 302.

³⁷ See for example art. 2050 of the Italian civil code, which represents an advance over earlier continental codes. See Stone (1972).

³⁸ 520 Restatement (Second) of Torts (1965).

³⁹ See Rogers (2002) and Schwartz (2002) for English and American law respectively.

⁴⁰ In *Rylands v. Fletcher*, the reference is to *non-natural* use. See also Dias and Markesinis (1989) at 346-347 on the interpretation of non-natural as unusual, non-ordinary rather than artificial.

⁴¹ Zweigert and Kötz (1998) at 671 note that the domain of strict liability encompasses two categories of situations: activities that entail particular risk and activities with respect to which the injurer’s fault is particularly difficult to prove.

⁴² See Fedtke and Magnus (2002) at 156 on the implementation of strict liability in German law in cases of plaintiffs facing extreme difficulties in proving fault on the part of the defendant. See Tichý (2002) at 86 on Czech law. See du Perron and van Boom (2002) at 245 on Dutch law. Gilead (2002) at 195 observes that in Israel “dangerousness per se can hardly justify strict liability” as “fault-based liability provides adequate protection against dangerousness by adjusting the level of care to the magnitude of the risk”

⁴³ See Koch and Koziol (2002b) at 411.

following examples.

Liability for damages caused by animals is generally strict,⁴⁵ irrespective, at times, of the dangerous nature of the particular animal,⁴⁶ and non-dangerous species often fall under such a regime.⁴⁷ When negligence applies, the burden of proof is often reversed.⁴⁸ Ruinous buildings trigger the application of strict liability or the reversal of the burden of proof in most cases,⁴⁹ and so do thrown⁵⁰ or falling⁵¹ things, as “in many cases, the activity or negligence of some person cannot be demonstrated”.⁵² Damages caused by things may furnish another example along the same lines. Although, in some instances, the general principle of fault is applied, many legal systems make a broad use of strict liability.⁵³ Liability is also strict in Austria and Germany for damages caused by genetically modified organisms,⁵⁴ in Austria for inadequate public computer services,⁵⁵ and in Spain for damages caused by noxious fumes.⁵⁶

6.2. *A diachronic perspective: the evolution of liability rules*

The same arguments may be used to suggest a theoretical framework for the evolution of liability systems.⁵⁷ I maintain that there is a tendency for liability rules to respond not only to the degree of risk produced by human activities but also to the informational characteristics thereof. Hence, even if the riskiness of certain activities is constant over time, an erratic variation of liability rules may be justified by a corresponding change in the cost of acquiring information about such activities.⁵⁸

⁴⁴ See Zweigert and Kötz (1998) at 653.

⁴⁵ English, French, German and American law know at least some instances of strict liability. See Koch and Koziol (2002b) at 396-398.

⁴⁶ English law, in section 2(1) of the 1971 Animals Act, applies strict liability to dangerous animals that are not commonly domesticated in the British Isles, see section 6(1). The application of strict liability is triggered by the characteristics of the species and not of the individual animal within a species. Strict Liability also applies to dogs that injured or killed livestock (section 3). See Fleming (1983), Dias and Markesinis (1989) and Epstein (1999).

⁴⁷ English law applies strict liability to damages caused by straying livestock, as regulated by section 4 the 1971 Animals Act; fall in this category also sheep and poultry. See Dias and Markesinis (1989) at 360.

⁴⁸ Austria, Italy and Switzerland opt for a reversal of the burden of proof.

⁴⁹ 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.

⁵⁰ Civil law countries follow the Roman tradition of dealing with these instances under a strict liability regime, while common law requires fault.

⁵¹ In general, strict liability or presumed responsibility is largely applied.

⁵² Stone (1972) at 32.

⁵³ French law (art 1384 par I of the Code civil) holds the custodian strictly liable for damages caused by things, irrespective of the intrinsically or potentially dangerous nature of the thing. See Zweigert and Kötz (1998) at 661 and Galand-Carval (2002). The Italian Codice Civile encompasses a similar rule in art. 2051, see Busnelli and Comandé (2002). See also for German law Fedke and Magnus (2002) at 174.

⁵⁴ See Fedtke and Magnus (2002). Koch and Koziol (2002b) notice that the rule has been introduced for fear of innovative technologies rather than of high risk.

⁵⁵ Koch and Kotziol (2002a).

⁵⁶ See Martin-Casals, Ribot and Solé (2002).

