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Robert Cooter
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Unity in Tort, Contract, and Property: The Model of Precaution

Robert Cooter†

Much of the common law is concerned with allocating the costs of harm, such as the harm caused by accidents, nuisances, breaches of contract, or governmental takings of private property. There are at least two distinct goals for adopting allocative cost rules: the *equity* goal of compensating victims and the *efficiency* goal of minimizing costs to society as a whole.¹ These goals in turn can be formulated as two principles: the compensation principle and the marginal principle. The compensation principle states that victims should be compensated for harm caused by others. The marginal principle states that social costs should be minimized by equating the incremental benefit of each precautionary activity to its incremental cost.

Is the common law primarily concerned with the justice of compensation or the efficiency of cost minimization? Presented this way, the two principles appear to be rival theories of law.² This Article, however, poses a different question: How does the common law combine the goal of compensation with the goal of minimizing social costs? The two principles now appear as complementary, rather than rival, explanations. As a result, this Article assumes that there are circumstances in which compensation is required for reasons of justice and examines mechanisms

† Professor of Law, Boalt Hall School of Law, University of California, Berkeley. B.A. 1967, Swarthmore College; B.A. 1969, Oxford University; Ph.D. 1975, Harvard University. This Article was originally presented to the Law and Economics Workshop, University of Toronto.

1. In his classic work, Professor Calabresi states that accident law has two principal goals: "First, it must be just or fair; second, it must reduce the cost of accidents." G. CALABRESI, *THE COST OF ACCIDENTS* 24 (1970). This view is amplified in Calabresi, *About Law and Economics: A Letter to Ronald Dworkin*, 8 *HOFSTRA L. REV.* 553 (1980).

2. This juxtaposition leads to the tiresome but inevitable debate about whether the common law concerns justice or efficiency. For an introduction to this dispute, see *Symposium on Efficiency as a Legal Concern*, 8 *HOFSTRA L. REV.* 485 (1980).

that attempt to provide compensation, without undermining incentives for efficient behavior.

In addition to direct costs, there are many indirect social costs of harm, such as the cost of precautions against harm, the cost of bearing the risk of harm, the cost of obtaining information about risk, and the cost of settling disputes. Analyzing all of these costs thoroughly, however, is impossible in an article of modest length. Consequently, this Article selects two types of cost for detailed analysis, the direct cost of harm and the cost of precautions against it. The "model of precaution" is my label for an account of the relationship between these two types of costs.

There is justification in terms of economic theory for developing the model of precaution before considering other types of indirect costs. An economic model is built up by mathematical deduction from axioms describing the behavior of individuals and organizations.³ This axiomatic structure contains an accepted order of simplification, which is dictated by the internal structure of economic reasoning.⁴ Following this order, the simplest level of analysis assumes away the costs of risk aversion, the costs of obtaining information about risk, and the transaction costs of dispute resolution. Thus, the model of precaution is basic in terms of the internal structure of economic reasoning. Furthermore, this Article shows that the model of precaution is similar in structure for torts, contracts, and property. Thus the theme of the Article is the unity of the common law at the simplest level of economic analysis.

Part I of this Article describes the simple model as applied to torts, contracts, and property. This Part describes three common-law mechanisms for compensating victims that also create incentives for efficient behavior. Part II then provides several examples of the model's explanatory power by applying it to several legal rules and practices. Finally, Part III contains a brief discussion of the consequences of relaxing some of the simplifying assumptions. The use of graphs or algebra is kept to a minimum, although a mathematical appendix is included following the Article for the benefit of those who find quantitative analysis helpful.

3. Almost every intermediate microeconomics text begins by developing the logic of choice (optimization) and then proceeds to describe the aggregation of choices by markets and other institutions. *See, e.g.*, E. MANSFIELD, *MICROECONOMICS: THEORY AND APPLICATIONS* chs. 1-9 (4th ed., 1982). These models assume that individuals maximize utility and competitive firms maximize profits.

4. Microeconomic study adopts a standard set of assumptions about technology and taste. The assumptions imply smooth, convex indifference curves and isoquants. They justify the use of marginalist reasoning to describe optima. The standard approach, therefore, begins with these simple curves and proves various theorems. If these assumptions are relaxed, the analysis is complicated. Unfortunately, the literature on economic analysis of law often concentrates upon technologies and tastes that are discontinuous or nonconvex. *See, e.g.*, the discussions of contributory negligence in R. POSNER, *ECONOMIC ANALYSIS OF LAW* ch. 6 (2d ed. 1977); Schwartz, *Contributory and Comparative Negligence: A Reappraisal*, 87 *YALE L.J.* 697 (1978).

I
THE MODEL OF PRECAUTION

A. Forms of Precaution

Even when necessary or unavoidable, an accident, breach of contract, taking, or nuisance causes harm. The affected parties, however, can usually take steps to reduce the probability or magnitude of the harm. The parties to a tortious accident can take precautions to reduce the frequency or destructiveness of accidents. In contract, the promisor can take steps to avoid breach, and the promisee, by placing less reliance on the promise, can reduce the harm caused by the promisor's breach. Similarly, for governmental takings of private property, the condemnor can conserve on its need for private property, while property owners can reduce the harm they suffer by avoiding improvements whose value would be destroyed by the taking. Finally, the party responsible for a nuisance can abate; furthermore, the victim can reduce his exposure to harm by avoiding the nuisance.

Generalizing these behaviors, I extend the ordinary meaning of the word "precaution" and use it as a term of art in this Article to refer to any action that reduces harm. Thus the term "precaution" includes, for example, prevention of breach and reduced reliance on promises, conservation of the public need for private property and limited improvement of private property exposed to the risk of a taking, and abatement and avoidance of nuisances. These examples are, of course, illustrative, not exhaustive.

B. The Paradox of Compensation

When each individual bears the full benefits and costs of his precaution, economists say that social value is internalized. When an individual bears part of the benefits or part of the costs of his precaution, economists say that some social value is externalized. The advantage of internalization is that the individual sweeps all of the values affected by his actions into his calculus of self-interest, so that self-interest compels him to balance all the costs and benefits of his actions. According to the marginal principle, social efficiency is achieved by balancing all costs and benefits. Thus, the incentives of private individuals are socially efficient when costs and benefits are fully internalized, whereas incentives are inefficient when some costs and benefits are externalized.

In situations when both the injurer and the victim can take precaution against the harm, the internalization of costs requires both parties to bear the full cost of the harm. To illustrate, suppose that smoke from a

factory soils the wash at a commercial laundry,⁵ and the parties fail to solve the problem by private negotiation. One solution is to impose a pollution tax equal to the harm caused by the smoke. The factory will bear the tax and the laundry will bear the smoke, so pollution costs will be internalized by both of them, as required for social efficiency.⁶ In general, when precaution is bilateral, the marginal principle requires both parties to be fully responsible for the harm. The efficiency condition is called double responsibility at the margin.⁷

One problem with the combination of justice and efficiency, however, is that compensation in its simplest form is inconsistent with double responsibility at the margin. In the preceding example, justice may require the factory not only to pay for harm caused by the smoke, but also to compensate the laundry for that harm. Compensation, however, permits the laundry to externalize costs, thereby compromising efficiency. Thus, a paradox results: If the factory can pollute with impunity, harm is externalized by the factory; if the factory must pay full compensation,⁸ harm is externalized by the laundry; if compensation is partial, harm is partly externalized by the factory and partly externalized by the laundry.⁹ Assigning full responsibility for the injury to one party or parceling it out between the parties cannot fully internalize costs for both of them. Thus, there is no level of compensation that achieves double responsibility at the margin. In technical terms, when efficiency requires bilateral precaution, strict liability for any fraction of the harm, from zero percent to 100 percent, is inefficient.¹⁰

Rules that combine compensation for harm with incentives for efficient precaution are therefore patently difficult to formulate. The problem confronted in this Part of the Article is to explain how the law combines compensation with double responsibility at the margin. The

5. This familiar example is discussed in detail in Cooter, *How the Law Circumvents Starrett's Nonconvexity*, 22 J. ECON. THEORY 499 (1980).

