North Carolina Central Law Review

Volume 17
Number 2 *Volume 17, Number 2*

Article 6

10-1-1988

The Many Meanings of Comparative Fault: An Economic Analysis of Alternative Methods of Apportioning Liability

Leonard Schwartz

Follow this and additional works at: https://archives.law.nccu.edu/ncclr

Recommended Citation

THE MANY MEANINGS OF COMPARATIVE FAULT: AN ECONOMIC ANALYSIS OF ALTERNATIVE METHODS OF APPORTIONING LIABILITY

LEONARD SCHWARTZ*

I. INTRODUCTION

Where a plaintiff has suffered a loss that was caused by more than one person, what criteria should be used to allocate liability among the persons whose conduct is a substantial causal factor of the loss?[1] Method of allocating liability can be divided into two broad categories: apportionment rules and nonapportionment rules. An apportionment rule divides the total loss among the persons. A nonapportionment rule, on the other hand, either makes one or more defendants liable for the entire loss or makes no defendant liable for any of the loss.

Consider case 1: The row house of the plaintiff, P, was harmed because (1) a wrecking crane operated by D1, who was knocking down the adjoining house, unavoidably damaged P's house, (2) a car driven drunkenly by D2 swerved off the road and into P's house, (3) a time bomb set by D3 exploded in P's backyard, (4) the dispatcher, D4, at the fire department fell asleep and did not dispatch the firefighters, and (5) a can of

---

* Associate Professor, Department of Finance, Memphis State University

1. "Plaintiff," in this paper, refers to the person who has suffered the loss. "Defendant" refers to any person, other than the plaintiff, who is a cause of the loss. The procedural status of a litigant or potential litigant is ignored. Thus, for a multi-car collision among X, Y, and Z, when considering allocation of the loss suffered by X, X is the plaintiff, and Y and Z are the defendants regardless of who is suing whom and regardless of whether a person is a litigant.

"Loss" refers to the compensatory value of the harm. This paper is not concerned with the criteria by which harm is valuated. Rather, it is concerned with the criteria by which the loss is allocated once the loss has been determined. Where the loss is caused only by defendants (and not also by the plaintiff) and where damages (the pecuniary remedy owed by the defendants) are compensatory, allocation of the loss is also allocation of damages. This paper assumes that damages are compensatory.

"Conduct" includes action and a failure to act. "Substantial causal factor" refers exclusively to what is often called "causation in fact." It is not concerned with limitations on liability despite causation in fact, which are often called "proximate cause" or "legal cause." *See* PROSSER, HANDBOOK OF THE LAW OF TORTS §§ 41-42 (4th ed. 1971). For a discussion of some problems in deciding whether a person's conduct is a substantial causal factor of the loss, *see infra* note 30.

"Causation of loss" should be distinguished from "causation of a casualty." Consider the situation in which a car collides with a road sign, where the driver did not fasten the seat belt and the road sign was unsafely designed. Neither the failure to fasten the seat belt nor the unsafe sign are a cause of the collision, which is the casualty. But insofar as the loss suffered by the driver would have been less if the driver had fastened the seat belt or if the sign had been safer, the failure to fasten the seat belt and the unsafe road sign are causes of loss.

<center>191</center>

gasoline stored by P next to the furnace exploded. The total loss to P is $60,000. Apportionment involves dividing liability for the $60,000 loss among the persons who caused the loss, including the plaintiff. A nonapportionment method of allocating liability requires either the plaintiff or one or more of the defendants to be liable for the entire $60,000.[2]

This paper will discuss alternative substantive rules for apportioning loss among persons.[3] It ignores alternative nonapportionment rules and the general issue of allocation based on apportionment rules versus allocation based on nonapportionment rules. It does not address procedural issues such as joinder, burden of production of evidence, and the quantum of evidence.[4] This paper assumes the parties have not agreed on how the risk of loss will be shared. It also assumes that no person is vicariously liable for any other person or that such persons are treated as one person.

"Comparative fault" and related terms have been used as generic terms for methods of apportionment.[5] They are rarely defined except as anything in contrast to traditional all-or-nothing nonapportionment rules.[6] Although nonapportionment rules have been discussed exten-

---

2. Although this case and the previous discussions of comparative fault involve "tort" law (in its narrow sense), the same issue arises in contract law. Suppose the plaintiff, a general contractor, suffers a $50,000 loss because the plumbing subcontractor breached its contract, the electrical subcontractor breached its contract, and the plaintiff failed to mitigate the harm from these breaches. How should the loss be allocated among the parties?

When two or more defendants are each liable for the entire loss, nonapportionment rules allow the plaintiff to decide how much will be collected from each defendant. Thus even a nonapportionment rule involves an apportionment. But the apportionment is by the plaintiff, not the judge or jury.

3. Because damages are assumed to be compensatory, the sum of the damages imposed on the defendants equals the loss suffered by the plaintiff minus the loss borne by the plaintiff. For a discussion of damages greater than or less than the loss not allocated to the plaintiff and a discussion of remedies not based on loss, see Schwartz, *Particular Loss, Average Loss, and Actuarial Loss: The Ethics and Economics of Alternative Remedies for Wrongful Conduct*, 18 Conn. Rev. 115 (1985).

This paper does not explicitly discuss apportionment where one of the causes of loss is an act of nature (such as a tornado) rather than a person. In traditional tort law, the plaintiff bears the share of loss apportioned to an act of nature. RESTATEMENT (SECOND) OF TORTS § 433A comments a & e, & illustration 6 (1965). Under the Uniform Comparative Fault Act § 2(a)(1) (1979), apparently the same rule is applied. *See also infra* note 10 and accompanying text. For a comparison of the treatment of acts of nature with treatment of persons who are insolvent or beyond the jurisdiction of the court, *see infra* note 4.