⁵⁷ For a law and economics analysis of the genesis of liability in ancient law see Parisi (2001).

⁵⁸ Along the same lines, Landes and Posner (1987), at 107-122, provide several efficiency justifications for strict liability. In particular, at 115 they remark that “During the early stage of the development of a new product or

In their early appearance, liability systems seem to adopt mainly strict liability.⁵⁹ This choice seems to be difficult to justify only in terms of risk, since modern activities are often more dangerous. Instead, in the early stages 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,⁶⁰ and sufficient judicial expertise. The application of the negligence criterion increases litigation as it creates animosity.⁶¹ Therefore, the choice of the liability rule is mainly a choice between no liability and strict liability.⁶²

In modern legal systems, liability rules tend to move towards a more generalized application of negligence. Given the superiority of negligence rules in terms of incentives (they spur both parties' precaution), legal systems move in their direction as soon as the information costs decrease below the allocative gains. Information costs decrease when literacy and knowledge develop, resulting in increased judicial expertise. This justifies a move away from strict rules towards rules that implement a negligence inquiry.

However, information costs also depend on the complexity of the parties' actions, which in turn depends on social and technological development. In those areas of torts where the parties' actions become more complex (as in the production of certain goods), information costs might increase and thereby justify strict rules. Negligence rules become more common, although strict rules survive in some specific areas.⁶³

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”.

⁵⁹ Roman law first developed a strict liability regime. 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 tabularum* 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. See Parisi (1992 and 2001) for a discussion of the problem from a legal viewpoint and a vast bibliography.

⁶⁰ Posner (1980).

⁶¹ Parisi (1992) at 33-34, and 56-58.

⁶² English and American legal history seems to confirm this pattern too, as it developed from the strict-liability formant and slowly evolved towards negligence; not until the nineteenth century was there any general acceptance of the fault principle. See Fleming (1983) at 300 on this point. 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. See White (1980) at 3 ff. and Fleming (1983) at 97.

⁶³ 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 an attempt to approach the goals of ethics. At 967, he speaks of the “swinging of the pendulum between strict rules and negligence rules”. See also Koch and Koziol (2002b).

7. Conclusion

In his seminal work, Calabresi (1970) suggested that the optimal choice of liability rules ought to minimize administrative costs, next to the total accident costs. The literature on tort law and economics has built refined models mainly on the latter category of costs, while the issue of minimizing the administrative costs has been relegated to an informal comparison of the different liability rules, with particular attention to comparative negligence, and has yielded no widely accepted result.

In this study, I have attempted to show that administrative costs bear not only on the choice of which liability rule to implement, but also on the setting of the optimal negligence criterion. In particular, I have shown how an increase in the administrative costs of the system reduces the optimal *scope* of the negligence rule, that is, it curbs the number of precautionary measures that courts will consider relevant for a finding of negligence.

In fact, the optimal scope of negligence balances the advantages of a broader scope, in terms of better incentives, with its administrative costs. The need of restricting the scope of negligence should not be interpreted as a failure of the liability system; to the contrary, it signals an efficient allocation of resource between two competing goals.⁶⁴

I have shown how this perspective may shed some light on the choice of the liability regimes and on the historical dynamics of tort.

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⁶⁴ It has been said that the notion itself of activity level as a proxy for those precautionary measures that escape the determination of negligence 'undermined the confidence in the efficiency of tort law.' See Donohue (1988), at 1058. Shavell (1987) at 25 entitles paragraph 2.3.6 'The source of the defect of the negligence rule'. However, as we have contended, this is only true of incentives. The broader picture provided in this article show that restricting the scope of negligence is efficient.

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APPENDIX

A. *If there are no administrative costs, parties always comply with the negligence criterion if the negligence criterion is optimally set.*

Proof

Let us consider simple negligence. The negligence criterion is optimally set: $N=(x^*,n^*)$. Recall that, given assumption (IV), the levels of all the precautionary measures included in the negligence criterion can also be said to be optimal, so let an asterisk denote the optimal levels. Hence the negligence criterion can also be rewritten in explicit form as $N=\{p_1^*,\dots,p_n^*\}$. The injurer is considered non-labile if he takes at least all the precautionary measures in the negligence criterion at the optimal levels. He is liable and pays damages otherwise. If he complies with the negligence criterion, he bears a cost equal to x^* . If he does not, he pays the cost of precaution and the expected accident loss. It is worthwhile noticing that assumptions (I) and (IV) guarantee that if the injurer takes the $n^*=z$ precautionary measures and spends x^* on precaution, the internal allocation of such expenditure among the different precautionary measures that is optimal for the injurer corresponds to the negligence criterion. Hence, we can look at the problem of compliance by simply considering the implicit form of the negligence criterion $N=(x^*,n^*)$. The injurer's cost function is:

$$(11) \quad \min_{x,n} \begin{cases} x & \text{if } x \geq x^* \text{ and } n \geq n^* \\ l(x, n, \bar{x}, \bar{n}) + x & \text{otherwise} \end{cases}.$$