6. For a full discussion of the tax remedy, see Cooter, *The Cost of Coase*, 11 J. LEGAL STUD. 1 (1982). Like other remedies, the tax remedy assumes that there is no bargaining between the injurer and the victim. If bargaining is possible, however, it will pay the injurer to bribe the victim to take more than the socially efficient amount of precaution, thus reducing the injurer's tax liability.

7. "The margin" refers to the change in harm brought about by a small change in precaution by either party. The economic concept of the margin corresponds to the mathematical concept of the first derivative.

8. Perfect compensation, by definition, is the level of compensation at which the laundry becomes indifferent to the level of pollution. Costs are internalized, by definition, when a decisionmaker's self-interest perfectly coincides with an economic conception of the public interest. In other words, costs are internalized when minimized private costs correspond to minimized social costs. Costs are externalized when they are not minimized.

9. See *infra* note 17 and accompanying text.

10. An implicit assumption of the paradox of compensation is that this inefficiency cannot be overcome by private bargaining, e.g., that transaction costs block an efficient solution by private agreement. See generally Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

law has evolved three distinct mechanisms for achieving this end, which I will sketch by reference to the law of torts, contracts, and property.

I. Accidents

Assume that Xavier and Yvonne are engaged in activities that sometimes result in accidents. If an accident occurs, Yvonne's property is damaged and Xavier's is not. For this reason I will call Xavier the injurer and Yvonne the victim, regardless of who is at fault. The probability that an accident will occur depends on the precautions taken by both of them, which are costly. The relationship between harm and precaution is easy to visualize in concrete cases. Drawing on a famous example,¹¹ suppose that Xavier operates a railroad train that emits sparks that sometimes set fire to Yvonne's cornfield. Xavier can reduce the harm to the corn by installing spark arresters, by running the trains more slowly, or by running fewer trains. In a like manner, Yvonne can reduce the harm by planting her corn farther from the tracks, by planting cabbage instead of corn, or by leaving the fields fallow.

There are two rules that assign liability without regard to fault. The first of these is a rule of no liability, which means that courts will not redistribute the cost of accidents. Under such a rule, the victim bears the full cost of accidents. The second rule is strict liability, which means that the injurer must compensate the victim whenever an accident occurs.¹² The rule used by the courts for allocating accident costs will determine Xavier's and Yvonne's incentives for precaution.

As noted by Professor Coase, the rule of law makes no difference from the viewpoint of social efficiency if Xavier and Yvonne can bargain with each other and agree on the reallocation of social costs.¹³ Therefore, in order for the rule of law to make a difference, one must assume that obstacles prevent potential injurers and victims from bargaining together. The conclusions that follow from this assumption can be stated briefly. If the rule of law is no liability, the injurer has no economic

11. This example was presented in Coase, *supra* note 10, at 29-34, and extended in Cooter, *supra* note 6, at 2-4.

12. There are some background conditions that must be satisfied for liability but are not explicitly analyzed in my model, for example, the requirement of proximate cause. The unqualified term "strict liability" in this paper is synonymous with the rule of law which is sometimes called "absolute liability," or "liability without fault." Strict liability is compatible with different methods of computing damages, although for purposes of analysis, perfect compensation is a useful benchmark. Compensation is perfect if the victim is indifferent to whether a compensated accident or no accident occurs. Strictly speaking, compensation is perfect when the victim's utility level is unaffected by a compensated accident. See *supra* note 8.

13. See generally Coase, *supra* note 10. Thus, if the legal rule is no compensation, Yvonne will be willing to pay Xavier to take efficient precautions to reduce Yvonne's exposure to harm. This will reduce her total costs. Conversely, if Xavier is required by law to compensate Yvonne, he will be willing to pay Yvonne to take efficient precautions so that her harm will be minimized.

incentive to take precaution and so will minimize his expenditure on precaution by taking none. If the rule of law is strict liability with perfect compensation, the victim is indifferent to whether or not an accident occurs. Since she has no economic incentive to take precaution, she will minimize her expenditure on precaution by not taking any. Thus, no liability and strict liability with perfect compensation are symmetrical opposites.¹⁴

The desirability of no liability or strict liability can be evaluated from the viewpoint of economic efficiency. The measure of social costs in the simple model of precaution is the sum of the parties' costs of precaution and the expected cost of harm. Efficient levels of precaution minimize the social costs of accidents.¹⁵ For most accidents, precaution is bilateral in the sense that social efficiency requires both injurer and victim to take at least some precaution.¹⁶ The rule of no liability and the rule of strict liability with perfect compensation both lack incentives for one of the parties to take precaution, so these rules cannot be efficient for accidents that are bilateral in this sense.

A similar statement is true when compensation is imperfect rather than perfect. Compensation is less than perfect if the victim would prefer no accident to an accident with (imperfect) compensation. Under a rule of strict liability with less than perfect compensation, the injurer externalizes the uncompensated portion of the harm and the victim externalizes the compensated portion of the harm. Since neither of them internalizes the full cost of harm, both have inadequate incentives for precaution.¹⁷ Thus, when efficiency requires bilateral precaution, rules of no liability or strict liability provide inadequate incentives for precaution, regardless of the level of compensation.

This is an instance of the paradox of compensation. Nonetheless,

14. This is the standard conclusion first proved by Brown, *Toward an Economic Theory of Liability*, 2 J. LEGAL STUD. 323, 328 (1973).

15. For any given technology of care, some potential precautionary steps will be efficient, i.e., will return a reduction in harm greater than the cost of implementation. Liability rules have the effect of assigning to one party or the other the incentive to take particular precautionary steps, but the socially efficient level of precaution, however, is a function of the technology of care (the costs of particular precautions and the resulting reduction in harm), and is independent, at least in the simple model, of the assignment of incentives to the parties.

16. Some efficient precautions may cost less when taken by one party or the other. Precaution is bilateral when at least one such precaution for each party exists. Workplace injuries, consumer product injuries, automobile collisions, and pedestrian accidents are all examples of accidents that are bilateral with respect to precaution.

17. Assume for example that if either party took a particular precaution costing \$100 annually, the annual cost of accidents would be reduced by \$150. This is an efficient precaution since total social costs would be reduced by \$50 annually if the precautionary step were taken. Yet under a rule of strict liability with imperfect compensation, say, one that requires the injurer to compensate the victim for half the cost of accidents, each party will externalize half the accident cost, and neither will be willing to spend \$100 to avoid a cost of \$75.

the paradox can be resolved by adopting fault rules that assign responsibility for harm according to the fault of the parties. To illustrate, a simple negligence rule requires the victim to be compensated by the injurer if, and only if, the latter is at fault. Under a simple negligence rule, Xavier will satisfy the legal standard in order to avoid liability. Thus, if the legal standard corresponds to the efficient level of precaution, Xavier's precaution will be efficient. Since Yvonne knows that she bears residual responsibility, she internalizes the costs and benefits of precaution; therefore, her incentives are efficient. Thus, if the legal standard of fault corresponds to the efficient level of care, both parties will take efficient precaution.¹⁸

Like the tax solution, a simple negligence rule creates a condition in which each party bears the cost of the harm caused by a small decrease in his precaution. The injurer responds by minimally fulfilling the legal standard of care, so that even a small reduction in his care will cause him to be liable.¹⁹ Absent that reduction in care by the injurer, however, the victim will be responsible. Thus, each party bears the full cost of the increase in harm caused by the decrease in his precaution. This is double responsibility at the margin.