4. Procedural rules can have real effects. For example, consider the treatment of persons who are insolvent or beyond the jurisdiction of the court. In traditional tort law, the plaintiff general bears the share of loss apportioned to persons who are insolvent or beyond the jurisdiction of the court. *Compare* RESTATEMENT (SECOND) OF TORTS § 433A comment a (1965) (stating the general rule) with comment h (discussing possible exceptions). Under the Uniform Comparative Fault Act § 2 and comment (1979), the loss that is uncollectible from insolvent litigants or that would otherwise be apportioned to nonlitigants is apportioned among the solvent litigants. (In this apportionment, persons released from liability are considered litigants and the shares of these persons are borne by the plaintiff. *Id* §§ 2 & 6 and comment.)

5. Two related terms are "comparative negligence" and "apportionment of harm to cause." For a discussion of the meaning of "comparative negligence," *see infra* Section IV. For a discussion of the meaning of "apportionment of harm to causes," *see infra* note 54.

6. Traditional tort law in general consists of a system of nonapportionment rules. The one

---

sively in the literature on economic analysis law, apportionment rules have been discussed only superficially.[7] There seems to be little awareness that there are many ways of apportioning liability. This paper uses economic analysis of law concepts to explore alternate methods to apportion liability.

Section II introduces some economic concepts related to the apportionment of liability. Section III describes some alternative methods of apportioning liability. Section IV discusses the meaning of "comparative negligence" and related terms. Section V describes some alternative methods for treating the special problems of synergy.

II. Economic Perspective

Retrospectively, allocating to a defendant some or all of the loss merely redistributes wealth. In personal injury actions, among others, making a defendant compensate a plaintiff cannot undo the loss a plaintiff has suffered. While the litigants bear the administrative costs of the legal system, compensation reduces the total wealth of the litigants. Thus, the alternative rules for allocating liability affect the total wealth of litigants only through differences in the administrative costs of the legal system.

Prospectively, however, allocating to a defendant some or all of the loss may affect total future losses. Making a defendant compensate a plaintiff establishes a precedent which may affect the incentive to engage in potentially harmful conduct. Thus, the alternative rules on allocating liability affect the total wealth of potential litigants, not only through differences in administrative costs, but also through differences in losses.

The legal issue of apportioning liability for loss among the persons who caused the loss is analogous to the economic issue of distributing the value of the output among the owners of the inputs that produced the output. For example, suppose W, X, Y, and Z are partners in a farm. W provides the land, X and Y provide the labor, and Z provides the ma-

---

exception is apportionment of harm to causes. RESTATEMENT (SECOND) OF TORTS § 433A (1965). *See infra* note 54.

7. Some recent papers that discuss alternative nonapportionment rules are Calabresi, *Optimal Deterrence and Accidents: To Fleming James, Jr., il miglior fabbro*, 84 Yale L.J. 656 (1975); Epstein, *A Theory of Strict Liability*, 2 J. Legal Stud. 151 (1973); Epstein, *Defenses and Subsequent Pleas in a System of Strict Liability*, 3. J. Legal Stud. 165 (1974); Grady, *A New Positive Economic Theory of Negligence*, 92 Yale L. Rev. 799 (1983); Landes & Posner, *The Positive Economic Theory of Tort Law*, 15 Ga. L. Rev. 851 (1981); Rizzo, *Law amid Flux: The Economics of Negligence and Strict Liability in Tort*, 9 J. Legal Stud. 291 (1980); Shavell, *Strict Liability versus Negligence*, 9 J. Legal Stud. 1 (1980); Shavell, *An Analysis of Causation and the Scope of Liability in the Law of Torts*, 9 J. Legal Stud. 463 (1980); Wittman, *Optimal Pricing of Sequential Inputs: Last Clear Chance, Mitigation of Damages, and Related Doctrines in the Law*, 10 J. Legal Stud. 65 (1981). Papers that discuss alternative apportionment rules are cited infra note 16, 22, 23, 27.

chinery. The total revenue from the sale of the crops is $400,000. How should the revenue be apportioned among the partners?

Economists traditionally analyze this issue in terms of a production function in which each input is an independent variable and the revenue is the dependent variable.[8] The rate of revenue change with respect to an input generally is called the marginal revenue product. To give people an incentive to provide and use the inputs efficiently, the revenue distributed to the owner of each input should equal the quantity of the input times the marginal revenue product.[9]

There are several problems in trying to apply this marginal productivity method of distribution. First, the production function generally involves a synergistic relation among the inputs. That is, the marginal revenue product for each input generally varies with the quantities of the other inputs and with the quantities of that input. Second, the production function and thus the marginal revenue product generally are stochastic. That is, the marginal revenue product for any given combination of inputs is itself variable. For example, the output of a farm depends not only on the quantity of the marketable inputs, but also on the quantity of rain.[10] Third, if the revenue distributed to the owner of each input equals the quantity of the input times the marginal revenue product, distribution generally will be nonunitary. The sum of the amounts to be distributed will not equal the total revenue. Revenue will be overdistributed or underdistributed.[11] Fourth, many inputs are not homogenous in quality or even continuous in quantity. For such inputs, the marginal revenue product may have more than one meaning. For example, if the farm has one tractor, the marginal revenue product of that tractor can be the difference between what the revenue was and what the

---

8. This function often is divided into two functions. In the first stage, each input is an independent variable and the physical product is the dependent variable. In the second stage, the physical product is the independent variable and revenue is the dependent variable. MILTON FRIEDMAN, PRICE THEORY 176 (1976); JACK HIRSLEIFER, PRICE THEORY AND APPLICATIONS 411 (2d 1980).

9. An input is used efficiently, in the sense of maximizing value, when the quantity of the input used is such that the marginal revenue product equals the marginal cost of the input. SEE FRIEDMAN, *supra* note 8, at 176-200 (Friedman uses the term "marginal value product"); HIRSHLEIFER, *supra* note 8, at 411.