It is immediately evident that there is no incentive to take more precaution than is required, hence the cost of compliance is x^* . Consequently, the victim bears $l(x^*, n^*, \bar{x}, \bar{n}) + \bar{x}$, which is minimized by $\bar{x}^*$ and $\bar{n}^*$.

If the injurer does not comply, he will try to minimize the costs he bears, given the behavior of the victim. Since the victim bears no accident cost in the case of the injurer being at fault, his best response to the injurer's non compliance is no precaution, $\bar{x} = 0$, $\bar{n} = 0$. Hence the negligent injurer bears $l(x, n, 0, 0) + x$. It follows from assumption (III) that n^* minimizes the cost for the negligent injurer. Let $\hat{x}$ denote the level of x that minimizes the costs for the negligent injurer. It is worthwhile noticing that $\hat{x}$ and n^* coincide with the optimal level and scope of the injurer's precaution under strict liability. Hence we can write $x^* < l(x^*, n^*, \bar{x}^*, \bar{n}^*) + x^* + \bar{x}^* < l(\hat{x}, n^*, 0, 0)$, by definition of x^* and $\bar{x}^*$. It follows that it is best for him to comply with the negligence criterion, as the cost of compliance (first term in the expression) is lower than the cost of non-compliance, last term in the expression.

In situations in which the amount of damages that the injurer has to pay if negligent is diminished by the loss that would have occurred anyway had the injurer been non-negligent

(Grady, 1983, and Kahan, 1989), the injurer cost function becomes:

$$(12) \quad \min_{x,n} \begin{cases} x & \text{if } x \geq x^* \text{ and } n \geq n^* \\ l(x, n, \bar{x}, \bar{n}) - l(x^*, n^*, \bar{x}, \bar{n}) + x & \text{otherwise} \end{cases}.$$

It is easy to show that also in this case parties will take the optimal level and the optimal scope of precaution.

The application of these findings to the case of strict liability with defense of contributory negligence is straightforward.

B. If administrative costs are positive, victims will always comply with the negligence criterion under strict liability with defense of contributory negligence, if the negligence criterion is optimally set and the residual bearer is optimally chosen.

Proof

Let us consider strict liability with defense of contributory negligence, where the negligence criterion is set as $\bar{N} = (\bar{x}^v, \bar{n}^v)$, and assume that:

- a) $\bar{n}^v$ minimizes $\bar{L}(\bar{n}) + \bar{I}(\bar{n})$; i.e. $\bar{n}^v$ is the optimal scope of the negligence criterion;
- b) $\bar{x}^v$ minimizes $l(x, n^*, \bar{x}, \bar{n}^v) + \bar{x}$, given the injurer's optimal precaution expenditure x^v ; i.e. $\bar{x}^v$ is the optimal level of the negligence criterion;
- c) $L(n) + I(n) \geq \bar{L}(\bar{n}^v) + \bar{I}(\bar{n}^v) + K$, for any n ; i.e. the injurer is the optimal residual bearer.

The victim's cost function is:

$$(13) \quad \min_{x,n} \begin{cases} \bar{x} & \text{if } \bar{x} \geq \bar{x}^v \text{ and } \bar{n} \geq \bar{n}^v \\ l(x, n, \bar{x}, \bar{n}) + \bar{x} & \text{otherwise} \end{cases}.$$

It results from the former appendix section that non-negligent victims bear $\bar{x}^v$ and injurers have incentives to take x^v and $n^*=z$, as these are the values of $\bar{x}$ and $\bar{n}$ that minimize their costs. Negligent victims bear $l(0,0, \bar{x}^\wedge, \bar{n}^*) + \bar{x}^\wedge$, where $\bar{x}^\wedge$ is the level of victim's precaution that minimizes his total costs given that the injurer takes no precaution – as he bears no liability – and the victim takes all his precautionary measures – which follows from assumption (III).