The same method of reasoning can be used to show that efficient incentives for precaution are created by fault rules other than simple negligence, such as negligence with contributory negligence, strict liability with contributory negligence, or comparative negligence.²⁰ Under any fault rule, the injurer can escape responsibility by satisfying the legal standard, so an efficient legal standard will cause his behavior to be efficient. Similarly, the victim's precaution will be efficient because he bears residual responsibility and thus internalizes the costs and benefits of precaution.²¹ So long as the legal standards correspond to efficient precau-

18. The argument that the legal standard of reasonable care is identical to the efficient standard of care has developed around the Hand Rule. *United States v. Carroll Towing Co.*, 159 F.2d 169 (2d Cir. 1947); see Brown, *supra* note 14; Cooter, Kornhauser & Lane, *Liability Rules, Limited Information, and the Role of Precedent*, 10 BELL J. ECON. 366 (1979). For a proof of this result, see Brown, *supra* note 14, at 331-35. In the simple model we assume that the statistical cost of harm is perfectly known by the parties.

19. In reality, legal standards tend to be vague. The negligence theory does not change qualitatively, however, when a model with vague legal standards is adopted. A theory of negligence with fuzzy standards is discussed in Cooter, *Economic Analysis of Punitive Damages*, 56 S. CAL. L. REV. 79 (1982) and in R. Cooter, *Comparative Negligence Under Uncertainty* (November 1984) (unpublished manuscript) (on file with the *California Law Review*).

20. Professor Brown, *supra* note 14, asserts that a rule of comparative negligence creates obstacles to achieving efficient precaution that do not arise under traditional negligence rules. However, his argument is based upon an error in his mathematical formulation. In fact, he developed a mathematical model in which responsibility for accident costs is based upon comparative precaution, not comparative fault. See R. Cooter, *supra* note 19.

21. For a strict proof of efficiency results with fault rules, see Cooter, Kornhauser & Lane, *supra* note 18.

tion, all such rules create double responsibility at the margin. Thus the particular rule can be chosen that best accords with the requirements of just compensation.

The reader may raise some objections to this analysis of torts. After all, expensive legal fees may make no-fault rules more efficient than negligence rules and, in certain situations, precaution by only one party may be more efficient than bilateral precaution.²² The savings in legal fees mentioned in the first objection are omitted from the simple model of precaution by assuming away the costs of dispute resolution. This simplification is dropped in Part III, however, where the effects of costly dispute resolution are addressed. Furthermore, upon close examination, the second objection is incorrect unless some odd assumptions are made about the technology of precaution.²³

Other objections could be posed and answered. Instead, I want to develop the preceding arguments using some simple algebra and graphs. By mastering the algebra and graphs, the reader will be able to see more clearly the assumptions and implications of the model of precaution. Although the math is valuable for understanding the strengths and weaknesses of the model, this section may be skipped by the reader who does not find quantitative reasoning illuminating.

Expenditures on precaution by Xavier and Yvonne are denoted by x and y , respectively. The probability of avoiding an accident is a function of precaution by both parties: $p = p(x, y)$. Thus, the probability of an accident equals $1 - p(x, y)$. For example, $1 - p(0, 0)$ is the probability of accident if neither party takes precaution. The value of the harm caused by an accident is denoted a . The social cost SC of accidents in the simple model of precaution is the sum of precaution and expected harm:

$$SC = x + y + (1 - p(x, y))a.$$

Efficiency is achieved when social costs are minimized. The levels of precaution that minimize social costs are denoted x^* and y^* .²⁴

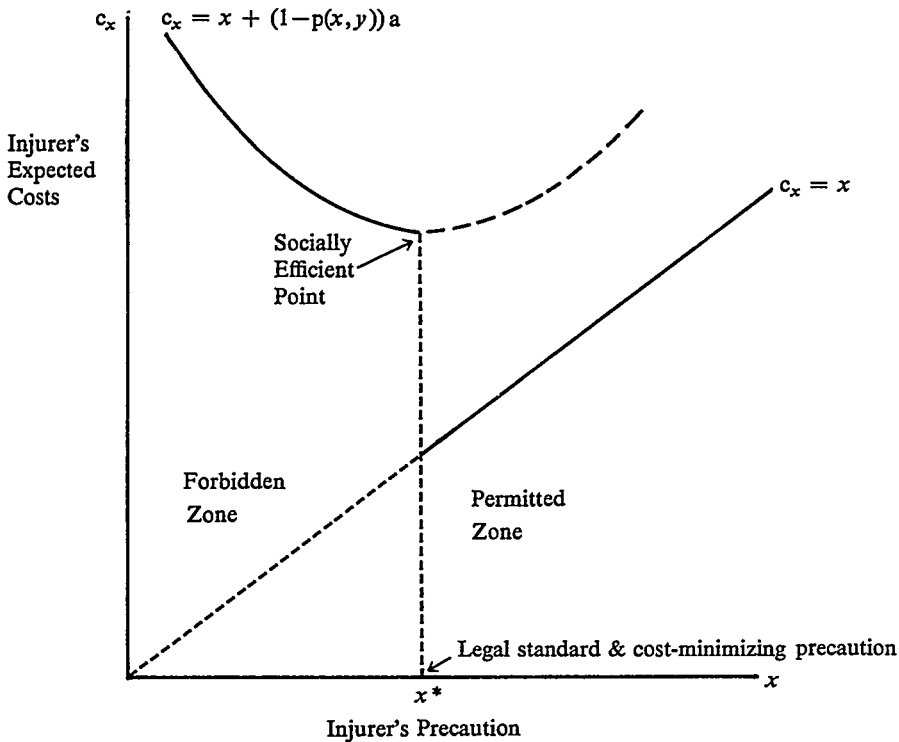
Under a negligence rule, the costs borne by the injurer depend on his level of precaution. This relationship is plotted in Figure 1a. The in-

22. See R. POSNER, *supra* note 4; Schwartz, *supra* note 4.

23. A negligence rule creates incentives for efficient precaution even if efficiency requires only one party to take precaution, provided the technology of care satisfies the usual economic assumptions of convexity. A problem does not arise with negligence unless the technology of care is nonconvex; of course, large nonconvexities vitiate every general conclusion in microeconomics. See, e.g., Starrett, *Fundamental Nonconvexities in the Theory of Externalities*, 4 J. ECON. THEORY 180 (1972). A nonconvexity corresponds to an isoquant or indifference curve the curvature of which is reversed from the usual case depicted in microeconomic text books.

24. The extent of harm, a , may also be affected by precautionary expense. Let $a = a(x, y)$. Precautions that reduce a operate identically to those that change p , the probability of avoiding an accident, so long as $(1 - p(x, y))a(x, y)$ is a concave function.

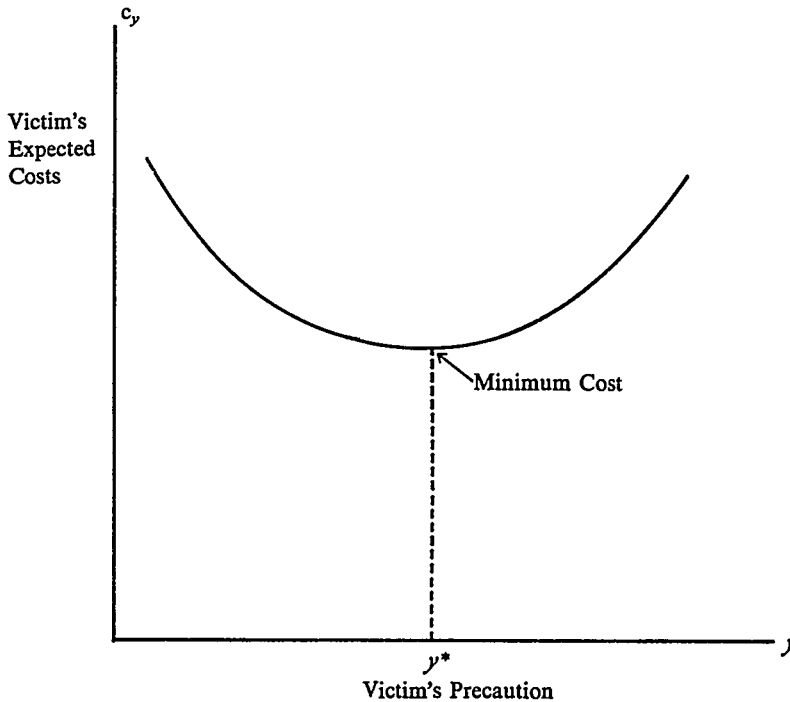
FIGURE 1A
INJURER'S COSTS, NEGLIGENCE RULE