10. Rain can be considered an input that is not owned by persons. The distribution of the value of the output produced by rain is analogous to the apportionment of the loss caused by acts of nature. *See supra* note 3.

Synergy and stochasticity concern different aspects of the variability of the marginal revenue product. "Synergy," in this paper, refers to variability caused by fluctuations in the quantities of the marketable inputs. "Stochasticity" refers to variability caused by fluctuations in other (known or unknown) determinants of the marginal revenue product.

11. The sum of the percentage shares equals one only if the production function is such that a percentage change in the quantity of the inputs causes the same percentage change in the quantity of the output. This is called "constant returns to scale" or a production function that is "homogeneous of the first degree." *See* FRIEDMAN, *supra* note 8, at 194.

revenue would have been if there were (a) no tractor, (b) an additional identical tractor, or (c) a different tractor.[12]

The apportionment of liability can be analyzed similarly in terms of a function in which each person's potentially harmful conduct is an independent variable and the loss is the dependent variable. The rate of change of the loss with respect to a person's conduct can be called the marginal loss. To give people an incentive to refrain from potentially harmful conduct efficiently, the liability apportioned to each person should equal the quantity of harmful conduct by that person times the marginal loss from that conduct.[13] However, the marginal loss method of apportioning liability has all the practical problems that exist with the marginal productivity method of distribution. First, the significance of each person's conduct generally is synergistic. For example, the marginal loss from an explosion may depend on whether the firefighters are dispatched. Second the marginal loss generally is stochastic. For example, the range of loss caused by drunk driving varies. Third, if the liability apportioned to each person equals the quantity of harmful conduct times the marginal loss from that conduct, the sum of the amounts apportioned generally will not equal total loss. Liability will be overapportioned or underapportioned.[14] Fourth, conduct often is not homogeneous in quality or even continuous in quantity. For such conduct, the marginal loss may have more than one meaning. For example, if a person stores a can of gasoline next to a furnace, the marginal loss from the explosion can be the difference between what the loss was and what the loss would have been if the person had stored next to the furnace (a) no gasoline, (b) an additional identical can of gasoline or (c) a different can of gasoline.[15]

III. METHODS OF APPORTIONING LIABILITY

The magnitude of the marginal loss is only one of many criteria for apportioning liability. Methods of apportioning liability can be grouped into a matrix. One dimension of the matrix is the criterion for deciding the share of liability among those persons who are subject to apportion-

---

12. The problem of homogeneity and continuity is closely related to the problem of synergy. Both involve conjectures on counterfactual conditions. For example, what the revenue would have been if there were no tractor, or if there were two tractors, or if the quantity of land were different, is conjectural.

13. Potentially harmful conduct is refrained from efficiently, in the sense of maximizing value, when the quantity of the conduct is such that the marginal loss equals the marginal cost of avoiding the loss. See Brown, *infra* note 27, at 325; Landes & Posner, *supra* note 7, at 870.

14. *See supra* note 11 and accompanying text.

15. The problem of homogeneity and continuity is closely related to the problem of synergy. Both problems involve conjectures on counter factual conditions. For example, in case 1 *supra*, what the loss would have been if there were no gasoline, or if there were two cans of gasoline, or if D2 had not been drunk, or if the size of D3's bomb were different, is conjectural.

ment. The share of liability can be based on fixed shares, or the share can be based on the magnitude of a variable which will be called the share variable. The other dimension of the matrix is the criterion for deciding which persons will be subject to apportionment. Apportionment can be applied to all persons whose conduct is a substantial causal factor of loss; this will be called strict liability. Apportionment can also be restricted by a variable which will be called the liability variable. Thus the methods of apportioning liability can be grouped into four categories:

1. Strict liability and fixed shares.
2. Strict liability and variable shares.
3. Restricted liability and fixed shares.
4. Restricted liability and variable shares.

In addition, the apportionment of liability can be based on a mixture of the methods.

There are several ways to apportion liability by fixed shares.[16] One method is to divide the total loss equally among all the persons who are subject to apportionment. Another method is to treat all the defendants as a group, divide liability equally between the plaintiff and the group of defendants and divide the liability of the group equally among the defendants.[17] Consider case 1, *supra,* assuming that all five persons are subject to apportionment. If liability is divided equally among all five persons, each of the four defendants would be liable for one fifth the loss, and P likewise would bear one fifth the loss. If liability is divided equally between the plaintiff and the group of defendants and then equally among the defendants, each defendant would be liable for one eighth the loss and P would bear half the loss.

Variable share apportionments, as its name implies, is based on the magnitude of a variable. Apportionment by variable shares involves not only an ordinal comparison to determine if one person should be more liable than another, but also a cardinal comparison of the extent to which one person should be more liable than another.[18] The share variable

---

16. Although this method apportions liability, it does not compare any aspect of "fault," whatever this means. Therefore, apportionment by fixed shares perhaps should not be considered a method of comparative fault. For a comparison with variable shares, *see infra* note 18.

Apportionment by fixed shares is discussed in R. EPSTEIN, MODERN PRODUCTS LIABILITY LAW 134-41 (1980); Landes & Posner, *Joint and Multiple Tortfeasors: An Economic Analysis,* 9 J. Legal Stud. 517, 529-31 (1980).

17. The division of liability equally between the plantiff and the group of defendants can be separated from the division of liability equally among the defendants. There can be variable shares between the plaintiff and the group of defendants, but equal shares among the defendants. And there can be equal shares between the plaintiff and the group of defendants, but variable shares among the defendants. This distinction is discussed in Epstein, *supra* note 16, at 137-41. Under the Uniform Contribution Among Tortfeasors Act § 1-2 (1955), the collective liability of defendants generally is divided equally among the defendants.