Victims would have an incentive not to comply with the negligence criterion only if $\bar{x}^v > l(0,0, \bar{x}^\wedge, \bar{n}^*) + \bar{x}^\wedge$, which violates at least one of the optimality conditions imposed supra. In fact, recalling that $\bar{I}(0)=0$, the former inequality would imply $l(x^v, n^*, \bar{x}^v, \bar{n}^v) + x^v + \bar{x}^v + \bar{I}(\bar{n}^v) + K > l(0,0, \bar{x}^\wedge, \bar{n}^*) + \bar{x}^\wedge + \bar{I}(0)$ or $\bar{L}(\bar{n}^v) + \bar{I}(\bar{n}^v) + K > L(0) + I(0)$, which clearly violates assumption c). Thus, victims always

comply with an optimally set strict liability with defense of contributory negligence.

C. If administrative costs are positive, injurers do not always comply with the negligence criterion under simple negligence even if the negligence criterion is optimally set and the residual bearer is optimally chosen

In the simple model employed in this article, the belief that the level of care should be set at the socially optimal level in order to insure that parties take due care does not hold true. I found that while under strict liability the victim always complies with the negligence criterion (as predicted by the standard model), under simple negligence the injurer might find it advantageous not to take due care. This result obtains even though the scope of negligence is set optimally, the level of care is set optimally and the residual bearer is optimally chosen. Thus, the fact that the injurer does not take due care cannot be attributed to errors in the setting of the negligence inquiry, as in the standard model, but can be explained by a possible divergence between private and social incentives to choose between different liability rules.

The decision not to comply with the negligence criterion under simple negligence is equivalent to a private decision to opt for strict liability. In fact, if the injurer does not take due care, the victim loses his incentives to take any precaution, as he will be completely compensated by the negligent injurer anyway.⁶⁵ The outcome of simple negligence when the injurer decides to be negligent is the same as under strict liability. Only the injurer takes precaution.⁶⁶

The injurer's decision whether or not to comply with the negligence criterion may therefore be interpreted as a choice between simple negligence and strict liability. It is indeed possible that the injurer's private optimal choice may diverge from the socially optimal choice between the two rules (i.e. the choice of the optimal residual bearer). Such a discrepancy is grounded in the fact that the injurer might not bear the compensation costs K that are associated to strict-liability-based rules.

In section 5.2.3, we noticed that the presence of compensation costs biases the choice of the optimal residual bearer towards the victim (i.e. towards simple negligence or no liability), even in cases where the balance between accident and information costs would require that a strict-liability-based rule should be employed. Hence, there are cases where, in the absence of compensation costs, the optimal residual bearer would be the injurer, and the choice of the victim hinges on their presence. Figure 1 describes such a situation. A form of strict liability

⁶⁵ If we assumed that the injurer's decision not to comply is not anticipated by the victim, and that hence the victim still takes optimal precaution, the cost for the negligent injurer would be even lower (as the victim's precaution reduces the accident costs he bears) and therefore his incentives not to comply would be even stronger.

⁶⁶ Moreover, since he is not bound any more by the negligence criterion, he takes precaution with respect to all his precautionary measures, exactly as under strict liability.

with defense of contributory negligence is optimal given the balance of accident and information costs (the minimum point of the dashed curve is below the minimum point of the curve for simple negligence). However, the presence of compensation costs impinges upon the final choice and makes strict liability less attractive than simple negligence.

If the injurer does not bear compensation costs (and in my model he does not), he might find it advantageous to favor strict liability and decide not to comply with the negligence criterion set (optimally) under simple negligence. As compensation costs bias the choice in only one direction, the same cannot occur for strict-liability-based rules; hence, the victim will always follow the negligence criterion.

As a result, the problem of injurer's non-compliance might be tackled from different angles. If the injurer bears the compensation cost (at least to some scope), the private and social incentives to choose the residual bearer will be again aligned. Otherwise, the legal system might choose in the first place to disregard compensation cost and opt for strict liability with or without a negligence defense. A third possibility is that the *level* of precaution that the injurer is supposed to take (in order to be found non-negligent) be lowered below the optimal level, in order to lower the cost of the injurer's compliance and remove the incentives to deviate.