injurer's costs (c_x) are shown on the vertical axis and his cost of precaution is shown on the horizontal axis. The graph can be divided into two zones according to the injurer's level of precaution. In the permitted zone, the injurer has expended more on precaution than the legal standard for fault (x^*), so he escapes liability and his total costs (c_x) equal his expenditures on precaution: $c_x = x$ for $x \geq x^*$. The graph of the equation $c_x = x$ is a 45-degree line through the origin as shown. In the forbidden zone, the injurer's precautionary expense falls short of the legal standard, so he is liable. His expected costs include both precaution and the costs of expected harm: $c_x = x + (1 - p(x, y))a$ for $x < x^*$. Xavier's expected costs (c_x) are graphed in Figure 1a as a function of his precaution x , while Yvonne's precaution is held constant at the efficient level ($y = y^*$). The graph of the equation $c_x = x + (1 - p(x, y^*))a$ is a curve as shown, which achieves its minimum at the socially efficient level of precaution x^* .²⁵ To minimize his costs, the injurer chooses the level of pre-

25. For simplicity, Figure 1a is drawn under the assumption that the socially efficient level of care equals the legal standard.

FIGURE 1B
VICTIM'S COSTS, NEGLIGENCE RULE



caution corresponding to the lowest point on his cost curve. It is clear from Figure 1a that the injurer minimizes his costs by setting his precaution equal to the legal standard: $x = x^*$.²⁶

If the injurer is nonnegligent, that is, if $x \geq x^*$, then the victim bears the cost of her precaution and the expected harm:

$$c_y = y + (1 - p(x, y))a.$$

This equation is graphed in Figure 1b. To minimize her costs, the victim chooses the level of precaution corresponding to the lowest point on her cost curve, denoted y^* .

By comparing the social cost function SC to the victim's cost function c_y , it is apparent that the victim internalizes the full harm caused by accidents. Consequently, for any given level of precaution by the injurer (x), the level of precaution that minimizes social costs also minimizes the

26. Notice that the injurer's costs jump at the legal standard x^* , which forms the boundary between the permitted zone and the forbidden zone. Consequently, conforming to the legal standard is much cheaper than not conforming to it.

victim's private costs. As explained above, the injurer will satisfy the legal standard in order to escape liability. If the legal standard equals the efficient level of care, then the injurer's precaution will be efficient. Thus the injurer takes efficient precaution to satisfy the legal standard, and the victim takes efficient precaution because she bears residual responsibility.

2. *Breach of Contract*

Yvonne and Xavier enter into a contract in which Yvonne pays for Xavier's promise to deliver a product in the future. There are certain obstacles to Xavier's performance that might arise, and if severe obstacles materialize, Xavier will not be able to deliver the product as promised. The probability of timely performance depends in part on Xavier's efforts to prevent such obstacles from arising. These efforts are costly.

One purpose of contracting is to give Yvonne confidence that Xavier's promise will be performed, so that she can rely upon his promise. Reliance on the contract increases the value to Yvonne of Xavier's performance. However, reliance also increases the loss suffered in the event of breach. The more the promisee relies, therefore, the greater the benefit from performance and the greater the harm caused by breach.

To make this description concrete, suppose that Xavier is a builder who signs a contract to construct a store for Yvonne by the first of September. Many events could jeopardize timely completion of the building; for example, the plumbers union may strike, the city's inspectors may be recalcitrant, or the weather may be inclement. Xavier can increase the probability of timely completion by taking costly measures, such as having the plumbers work overtime before their union contract expires, badgering the inspectors to finish on time, or rescheduling work to complete the roof before the rainy season arrives. Yvonne, on the other hand, must order merchandise for her new store in advance if she is to open with a full line on the first of September. If she orders many items for September delivery and the store is not ready for occupancy, she will have to place the goods in storage, which is costly. The more merchandise she orders, the larger her profit will be in the event of performance, and the larger her loss in the event of nonperformance.

As thus described, the structure of the contractual model is similar to the model developed for tortious accidents. The precaution taken by the potential tortfeasor against accidents parallels the steps taken by the promisor to avoid obstacles to performance. The parallel between the tort victim and the promisee, however, is more subtle. *More* precaution by the tort victim is like *less* reliance by the contract promisee, because each action reduces the harm caused by an accident or a breach. Therefore, the tort victim's precaution against accidents and the contract

promisee's reliance upon the contract are inversely symmetrical.²⁷

If Xavier does not perform, then a court must decide whether a breach has occurred or whether nonperformance is excused by circumstances. Among the excuses that the law recognizes are: that the quality of assent to the contract was too low due to mistake, incapacity, duress, or fraud; that the terms of the contract were unconscionable; or that performance was impossible or commercially impractical.²⁸ If the court narrowly construes excuses, usually finding nonperformance to be a breach, then Xavier will usually be liable. If the court construes excuses broadly, usually finding nonperformance to be justified, then Xavier will seldom be liable.

The incentive effects of a broader or narrower construction of excuses are similar to the effects of strict liability and no-liability rules in tort. If defenses are narrowly construed and perfect expectation damages are awarded for breach,²⁹ the promisee will rely as if performance were certain. Specifically, Yvonne will order a full line of merchandise as if the store were certain to open on the first of September.³⁰ A promisee's reliance to the same extent as if performance were certain corresponds to a tort victim's failure to take precaution against harm.

A broad construction of excuses has the symmetrically opposite effect: the promisor expects to escape liability for harm caused by his breach, so he will not undertake costly precautions to avoid nonperformance. Specifically, if Xavier is unconcerned about his reputation or the possibility of future business with Yvonne, and if nonperformance due to a plumber's strike, recalcitrant inspectors, or inclement weather will be excused, say, on grounds of impossibility, then Xavier will not take costly precautions against these events. The promisor's lack of precaution

27. At this point, it is appropriate to qualify my contracts model. Damage rules for breach of contract influence several types of behavior such as searching for trading partners, negotiating exchanges, drafting contracts, keeping or breaking promises, relying on promises, mitigating damages caused by broken promises, and resolving disputes about broken promises. A complete account of the incentive effects of contract law would model all of these types of behavior. Instead of a complete account, however, this Article follows the order of simplification suggested by microeconomic theory and selects two types of behavior from this list for detailed examination: the promisor's precaution against events that may cause nonperformance and the promisee's reliance.

28. See Eisenberg, *The Bargain Principle and Its Limits*, 95 HARV. L. REV. 741 (1982).

29. The most common remedy for breach of contract is damages, which may be perfectly compensatory or partially compensatory. As with tort damages, compensation is perfect if the beneficiary is indifferent to the alternatives of performance and compensated breach. Perfect compensation puts the promisee in as good a position as if the promisor had performed. Since this is the goal of expectation damages, damages that perfectly compensate for breach of contract could be called perfect expectation damages.

Expectation damages are usually based on lost profits, rather than on costs incurred in reliance. Nevertheless, some elements of anticipated profit are routinely excluded. See, D. DOBBS, *HANDBOOK ON THE LAW OF REMEDIES* ch. 12 (1973).