18. The magnitude of the share variable can be considered an indicator of "fault" that is compared in comparative fault. For a comparison with fixed shares, *see supra* note 16.

must be numerical and preferably continuous; otherwise no cardinal comparison can be made.[19] The equation used to derive the share of liability from the magnitude of the share variable must set the sum of the shares of liability equal to one; otherwise, liability will be either overapportioned or underapportioned.[20] The magnitude of a share variable for any given person divided by the sum of the magnitudes of that variable for all persons is one equation.[21]

The share variable can be based on several criteria. Among the few that have been mentioned in the economic analysis of law literature is a factor based on loss.[22]

A second criterion is the unincurred cost of reducing the loss.[23] A person generally is considered to be more blameworthy if the unincurred cost of reducing loss is low than if the cost is high. Thus, the share variable based on cost ought to be an inverse function of the cost of reducing loss.[24]

A third criterion, which we will call waste, is the difference between the loss and the unincurred cost of reducing loss.[25] The magnitude of the loss or cost is never less than zero. But where the unincurred cost of reducing loss is greater than the loss avoided, the waste is negative.[26]

---

19. For comparison with the characteristics of a liability variable, *see infra* text accompanying note 33. For a discussion of the difference between an ordinal comparison and a cardinal comparison in economics, see HIRSHLEIFER, *supra* note 8, at 66-74.

20. *See supra* text accompanying note 14. Previous discussions of apportionment have ignored the problem of nonunity. *See infra* notes 23 & 25.

21. For n persons:
$S_i = M_i (M_1) + \ldots + M_i + \ldots + M_n)$, where S_i = the percentage share apportioned to person i,
M_i = the magnitude of the share variable for person i.
The sum of the shares using this equation always equals one. For variations of this equation, one can use the square, logarithm, or other functions of the share variable.

22. Apportionement by loss is discussed in Rizzo & Arnold, *Causal Apportionment in the Law of Torts: An Economic Theory*, 80 Colum. L. Rev. 1399, 1413 & n.92 (1980).

23. The cost of reducing the loss has at least two aspects. One is the cost of reducing loss where there is a casualty. Second is the cost of reducing the probability of a casualty. The difference between these two aspects is related to the stochastic relationship between conduct and loss. *See infra* text accompanying note 27. For a discussion of the difference between causation of a casualty, *see supra* note 1.

Apportionment by the unincurred cost of avoiding the casualty (that is, the cost of reducing the probability to zero) is discussed in Schwartz, *Contributory and Comparative Negligence: A Reappraisal*, 87 Yale L.J. 697, 705 n. 44 (1978). (Because Gary Schwartz ignores the problem of nonunity, the sum of the shares of liability in his equation does not necessarily equal one.)

24. One option is to use the reciprocal of the cost. For example, in the equation in note 21, replace M_i with $1/C_i$ where C_i equals the unincurred cost of reducing the loss for person i.

Another option is to use the difference between the sum of the costs for all persons and the cost for each person. For example, in the equation in note 21, replace M_i with $(C_T - C_i)$, where C_i equals the unincurred cost of reducing the loss for person i, and C_T equals the sum of the costs for all persons.

25. Apportionment by waste is discussed in Schwartz, *supra* note 23, at 706 n. 44. (Because Gary Schwartz ignores the problem of nonunity, the sum of the shares of liability in his equation does not necessarily equal one.)

26. If the waste is negative, someone's share of liability might be negative. One solution to this

198   *NORTH CAROLINA CENTRAL LAW JOURNAL*

The relationship between conduct and the magnitude of the share variable generally is stochastic. Because of this relationship, the retrospective magnitude of a share variable should be distinguished from the prospective magnitudes. Retrospectively, each variable has for each person a magnitude which will be called the particular magnitude. Prospectively, the variable has two magnitudes which will be called the actuarial magnitude and the average magnitude. The actuarial magnitude of a variable equals the probability that the potentially harmful conduct will be involved in a casualty times the average magnitude where there is a casualty. The probability of a casualty can itself be used as a prospective share variable.[27]

The use of any prospective share variable (such as those based on the actuarial loss, cost, or waste; the average loss, cost, or waste; or the probability of a casualty) differs significantly from the use of the retrospective share variables (such as those based on the particular loss, cost, or waste). The prospective variables require the categorization of potentially harmful conduct, such as speeding and drunk driving. Should the magnitude of the variable for someone who was both speeding and drunk driving be the sum of the magnitude of that variable for speeding plus the magnitude of the variable for drunk driving? Or should separate estimates be made for (a) speeding and driving drunk as distinct from (b) speeding but not drunk driving and (c) drunk driving but not speeding? Or should the estimate of the magnitude of the variable use a more detailed subcategorization based on time of day, type of road, degree of speeding, degree of drunkenness, weather conditions, etc.? With the prospective share variables, the share of liability for each person depends not only on which share variable and equation are used, but also on the categorization of potentially harmful conduct.[28]

Apportionment methods based on marginal cost, marginal waste, or marginal probability generally have all the practical problems (synergy, stochasticity, nonunity, and nonhomogeneity or noncontinuity) that exist with apportionment methods based on marginal loss.[29]

If apportionment is by strict liability and variable shares, the magni-

---

problem is simply to exclude waste as the criterion for the share variable where the waste for one or more persons is negative. Another solution is to exclude from the apportionment those persons for whom the waste is negative. This solution is similar to the method of apportionment discussed *infra* text accompanying note 35.

27. Probability of a casualty is an important concept only prospectively. Retrospectively, the probability is either zero (in which case there is no liability to apportion) or one.

Apportionment by probability of a casualty is discussed in Kaye & Aicken, *A Comment on Causal Apportionment*, 13 J. Legal Stud. 191, *passim* (1984); Rizzo & Arnold, *supra* note 22, at 1408-13.

Apportionment by a share variable based on the probability of a casualty divided by the cost of reducing the probability is discussed in Borwn, *Toward and Economic Theory of Liability*, 2 J. Legal Stud. 323, 329-331 (1973).