Proof

Let us consider simple negligence, where the negligence criterion is set as $N=(x^j, n^j)$, and assume that:

- a) n^j minimizes $L(n)+I(n)$; i.e. n^j is the optimal scope of the negligence criterion;
- b) x^j minimizes $l(x, n^j, \bar{x}^j, \bar{n}^*) + x$, given the victim's optimal precaution expenditure $\bar{x}^j$; i.e. x^j is the optimal level of the negligence criterion;
- c) $L(n^j) + I(n^j) \leq \bar{L}(\bar{n}) + \bar{I}(\bar{n}) + K$, for any $\bar{n}$; i.e. the victim is the optimal residual bearer.

The injurer's cost function is:

$$(14) \quad \min_{x, n} \begin{cases} x & \text{if } x \geq x^j \text{ and } n \geq n^j \\ l(x, n, \bar{x}, \bar{n}) + x & \text{otherwise} \end{cases}.$$

Non-negligent injurers bear x^j . Negligent injurers bear $l(x^\wedge, n^*, 0, 0) + x^\wedge$, provided that victims of negligent injurers bear no accident cost and therefore take no precaution and that negligent injurers take all their precautionary measures, given assumption (III) supra. Injurers have an incentive to not comply with the negligence criterion if $x^j > l(x^\wedge, n^*, 0, 0) + x^\wedge + 0$, which may be compatible with the optimality conditions imposed supra.

In fact, the former expression may be rewritten as

$l(x^j, n^j, \bar{x}^j, \bar{n}^*) + x^j + I(n^j) > l(x^\wedge, n^*, 0, 0)$ or $L(n^j) + I(n^j) > \bar{L}(0) + \bar{I}(0)$, which means that in those cases in which the injurer is induced to be negligent, simple negligence is inferior to a rule of strict liability that functions without compensation costs K . Therefore, for the outcome to be compatible with the requirements of condition c) imposed supra, the compensation costs K ought to be such that $K > L(n^j) + I(n^j) - \bar{L}(0)$. If compensation costs are sufficiently high, the injurer's non-compliance with the negligence criterion is compatible with condition c). Conditions a) and b) are evidently compatible with this outcome.

It is finally to be remarked that the Grady-Kahan model, since it lowers the cost of non-compliance by detracting the cost of those accidents that would have occurred anyway, facilitates the injurer's decision not to comply. Formally, the condition for injurers not to comply becomes $x^j > x^\wedge + l(x^\wedge, n^*, 0, 0) - l(x^j, n^j, \bar{x}, \bar{n})$, which is clearly more easily satisfied than $x^j > x^\wedge + l(x^\wedge, n^*, 0, 0)$.

To conclude, let us emphasize two additional necessary conditions for the injurer not to comply with an optimal negligence criterion under simple negligence:

1. $x^j > x^*$;
2. $x^j > x^\wedge$.

Let us first provide with an interpretation of them and then show that they are necessary conditions for non-compliance. Condition 1 states that the optimal level of the injurer's precaution under simple negligence ought to be higher than the optimal level under an omnicomprehensive simple negligence rule. The difference between the two is that in the former case some of the injurer's precautionary measures are omitted from the negligence criterion (and consequently not taken by the injurer), while the victim takes, to the contrary, all his precautionary measures in both instances. An interpretation of $x^j > x^*$ may be that the measures omitted are substitutes to some of the injurer's precautionary measures that are instead taken or of the victim's. If $x^j \leq x^*$, then we can write $x^j \leq x^* < l(x^*, n^*, \bar{x}^*, \bar{n}^*) + x^* + \bar{x}^* < l(x^\wedge, n^*, 0, 0) < x^\wedge + 0$, by definition of x^* , where the second inequality is self-evident and the third follows from the definition of x^* . From the first and the last term it is evident that 1 is a necessary condition for non-compliance.

Condition 2 states that the optimal level of the injurer's precaution under simple negligence ought to be higher than the optimal level under strict liability. Under the former, the victim takes all his precautionary measures and the injurer only those that are included in the negligence criterion; under the latter the injurer takes all his precautionary measures but the victim takes none. An interpretation of $x^j > x^\wedge$ may be that the injurer's precautionary measures are substitutes to the (untaken) victim's. If $x^j \leq x^\wedge$, then we can write $x^j < l(x^\wedge, n^*, 0, 0) + x^\wedge$, which

clearly implies compliance. Thus, 2 is a necessary condition for non-compliance.

FIGURES

Figure 1: Scope of the negligence criterion and social costs under liability rules with positive administrative costs