30. See Shavell, *Damage Measures for Breach of Contract*, 11 BELL J. ECON. 466 (1980); see also *infra*, Mathematical Appendix.

against possible obstacles to performance corresponds to the injurer's lack of precaution against tortious accidents.

As explained, the narrow and broad constructions of excuses for breach of contract affect behavior in ways that parallel no liability and strict liability in tort. Furthermore, the effects of these constructions on cost internalization and efficiency are also parallel. Specifically, if excuses are broadly construed, allowing the promisor to avoid responsibility for breach regardless of his precaution level, the promisor will externalize some of the costs of breach. As a result, his incentives to take precaution against the events that cause him to breach are insufficient relative to the efficient level. If, on the other hand, excuses are narrowly construed and full compensation is available for breach, the promisee can externalize some of the costs of reliance. Insofar as the promisee can transfer the risk of reliance to the promisor, her incentives are insufficient to provide efficient reliance and, therefore, reliance will be excessive.³¹

To illustrate, social efficiency requires Xavier to hire the plumbers to work overtime if the additional cost is less than the increase in Yvonne's expected profits caused by the higher probability of timely completion. Suppose, however, that there are circumstances in which tardiness will be excused regardless of whether or not Xavier hired the plumbers to work overtime. Suppose for example that inclement weather excuses tardiness on grounds of impossibility. In the event inclement weather provides Xavier with an excuse, the extra cost of hiring the plumbers to work overtime, which is valuable to Yvonne, has no value to Xavier. Anticipating this eventuality, Xavier may not hire the plumbers to work overtime, even though social efficiency may require him to do so.

Social efficiency also requires Yvonne to restrain her reliance in light of the objective probability of breach. To be more precise, social efficiency requires her to order additional merchandise until the resulting increase in profit from anticipated sales in the new store, discounted by the probability that Xavier will finish the store on time, equals the cost of storing the goods, discounted by the probability that Xavier will finish the new store late. Suppose, however, that Xavier must compensate Yvonne for her storage costs in the event that the goods must be stored. From a self-interested perspective, Yvonne has no incentive to restrain her reliance in these circumstances. Anticipating this possibility, instead of weighting the cost of storage by the objective probability of breach,

31. Since the purpose of many contracts is to facilitate planning and coordinate behavior, the possibility of excessive reliance may be difficult to grasp at first. Upon reflection, however, it is apparent that efficient reliance in many contractual contexts is less than the level that would maximize profits if performance were certain, and not merely likely. In the construction contract example, it is probably inefficient for Yvonne to order bulky merchandise with high storage costs, even though this would maximize her profits if timely construction were certain. For such contracts, efficiency requires the promisee to restrain her reliance.

Yvonne will weight it by the probability of breach without compensation. Since in this example the probability of breach is greater than the probability of breach without compensation, the weight Yvonne gives to the possibility of storage cost is too small. Therefore, her reliance will be excessive and thus inefficient.

In general, the possibility of successful excuses may externalize the costs of not taking precaution, so that the promisor takes too little precaution and the probability of breach is excessive. Similarly, the possibility of compensation may externalize the costs of reliance, so the promisee relies too heavily and the harm that materializes in the event of breach is excessive. This is an aspect of the paradox of compensation that arises in tort with respect to no liability and strict liability. As with tort law, contract law has a solution to the paradox, but the contract solution is different from the tort solution.³² To illustrate the characteristic remedy in contracts, consider the liquidation of damages. If the contract stipulates damages for breach requiring Xavier to remit, say, \$200 per day for late completion, then the promisor will have a material incentive to prevent breach. Specifically, Xavier may find that paying the plumbers to work overtime is cheaper than running the risk of late completion. If the promisee receives the stipulated damages as compensation, then the level of her compensation is independent of her level of reliance, so she has a material incentive to restrain her reliance. Specifically, if Yvonne receives \$200 per day in damages for late completion whether or not she orders the bulky merchandise, she may avoid the risk of bearing storage costs by not ordering it.

Like a negligence rule in tort, liquidation of damages in a contract imposes double responsibility at the margin: the promisor is responsible for the stipulated damages and the victim is responsible for the actual harm. By adjusting the level of stipulated damages, efficient incentives can be achieved for both parties. Stipulated damages are efficient when they equal the loss that the victim would suffer from breach if her reliance were efficient. To illustrate, assume that efficient reliance requires Yvonne to order the compact merchandise and not the bulky merchandise. Furthermore, assume that if Yvonne orders the compact merchandise she will lose \$200 in profits for each day that Xavier is late in completing the new store. Under these assumptions, liquidating damages at \$200 per day for late completion provides efficient incentives for both Xavier and Yvonne.

Under the stated assumptions, stipulating damages at \$200 per day will cause Yvonne to order the compact merchandise and not the bulky

32. Also note that breach differs from accident in that precaution by the promisor affects only the likelihood of breach and not the magnitude of damage, which depends on the promisee's reliance.

merchandise. Consequently, the actual harm that Yvonne will suffer in the event of breach is \$200 per day. Thus the stipulation of damages at the efficient level is a self-fulfilling prophecy: the stipulation of *efficient* damages causes the actual damages to equal the stipulation. Since Xavier internalizes the actual harm caused by breach, and Yvonne bears the risk of marginal reliance, there is double responsibility at the margin as required for efficiency.

Since liquidation of damages provides an immediate solution to the problem of overreliance, it would seem that liquidation clauses should be found in contracts where efficiency requires restraints on reliance. In fact, rather than liquidating damages, most contracts leave the computation of damages until after the breach has occurred. When damages are not liquidated in the contract and restraint of reliance is required by efficiency, various legal doctrines are available that can accomplish the same end as liquidation of damages. Liquidated damages restrain reliance by making damages invariant with respect to reliance. Courts restrain reliance by applying other legal doctrines that make damages similarly invariant.

To illustrate, the goods supplied by different firms in a perfectly competitive market are, by the definition of perfect competition, perfect substitutes. When the promisor fails to perform in a competitive market, damages are ordinarily set equal to the cost of replacing the promised performance with a close substitute (the replacement-price formula³³). Specifically, if the seller breaches his promise to supply a good at a specified price, the damages paid to the buyer may include the additional cost of purchasing the good from someone else. In technical terms, damages in such a case will equal the difference between the spot price and the contract price for that particular good. In a competitive market, no single buyer or seller can influence these prices. Consequently, damages computed by the replacement-price formula are invariant with respect to the level of the promisee's reliance. Thus, replacement price damages in a competitive market have the same efficiency characteristics as liquidated damages.

For noncompetitive markets, doctrinal alternatives are available to reduce or eliminate the effects of variations in damages due to reliance.³⁴ To illustrate, recovery may be limited to damages that were foreseeable at the time the promise was made. It is but a short step to argue that reliance that is excessive in efficiency terms is also unforeseeable. Thus,

33. See U.C.C. § 2-712 (1978). The concept of replacement damages is developed at much greater length in R. Cooter & M. Eisenberg, *Damages for Breach of Contract* (1984) (unpublished manuscript) (on file with the *California Law Review*).

34. See, e.g., U.C.C. § 2-715 (1978).

the foreseeability doctrine can be used to avoid compensation for excessive reliance.