28. Schwartz, *supra* note 3.

29. *See supra* text accompanying notes 13-15.

tude of the share variable may indirectly restrict liability. If the magnitude of the share variable for a person in infinitesimal, the share for that person is zero.[30]

If apportionment is by restricted liability, however, the liability variable directly restricts liability, regardless of the criterion for deciding the share of liability. Indeed, the criterion for deciding which persons are subject to apportionment must be applied before the criterion for deciding the share of liability is applied.[31]

Strict liability methods apportion a share of liability to each person whose conduct is a substantial causal factor of the loss. Restricted liability methods apportion a share of liability only to those persons who satisfy the liability criterion, in addition to being a causal factor.

A liability variable must be discrete and have only two values; a person is subject to apportionment with one value and not subject to apportionment with the other.[32] The liability variable can be based on several criteria. It can be based on status. Is the person a minor or a government official? It can be based on the significance of a person's conduct. Is it a substantial causal factor of the casualty?[33] It can be based on the person's mental state. Did the person intend to cause harm? It can be based on the nature of the person's conduct. Did the conduct fall below the standard established by law, or was the conduct reasonable? It can also be based on the magnitude of a share variable. Was the waste greater than zero (that is, was the loss greater than the cost of reducing the loss)?[34]

Mixed methods requires the judge or jury to use more than one of the above methods of apportioning liability. Mixed methods are either sequential or nonsequential.

Sequentially mixed methods require the judge or jury to consider different methods in a prescribed sequence. First, the judge or jury must try

---

30. When the share variable is the marginal loss, the magnitude of this variable may also determine whether a person is considered a substantial causal factor. Saying that the magnitude of the marginal loss is infintesimal is equivalent to saying that the person is not a substantial causal factor.

Whether the magnitude of the marginal loss is significantly greater than zero, and thus whether a person is a substantial causal factor, sometimes depends on the method by which the problems of homogeneity, continuity, and synergy are treated. *See supra* note 15 and accompanying text and *infra* Section V.

31. The distinction between strict liability methods and restricted liability methods is discussed in Rizzo & Arnold, *supra* note 22, at 1402-04.

32. For a comparison with the characteristics of a share variable, *see supra* text accompanying note 19.

33. For a discussion of the difference between causation of a casualty and causation of loss, *see supra* note 1.

34. A share variable can be the basis for the criterion for deciding which persons are subject to apportionment without being the criterion for deciding the share of liability. For example, liability can be based on whether the waste is greater than zero, but the share is based on fixed shares or the magnitude of loss.

to use one method to the extent feasible. If the use of the first method is limited by insufficient evidence or other reasons, the judge or jury must try to use a second prescribed method, and so on.[35]

Nonsequentially mixed methods give the judge or jury broad discretion in deciding which methods will be used and how much weight will be given to each method. The Uniform Comparative Fault Act is an example of a nonsequentially mixed method of apportioning liability.[36]

IV. THE MEANING OF "COMPARATIVE NEGLIGENCE" AND RELATED TERMS

In the nineteenth century, "comparative negligence" referred to a particular type of nonapportionment rule whereby the entire liability was on the defendant if his degree of negligence was greater than the plaintiff's degree.[37] Today, "pure comparative negligence" generally refers to apportionment of liability. "Modified comparative negligence" generally refers to systems in which the plaintiff's negligence is compared to the defendant's negligence and liability is sometimes apportioned (as in modern pure comparative negligence) and sometimes not apportioned (as in the old type of comparative negligence). Different versions of modified comparative negligence allow apportionment where the plaintiff's negligence is (a) slight, or (b) less than or equal to the defendant's negligence.[38]

Even in its "pure" sense, comparative negligence has many meanings. One meaning is that negligence is used as the liability variable; that is, negligence is used as the criterion for limiting the number of persons subject to apportionment. With this meaning, the share of liability is based on fixed shares, or the magnitude of a share variable. The formula considers only those persons who conduct is negligent, rather than all persons whose conduct is a substantial causal factor.[39]

A second meaning is that negligence is used as a criterion for limiting the magnitude of the share variable. For example, instead of considering the (particular, average, or actuarial) cost of avoiding the loss or casualty, consider only the cost of avoiding being negligent[40] or, instead of considering the probability of a casualty, consider only the incremental

---

35. Some sequentially mixed methods are discussed in Rizzo & Arnold, *supra* note 22, at 1413.

36. The Uniform Comparative Fault Act § 2 and comment (1979), gives the judge or jury essentially unlimited discretion in deciding what criteria to use and what relative importance to give to each criterion.

37. PROSSER, *supra* note 1, § 67 at 434 (4th ed. 1971); SCHWARTZ, COMPARATIVE NEGLIGENCE 17, 18, 31 (1974).

38. H. WOODS, THE NEGLIGENCE CASE: COMPARATIVE FAULT §§ 4.4-4.5 (1978).

39. The use of negligence as a liability variable is discussed in Rizzo & Arnold, *supra* note 22, at 1404.

40. The difference between the cost of avoiding a casualty and the cost of avoiding negligence is discussed in Grady, *supra* note 7, at 801-05.

probability that would have been avoided if the person's conduct had not been negligent.[41] Insofar as the magnitude of the share variable (as limited by the negligence criterion) may be so small that the share for some persons may be zero, this meaning of comparative negligence indirectly limits the number of persons subject to apportionment.[42]

A third meaning of pure comparative negligence is that negligence is used as the share variable. With this meaning, apportionment by negligence involves not only an ordinal comparison of whether one person was more negligent than another, but also the cardinal comparison of the extent to which one person was more negligent than another. This method of comparative negligence is feasible only if negligence is defined in such a way that it has a numerical, and preferably continuous magnitude; otherwise no cardinal comparison can be made.[43] If negligence is defined vaguely, thereby giving the judge or jury broad discretion in deciding the share of liability apportioned to each person, comparative negligence in this sense becomes essentially equivalent to a nonsequentially mixed method of apportionment.[44]

A fourth meaning is that "pure comparative negligence" is used as a generic term for any method of apportionment (and perhaps especially for a nonsequentially mixed method of apportionment) that involves negligence, however "negligence" may be defined.[45]

Variations of these four meanings of pure comparative negligence depend on the definition of "negligence." With all four meanings, negligence is used to directly (as a liability variable) or indirectly (through a share variable) limit apportionment to those persons who conduct was negligent as well as a substantial causal factor of the loss. Except when

---

41. Apportionment of liability by the extent to which a person's conduct raises the probability of a casualty above the "customary" probability (which is not necessarily the same as the nonnegligence probability) is discussed in Rizzo & Arnold, *supra* note 22, at 1413 & n. 70.

42. *See supra* note 30 and accompanying text.

43. *See supra* text accompanying notes 18-20.

Whether negligence has a magnitude, and thus whether it can be compared, depends on how "negligence" is defined and applied. If negligence is defined as the extent to which the magnitude of the risk of loss is greater than the magnitude of the utility of the conduct, negligence has an explicit magnitude. If negligence is defined as conduct for which the magnitude of the risk of loss is greater than the magnitude of the utility of the conduct, negligence has an implicit magnitude: the extent to which the magnitude of the risk of loss is greater than the magnitude of the utility of the conduct. (Because negligence is defined as a liability variable, not as a share variable, this magnitude is only implicit.) If negligence is defined as conduct that violates a safety law, negligence often does not have even an implicit magnitude. For some safety laws, a violation has no magnitude; for example, a person either stops at a "STOP" sign or does not stop at a "STOP" sign. For other safety laws, a violation has an implicit magnitude; for example, if a person violates a speed limit, the extent of the excessive speed is an implicit magnitude of the violation. The implicit magnitude of the violation may be the implicit magnitude of the negligence.

44. *See supra* text accompanying note 36 and *infra* note 49.

45. There seems to be little awareness of the many ways "negligence" can be defined and applied to the apportionment of liability. Thus "comparative negligence," in the general legal literature, has become merely a catch phrase with little meaning.

used only as a liability variable, negligence is also used to directly or indirectly determine the share of liability.

"Negligence" is one of many terms that is used to indicate that a person's conduct is not only a substantial causal factor of loss, but also blameworthy in the sense of failing to meet some standard of reasonable conduct. Additional blameworthiness terms are "gross negligence," "recklessness," "willfulness," "wantonness," "intent," and "maliciousness." Blameworthiness terms have been used in nonapportionment rules for allocating the entire loss to either a defendant or a plaintiff.[46] These additional blameworthiness terms may be applied in the same way as "negligence". Thus there can be comparative gross negligence, comparative recklessness, etc.[47]

V. METHODS OF TREATING SYNERGY

The magnitude of the share variable for one person generally depends on the conduct of other persons. Generally there is a positive or negative synergistic relationship regarding the significance of each person's conduct. For example, in case 1 above, the probability that P's gasoline explodes may depend on whether D3 sets a time bomb in P's backyard.[48] The particular loss if both P's gasoline explodes and D3's bomb explodes may be greater than or less than the sum of the particular loss if P's gasoline alone explodes and D3's bomb alone explodes. Unless apportionment is by fixed shares (in which case the magnitude of the share variable is immaterial) or the magnitudes of the share variable are by chance independent (in which case there is no synergy), each person's share of liability depends on the method by which synergy is treated.[49]

There are at least five methods of treating synergy. The first four methods divide the synergistic aspect in proportion to the marginal mag-

---

46. *See* PROSSER, *supra* note 1, § 34.

47. When blameworthiness terms are used as share variables, can the magnitude of one category of blameworthiness be compared with the magnitude of another category? The answer depends on how the blameworthiness terms are defined. Comparison is possible if the terms are defined vaguely, since apportionment will be essentially capricious. *See supra* text accompanying note 44. Comparison also is possible if the terms are defined so that they differ only in degree. For example, consider the relationship between negligence and recklessness where negligence is defined as conduct that creates an unreasonable risk of loss. If recklessness is defined as conduct that involves a high probability of an unreasonable risk of loss, the difference in the implicit magnitudes is one of degree (concerning the degree of probability) and the magnitudes of negligence and recklessness can be compared. But if recklessness is defined as conduct that is a conscious disregard of an unreasonable risk of loss, the difference is one of kind (a subjective standard instead of an objective standard) and the magnitudes of negligence and recklessness cannot be compared.

48. Synergy regarding the probability of a casualty is discussed in Kaye & Aicken, *supra* note 27, at 193-203; Rizzo & Arnold, *supra* note 22, at 1410-14.

49. Perhaps apportionment by nonsequentially mixed methods should be considered a third situation in which the method of treating synergy is unimportant, since nonsequentially mixed apportionment is essentially capricious.

nitude of the share variable. But, each involves a different definition of the marginal magnitude of the share variable.[50] (A) Defines the marginal magnitude according to the sequence of each person's harmful conduct. For the person whose harmful conduct occurred first, estimate what the magnitude would have been if the subsequent harmful conduct had not occurred; and for the person who harmful conduct occurred second, estimate what the marginal magnitude would have been, considering that the conduct of the first person was pre-existing and assuming that the subsequent harmful conduct had not occurred; etc. (B) Defines the marginal magnitude according to the sequence of harmful effects. For the person who conduct had a harmful effect first, estimate what the magnitude would have been if the subsequent harmful effects had not occurred; and for the person who conduct had a harmful effect second, estimate the marginal magnitude by considering the first harmful effect as preexisting and assuming that the subsequent harmful effects had not occurred; etc. (C) Treats each person as if that person were the only causal factor. For each person, estimate what the magnitude would have been if the other harmful conduct had not occurred. (D) Treats each person as if that person were an additional causal factor. Estimate what the magnitude would have been if only the other harmful conduct had occurred, and then estimate the extent to which the harmful conduct of that person increased the magnitude. (E) Divides the synergistic aspect according to fixed shares.[51]