There are other doctrinal approaches to damages that have similar effects. For example, suppose that Xavier fails to complete the building on the first of September as promised, and Yvonne has to rent temporary space elsewhere. The court might award damages based in part on the additional rent, if it finds Yvonne's calculation of lost profits too speculative.³⁵ If damages are based on the additional rent, and if the additional rent varies less than Yvonne's profits with respect to her reliance, then her incentive to overrely is reduced. As another example, failure to perform on a franchise agreement may result in an award of damages equal to the profit of similar franchise establishments, but not the "speculative profits" lost by the particular plaintiff. The general point of these two examples is that if compensation is restricted to nonspeculative damages, and if nonspeculative damages vary less with respect to reliance than the actual harm, then restricting compensation to nonspeculative damages reduces the incentive to overrely.³⁶

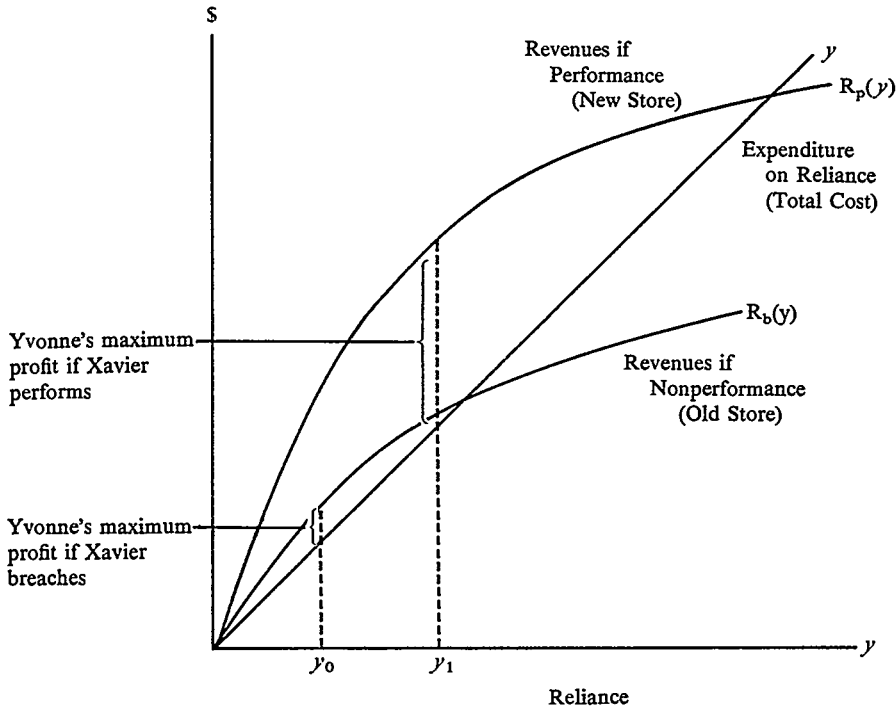
As in the torts section, instead of a lengthy discussion of qualifications and assumptions of the argument, I develop the model by using simple algebra and graphs. I begin by graphing the relationship between Yvonne's profits and her reliance. Profits equal the difference between total revenues and total costs, represented graphically by the vertical distance between the revenue and cost curves in Figure 2. Both revenues and costs increase as reliance increases in the range shown in Figure 2. However, revenue depends upon whether Xavier performs and Yvonne markets her merchandise in the new store, or whether Xavier breaches and Yvonne markets her merchandise in the old store.

Efficiency requires Yvonne to take account of the risk that Xavier will breach. In Figure 2, the level of reliance denoted y_1 maximizes profits in the event of performance, because y_1 is the point of maximum vertical distance between the cost of precaution (y) and revenues ($R_p(y)$) in the event of performance. If performance is almost certain, then the efficient level for Yvonne's reliance is almost y_1 . In Figure 2, the level of reliance denoted y_0 maximizes profits in the event of breach, because y_0 is the point of maximum vertical distance between costs (y) and revenues

35. The problem of speculative profits is discussed in Goetz & Scott, *Liquidated Damages, Penalties and the Just Compensation Principle: Some Notes on an Enforcement Model and a Theory of Efficient Breach*, 77 COLUM. L. REV. 554 (1977).

36. To avoid confusion, a comment is appropriate concerning the relationship between reliance and mitigation of damages. Mathematically, mitigation and restrained reliance are identical but for time: reliance occurs before breach is known, whereas mitigation occurs afterwards. When mitigation is discussed *infra* in text accompanying note 71, I make the argument that a fault rule, similar in operation to negligence rules in tort, applies to mitigation of damages.

FIGURE 2
YVONNE'S PROFITS



$(R_b(y))$ in the event of breach. If breach is almost certain, then the efficient level of Yvonne's reliance is almost y_0 . If performance is likely, but not certain, then the efficient level for Yvonne's reliance is less than y_1 and greater than y_0 .³⁷

Xavier bears the cost of his precautions against nonperformance and he pays damages to the extent of his liability in the event of breach. If he is never liable, then he will minimize his costs by not taking any precaution.³⁸ If he is fully liable for the actual reduction in Yvonne's profits

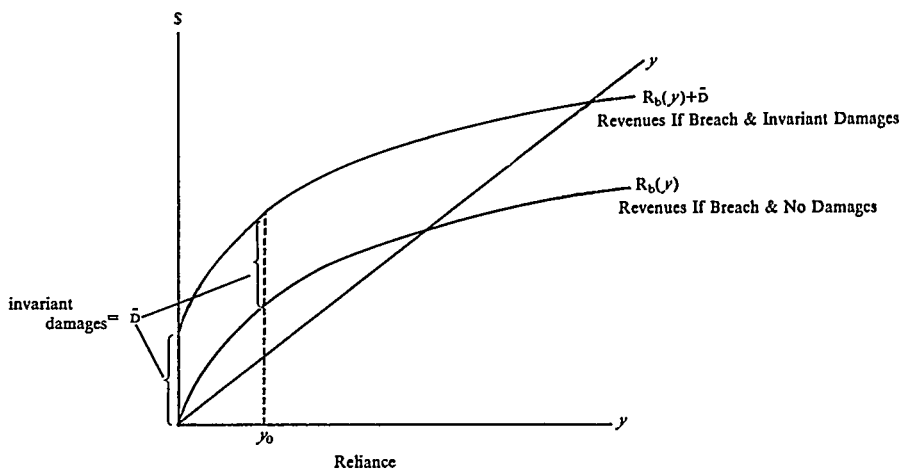
37. To be more precise, let $R_p(y)$ indicate Yvonne's revenues in the event of performance and let $R_b(y)$ indicate her revenues in the event of breach, as depicted in Figure 2. Furthermore, let p indicate the probability of performance and $(1 - p)$ the probability of breach. To achieve efficiency, Yvonne should choose the level of reliance that maximizes her expected profits, where revenues are weighted by the probability of achieving them:

$$\max \{-y + (1-p)R_b(y) + pR_p(y)\}.$$

If $p = 1$, then the optimal value is y_1 ; if $p = 0$, then the optimal value is y_0 ; if $1 > p > 0$, then the optimal value is between y_1 and y_0 .

38. Xavier's expenditure on precaution, denoted x , increases the probability of performance, according to the function $p = p(x)$. Xavier chooses precaution to minimize the expected cost of precaution plus damages (which are denoted by D):

FIGURE 3
INVARIANT AND VARIABLE DAMAGES



caused by breach, then he will internalize the cost of breach and take efficient precaution against it. On the other hand, if Yvonne is fully compensated regardless of how much she relies, she will act as if performance is certain and rely at the full level y_1 . However, if Yvonne receives compensation for breach in a lump sum (which is invariant with respect to her reliance), then she will bear the full risk of relying and thus rely at the efficient level.³⁹

The logic of invariant damages is illustrated in Figure 3, which graphs Yvonne's profits in the event of nonperformance as a function of her reliance. If she receives damages independent of her reliance (invariant damages), the revenue function shifts up uniformly by the amount of damages, denoted \bar{D} . Since the function shifts uniformly, the profit maximizing point is unchanged—it is still y_0 . In brief, invariant compensation is a lump sum transfer conditioned on breach, which has no effect on the

$$\min \{x + [1 - p(x)]D\}.$$

If damages are nil ($D = 0$), which corresponds to no liability, then Xavier will minimize his costs by taking no precaution.

39. In the event of a breach, Yvonne will receive damages, D . She maximizes her expected profits from reliance, including damages:

$$\max \{-y + [1 - p(x)][R_b(y) + D] + p(x)R_p(y)\}.$$

If damages equal the actual shortfall in profits caused by breach ($D = R_p(y) - R_b(y)$), which corresponds to strict liability with perfect compensation, then Yvonne will maximize her profits by overrelying to the full extent y_1 . More generally, if damages D are an increasing function of reliance y , then the marginal benefit of reliance is too high from the viewpoint of efficiency and there will be overreliance. However, if D is a constant, denoted \bar{D} , as is the case when damages are liquidated, then the value of this constant does not influence the marginal cost or marginal benefit of reliance, so the profit-maximizing level of reliance is independent of the magnitude of invariant damages. Furthermore, if $\bar{D} = R_p(y^*) - R_b(y^*)$, where y^* is the efficient level of reliance, then Xavier's precaution will be efficient.

promisee's level of reliance. The promisee will, therefore, maximize profits by choosing a level of reliance between y_1 and y_0 , as shown in Figure 2, just as she would if there were no compensation for breach. By contrast, if damages are an increasing function of reliance, Yvonne's profit is maximized at a level of reliance that exceeds the efficient level.

3. Takings

Xavier is a government official whose wall is covered by a large map with a thick blue line across it. The blue line represents a proposed government project, such as a highway, park, sewer line, or the boundaries of a neighborhood being downzoned. Yvonne is contemplating major improvements on her property, which is located on the blue line. If the government carries out its plan, it will either take Yvonne's title or an easement in her land, or restrict her ownership rights by regulation. By so doing, the government project will also destroy the value of Yvonne's proposed improvements. In brief, Yvonne's improvements will be valuable if the government project is abandoned and valueless if the project is carried out. Yvonne's improvements are therefore analogous to reliance in the contract example: the more she invests, the greater the benefit if there is no taking and the larger the loss if there is.

There are several ways in which a dispute could arise between Xavier and Yvonne.⁴⁰ Xavier might take the property and offer compensation that Yvonne considers inadequate. Xavier might regulate the property and offer no compensation. Or Xavier might threaten to take the property without actually taking it, thus eroding its value. Furthermore, the law offers Yvonne several remedies; for example, the courts may overturn the regulation or award her damages in the dispute.

For conceptual purposes, it is thus convenient to narrow the issues so that they resemble the breach of contract problem. Suppose the dispute is whether the government action is a taking or a mere regulation, and the remedy for a taking is compensation. Specifically, suppose that Yvonne owns a building that is currently being used as a retail outlet, although she proposes to expand and improve the building so that it can be used as a factory. The government official Xavier, however, contemplates downzoning the area to forbid industrial uses, although commercial uses would still be allowed. Xavier has commissioned a study, which will take several years to complete, to recommend for or against downzoning and has postponed his decision pending the results.

If Yvonne proceeds with a large investment and the government downzones the area, thereby preventing Yvonne from using her property

40. For an overview, see C. Berger, *When is Regulation a Taking?, How Do Courts Decide?*, in *LAND OWNERSHIP AND USE* 711-34 (3d ed. 1983).

as a factory, a court must decide whether the government action is a regulation or a taking. In the event the government action is judged to be a taking, Yvonne will be entitled to compensation, including compensation for the value of improvements. On the other hand, in the event that the government action is judged to be a mere regulation of Yvonne's use, she will not be entitled to compensation at all.

Since the government is required to compensate for takings but not for regulations, the incentive effects of the alternative decisions are starkly different. Yvonne bears a risk on investments the value of which may be destroyed by future regulations. Similarly, the city bears the risk that its future needs will require taking Yvonne's property rights. Consequently, if government action is almost certain to be deemed a taking, and if compensation for takings is perfect, Yvonne will invest as if there were no possibility of government action, whereas the government will have an incentive to proceed with caution. On the other hand, if the government action is almost certain to be deemed a regulation, Yvonne will be cautious about improvements, whereas the government will lack material incentives for precaution.

The incentive effects of takings and regulation are like the incentive effects of strict liability and no liability in tort, or like the narrow and broad construction of excuses for breach of contract. Moreover, the effects upon cost internalization and efficiency are also similar. When government action is likely to be judged a taking, private property owners externalize the risk associated with improvements the value of which may be destroyed by the government action. Instead of restraining investment in light of the objective probability of a taking, private investors have incentives to invest excessively relative to the socially efficient level.⁴¹

Social efficiency requires Yvonne to scale down or delay her planned improvements in light of the probability that Xavier's study will recommend downzoning. To be more precise, social efficiency requires her to make additional improvements until the resulting increase in her profits when there is no government action, multiplied by the probability of no

41. It is not always clear that efficient investment is a continuous function of the likelihood of downzoning so that an intermediate likelihood of downzoning requires an intermediate investment. In many cases, the most efficient alternative for Yvonne may be simply to wait. In other cases, however, the cost of waiting may itself be too high to be efficient due to interest expense or other opportunity costs. Generally the cost of waiting, either in interest expense incurred or opportunity lost, affects Yvonne continuously, justifying the textual assumption.

The principle that full compensation for takings stimulates too much private investment in improvements is illustrated in N. EVENSON, *PARIS: A CENTURY OF CHANGE, 1878-1978* (1979). The author describes how planned development by the city attracted private speculators whose incentive was to secure compensation: "The politics of the city consists, as almost always, in valorizing as highly as possible the land it wishes to buy." *Id.* at 276 (citation omitted). I am grateful to Philip S.C. Lewis for this reference.

government action, equals the loss in profits when there is government action, multiplied by the probability of government action. When the government action is likely to be judged a regulation it is in Yvonne's self-interest to make this calculation, so her incentives for investment will be efficient. However, when the government action is likely to be judged a taking with full compensation, Yvonne will give insufficient weight to her loss in profits in the event of government action. Therefore, she will invest excessively.

Similarly, when government action is likely to be judged a taking, the government internalizes the cost of its actions and thus restrains its taking of private property. On the other hand, when government action is likely to be judged a mere regulation, the government lacks material incentives to conserve its use of valuable private property rights. In general, the possibility that government action will be judged to be a mere regulation externalizes government costs, resulting in excessive government action. The possibility that takings will be fully compensated externalizes the risk to private individuals that government will destroy the value of private improvements, resulting in excessive private investment.

The takings and compensation problem has been discussed by utilitarians for many years,⁴² but their analysis is muddy. For example, in a classic article, Professor Michelman interprets utilitarianism as requiring compensation for government projects whenever "demoralization costs" exceed "settlement costs."⁴³ A proxy for measuring demoralization costs is the decline in property value due to the unwillingness of owners to undertake noncompensable investments. Settlement costs refer to the social costs of negotiating, administering, and litigating a scheme of compensation. One implication of this analysis is that efficiency demands full compensation of property owners whenever settlement costs are trivial, as is the case when property owners accept without challenge the proffered compensation.

Michelman's argument is backwards, however. The problem of takings without compensation is the resulting enthusiasm of government for further takings, not the demoralization of property owners. The disincentive for private improvements under a no-compensation rule would result in efficient private investment if government officials did not take too much private property.⁴⁴ The efficiency justification for compensa-

42. The traditional utilitarian argument does not extend much beyond the observation that property should be protected because happiness is difficult in the absence of secure possession, use, and control of goods. See L. BECKER, *PROPERTY RIGHTS: PHILOSOPHIC FOUNDATIONS* 57-74 (1977).

43. Michelman, *Property, Utility and Fairness: Comments on the Ethical Foundations of "Just Compensation" Law*, 80 HARV. L. REV. 1165, 1215 (1967).

44. Under a no-compensation rule, private investors would internalize the objective risk that improvements would be rendered valueless by governmental takings.

tion is that it discourages takings; discouraging too much private investment is only the indirect effect of taking too much private property. A rule of full compensation discourages government from excessive takings, and a rule of no compensation discourages property owners from excessive private improvements; however, neither rule achieves double responsibility at the margin, as required for efficiency.