Methods (A) and (B) are based on the actual sequence of events. Thus several problems arise which often make the use of this methods infeasible, capricious, or in need of additional clarifying rules. First, causes or effects often consist of gradual changes rather than discrete events. For example, when does a person who is drinking alcohol become drunk? Second, causes and effects often consist of intermittent events or continuous conditions. For example, for the homeowner whose chimney does not have a spark arrester, should his potentially harmful conduct be timed by when the homeowner first used the fireplace, last used the fireplace, first knew that there was no spark arrester, or first could have learned that there was no spark arrester? Third, the sequence of events often is indeterminate.[52] For example, if P is shot independently by two hunters, there may be no evidence, or there maybe conflicting evidence of equal weight, as to which hunter fired first or which shot hit P first. The timing of events is not a problem with methods (C), (D), and (E), as

---

50. The marginal magnitude of a share variable is not uniquely defined. *See supra* notes 15 & 29 and accompanying text.

51. Division of the synergistic aspect by fixed shares is discussed in Rizzo & Arnold, *supra* note 22, at 1411.

52. According to the theory of relativity, the sequence of events depends on the frame of reference of the observer. *See* ALBERT EINSTEIN, RELATIVITY 25-27 (1961).

these methods are not based on the sequence of events.[53]

The following hypothetical cases illustrate the significance of synergy and the differences among the methods of treating it. In these cases liability is apportioned by strict liability and particular loss using the formula in note 21.[54]

Case 1a involves positive synergy: P has suffered a $60,000 loss because a time bomb placed by D3 exploded and gasoline stored by P next to the furnace exploded. If only the bomb exploded, the loss would be $10,000. If only the gasoline exploded, the loss would be $20,000. With method (A), if D3 placed the bomb before P stored the gasoline next to the furnace, D3 is liable for $10,000 and P bears $50,000. If the order were reversed, D3 is liable for $$40,000 and P bears $20,000. With method (B), if D3's bomb exploded before P's gasoline exploded, D3 is liable for $10,000 and P bears $50,000. If the order were reversed, D3 is liable for $40,000 and P bears $20,000. With method (C), D3 is liable for $20,000 (1/3 of $60,000) and P bears $40,000 (2/3 of $60,000).[55] With method (D), D3 is liable for $26,667 (4/9 of $60,000) and P bears $33,333 (5/9 of $60,000).[56] With method (E), D3 is liable for $25,000 ($10,000 plus 1/2 of $30,000) and P bears $35,000 ($20,000 plus 1/2 of

---

53. The sequence of events as a method of treating synergy is discussed in Kaye & Aicken, *supra* note 27, at 206-207; Rizzo & Arnold, *supra* note 24, at 1409-1421. This method appears to be discussed also in Landes & Posner, *supra* note 16 *passim*. Landes & Posner discuss "simultaneous" torts, but this term is not necessarily defined by the sequence of events. *Id.* at 518. None of these papers distinguish the sequence of harmful conduct from the sequence of harmful effects.

54. Apportionment by strict liability and particular loss has not been chosen randomly as the method of apportionment. First, this method makes each person responsible for the consequences of each person's conduct, which may be considered ethically right. Second, this method closely approximates the marginal productivity method of distribution. *See supra* text accompanying notes 8,9 & 13. Third, this method closely approximates the only method of apportionment allowed under traditional tort law.

Apportionment under traditional tort law is discussed in RESTATEMENT (SECOND) OF TORTS § 433A (1965):

Apportionment of Harm to Causes

(1) Damages for harm are to be apportioned among two or more causes where:
    (a) there are distinct harms, or
    (b) there is a reasonable basis for determining the contribution of each cause to a single harm.

(2) Damages for any other harm cannot be apportioned among two or more causes.

This "black letter" rule provides only a criterion for deciding whether apportionment is allowed. It does not provide a method for apportioning liability where apportionment is allowed. Comments a and e, however, clearly indicate that apportionment should be by strict liability. Also, illustrations 3-11 are more consistent with apportionment by particular loss than with apportionment by any other criterion for deciding shares.

55. If each were the only causes of loss, the sum of the marginal losses would be $10,000 + $20,000 = $30,000. Using the equation in note 21, D3 is liable for 1/3 and P bears 2/3.

56. The difference between the actual loss and what the loss would have been if D3 were not a cause of loss is $60,000 − $20,000 = $40,000. The corresponding difference for P is $60,000 − $10,000 = $50,000. The sum of these marginal losses is $90,000. Using the equation in note 21, D3 is liable for 4/9 and P bears is liable for 5/9.

$30,000).[57]

Case 1b involves negative synergy: Again P has suffered a $60,000 loss because of D3's bomb and P's gasoline. If only the bomb exploded, the loss would be $40,000. If only the gasoline exploded, the loss would be $50,000. With method (A), if D3 placed the bomb before P stored the gasoline next to the furnace, D3 is liable for $40,000 and P bears $20,000. If the order were reversed, D3 is liable for $10,000 and P bears $50,000. With method (B), if D3's bomb exploded before P's gasoline exploded, D3 is liable for $40,000 and P bears $20,000. If the order were reversed, D3 is liable for $10,000 and P bears $50,000. With method (C), D3 is liable for $26,667 (4/9 of $60,000) and P bears $33,333 (5/9 of $60,000). With method (D), D3 is liable for $20,000 (1/3 of $60,000) and P bears $40,000 (2/3 of $60,000). With method (E), D3 is liable for $25,000 ($40,000 minus 1/2 of $30,000) and P bears $35,000 ($50,000 minus 1/2 of $30,000).

At one extreme of synergy, each person's conduct is sufficient to cause the entire loss. Consider case 1c: The loss from D3 alone is $60,000; the loss from P alone is $60,000; and the total loss is $60,000. With method (A), if D3 placed the bomb before P stored the gasoline next to the furnace, D3 is liable for the entire loss. If the order were reversed, P bears the entire loss. With method (B), if D3's bomb exploded before P's gasoline, D3 is liable for the entire loss. If the order were reversed, P bears the entire loss. With rule (C), liability is divided equally between D3 and P. With method (D), liability is indeterminate.[58] With method (E), liability is divided equally.

Sometimes one person's conduct alone is sufficient to cause the entire loss. Consider case 1d: The loss from D3 alone is $60,000; the loss from P alone is $40,000; and the total loss is $60,000. With method (A), if D3 placed the bomb before P stored the gasoline next to the furnace, D3 is liable for the entire loss. If the order were reversed, D3 is liable for $20,000 and P bears $40,000. With method (B), if D3's bomb exploded before P's gasoline exploded, D3 is liable for the entire loss. If the order were reversed, D3 is liable for $20,000 and P bears $40,000. With method (C), D3 is liable for $36,000 (6/10 of $60,000) and P bears $24,000 (4/10 of $60,000). With method (D), D3 is liable for the entire

---

57. Defining the marginal losses as if each person were the only causal factor, as in method (C), the sum of the marginal losses is $10,000 + $20,000 = $30,000. Since the total loss is $60,000, the synergistic aspect is $30,000. This amount is divided equally. D3 is liable for $10,000 + $15,000. P bears $20,000 + $15,000.

Alternatively, defining the marginal losses as if each person were an additional causal factor, as in method (D), the sum of the losses is $40,000 + $50,000 = $90,000. Since the total loss is $60,000, the synergistic aspect is −$30,000. This amount is divided equally. D3 is liable for $40,000 − $15,000. P bears $20,000 − $15,000.

58. If each were sufficient to cause the entire loss, both the numerator and the denominator in the equation in note 21, *supra*, would be zero, which gives an undefined share to each.

loss. With method (E), D3 is liable for $40,000 ($60,000 minus 1/2 of $40,000) and P bears $20,000 ($40,000 minus 1/2 of $40,000).

At the other extreme of synergy, each person's conduct alone is insufficient to cause any loss. Consider case 2a: D1 spills some gasoline and D2 drops a match. Together this starts a fire that destroys P's house, a $60,000 loss. Neither spilling gasoline alone nor dropping a match alone is sufficient to cause any loss. With method (A), if D1 spilled the gasoline before D2 dropped the match, D2 is liable for the entire loss. If the order were reversed, D1 is liable for the entire loss. With method (B), liability is indeterminate. With method (C), liability is indeterminate.[59] With method (D), liability is divided equally between D1 and D2. With method (E), liability is divided equally between D1 and D2.

Sometimes one person's conduct alone is insufficient to cause any loss. Case 2b is identical to case 2a except that spilling gasoline alone would cause a $20,000 loss. With method (A), if D1 spilled the gasoline before D2 dropped the match, D1 is liable for $20,000 and D2 is liable for $40,000. If the order were reversed, D1 is liable for the entire loss. With method (B), if D1 spilled the gasoline before D2 dropped the match, D1 is liable for $20,000 and D2 is liable for $40,000. If the order were reversed, D1 is liable for the entire loss. With method (C), D1 is liable for the entire loss. With method (D), D1 is liable for $36,000 (6/10 of $60,000) and D2 is liable for $24,000 (4/10 of $60,000). With method (E), D1 is liable for $40,000 ($20,000 plus 1/2 of $40,000) and D2 is liable for $20,000 (zero plus 1/2 of $40,000).

VI.   CONCLUSION

In summary, "comparative fault" and related terms are vague generic terms for apportionment of liability. There are many methods by which liability can be apportioned. The main differences concern the criterion for deciding which persons will be subject to apportionment and the criterion for deciding the share of liability among those persons who are subject to apportionment. Other differences concern the method of treating stochasticity and synergy.

In economic analysis of law papers it is traditional to conclude with a statement on the relative efficiency of alternative rules of law. This paper is not so ambitious. The main purpose of this paper is simply to show that there are many methods of apportioning liability, not to evaluate them.

Nonetheless, a few comments on efficiency will be made. Economic analyses of tort law emphasize two aspects of efficiency: the incentive to

---

59. If each were insufficient to cause any loss, both the numerator and the denominator in the equation in note 21, *supra*, would be zero, which gives an undefined share to each.

engage in alternative conduct and the administrative cost of the legal system. Regarding the incentive to engage in alternative conduct, apportionment by strict liability and particular loss corresponds most closely to the marginal productivity method of distribution and, to that extent, tends to given an incentive to efficiently refrain from potentially harmful conduct.[60]

Administrative costs are higher for apportionment by restricted liability than for apportionment by strict liability, which avoids litigation on the application of the liability variable. Administrative costs are higher for apportionment by variable shares than for apportionment by fixed shares, which avoids litigation on synergy and other aspects of the magnitude of the share variable.[61] Where apportionment is by variable shares, administrative costs are higher for apportionment by prospective share variables than for apportionment by retrospective share variables, which avoids litigation on the categorization of potentially harmful conduct.[62]

Administrative costs are highest for apportionment by mixed methods, especially nonsequentially mixed methods. With mixed methods there is litigation on the issues involved in each criterion. With nonsequentially mixed methods there also is litigation on the relative weight to be given to each criterion.

---

60. Landes & Posner assert that (a) the common law rules tend to encourage efficient conduct, (b) the common law does not allow apportionment, and (c) nonapportionment generally is better than any method of apportionment. Landes & Posner, *supra* note 16, *passim*. Assertion (b) is clearly wrong. *See supra* note 54. To the extent that apportionment by strict liability and particular loss corresponds to the marginal productivity method of distribution and encourages efficient conduct, assertion (c) is wrong.

61. Landes & Posner, *supra* note 16, at 529-31, 539.

62. Schwartz, *supra* note 3.