There are many situations in which private improvements should be restrained and government should conserve uses of private property. If a class of such cases is judged to be a taking, or a mere regulation, then one of the parties will have incentives to behave inefficiently. Thus, there is a potential problem obstructing the goal of efficient justice. The problem is to make the immune party—the property owner in compensable takings, the government in mere regulations—behave as if he were responsible.

This is an aspect of the paradox of compensation that arises in tort with respect to no liability and strict liability, and that arises in contracts with respect to the narrow and broad construction of excuses. As with torts and contracts, the solution requires a legal rule that creates double responsibility at the margin.⁴⁵ Double responsibility is achieved, for instance, when a property owner is not compensated for a taking of her property and the government has to pay the full cost of the taken property to a third party. For efficiency, therefore, Yvonne should regard government actions as mere noncompensable regulations, and Xavier should regard them as takings.

The solution to this problem in property law is similar to the solution in contracts. The contract remedy for breach is to liquidate damages so that the injurer is liable for liquidated damages and the victim for actual damages. This outcome is achieved in the condemnation setting when the government purchases an option from the property owner. An option entitles the government to buy the property at any time within a prescribed interval at a price specified in the contract. If government buys the property on which it holds an option, then it is liable for the price and the property owner is liable for any actual loss.

For example, if Xavier buys an option to purchase Yvonne's property for one million dollars, Yvonne must sell on demand at that price whether or not she has made improvements on her property. If the option is exercised, Xavier will bear the stipulated cost of one million dollars and Yvonne will bear the loss on any improvements. The stipulated price will provide an incentive for Xavier to conserve on taking private property, and the noncompensability of the actual cost of improvements

45. In this discussion of the simple model, two assumptions are implicit: one, that government agents act in the government interest; and two, that the government is interested in its own aggrandizement.

will provide an incentive for Yvonne to restrain her investments, thus resolving the problem of efficient incentives.

There is, however, an important practical difference between liquidating contract damages and the use of governmental options to acquire private property rights. Liquidating damages involves adding an additional clause to the primary contract; the parties must come together and negotiate the primary contract anyway. When the government purchases an option to buy private property, however, it must enter into negotiations that would not otherwise occur. The transaction costs of buying and selling options will often outweigh the gains from correcting efficiency incentives for investment.⁴⁶

Some remarks are in order concerning the measure of damages for takings—the “fair market value” of the property. Property owners are exposed to two different risks that are modeled in this Article. First, there is a risk that the government will undertake a project that interferes with the private use of property. Second, there is a risk that the harm caused by the interference will not be fully compensated (“mere regulation”). If the first risk alone exists—that is, if there is uncertainty about the government action but certainty that perfect compensation will be paid in the event of the action—then the actual market value of the property will be the same as if there were no uncertainty.⁴⁷ However, if both uncertainties exist, then the actual market value of the property will be less than it would be if there were no uncertainty.

For example, suppose that there are several acres of wetlands within the city limits. The land is worth one million dollars to a potential developer, but will be worthless if filling and development are prohibited. If it is uncertain whether development will be allowed, but certain that in the event development is prohibited, compensation will be paid at the market rate that would prevail were development allowed, then the market value will be one million dollars. However, if it is uncertain whether the owner will be compensated if development is restricted, then the market price will fall to a level reflecting this uncertainty.⁴⁸ Thus, uncertainty about payment of compensation lowers the market price, the value often used as the basis for computing compensation in the event that it is paid.

46. If negotiations fail, then it may not be possible to condemn an option, at least in some states, because the purpose may be too speculative. See CALIFORNIA LAW REVISION COMM'N, EMINENT DOMAIN LAW (1975), for a discussion of this point under California law.

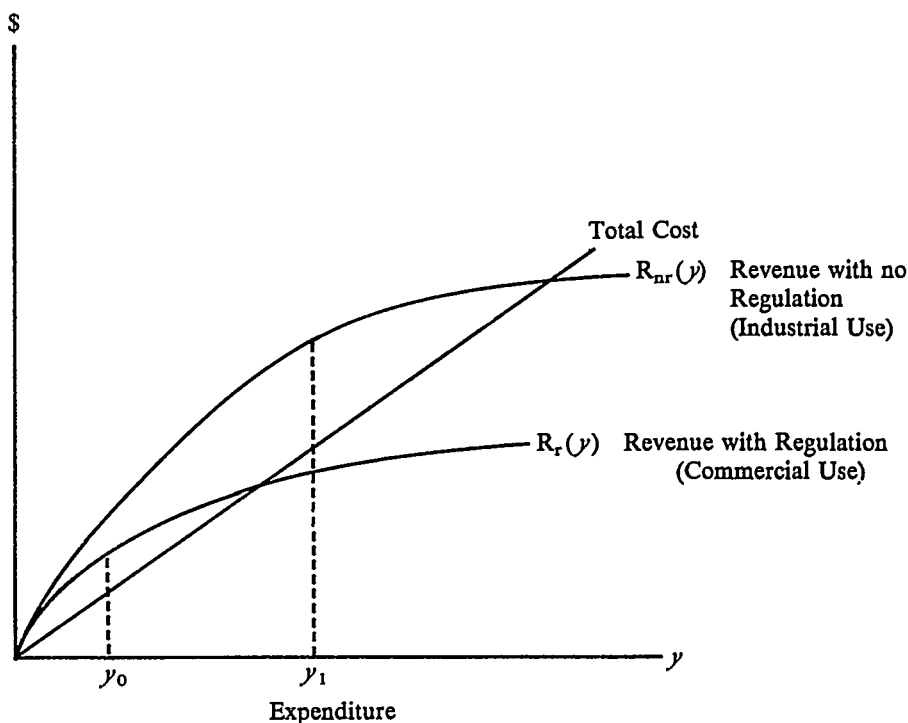
47. A proof of this proposition is included *infra* in the Mathematical Appendix.

48. There is, however, a problem in determining fair compensation: Suppose a speculator buys the wetlands for, say, two hundred thousand dollars. If government decides to prohibit development, then what is the correct compensation? Is the fair market value two hundred thousand dollars (the price the speculator paid), or a million dollars (the fair market value were development to be permitted), or some other figure? This question is difficult to resolve, but in general the *most* efficient outcome cannot be achieved at any level of compensation unless compensation was stipulated in an option.

There are some costs omitted from this simple analysis that affect the conclusions. Property taken by the government often represents a large proportion of the wealth of a victim, but only a small proportion of the wealth of all taxpayers. A rule of strict liability for takings could be justified as a type of insurance that reallocates the risk of large losses from individuals to all taxpayers. In other words, incentives for efficient investment by property owners might be sacrificed in order to spread the risk. This argument is discussed in Part III, where the assumption of risk neutrality is relaxed.

Before moving to the next Section, I again restate the argument with the help of a graph, so that those readers who followed the graphs in the earlier Sections can see that the takings problem is formally similar to the contracts example. Figure 4 shows the profits that Yvonne will enjoy, depending on the size of the building and its permitted uses. This graph is identical to Figure 2, except that the curves are labeled differently.⁴⁹

FIGURE 4
REGULATION AND PROFITS



49. To represent the profit curves algebraically, let y denote Yvonne's investment, let p denote the probability of no taking, let D denote the damages paid to Yvonne, and let R_r and R_{nr} denote Yvonne's revenues in the event of regulation and no regulation, respectively. The expected profit function for Yvonne can thus be written:

The straight line represents Yvonne's total investment in the building. The higher revenue curve represents revenues from the building if industrial use is allowed; the lower revenue curve represents revenues if industrial use is forbidden. The interpretation is unchanged from the contracts example. Specifically, y_0 represents the investment that maximizes profits when industrial use is forbidden, and y_1 represents the investment that maximizes profits when industrial use is allowed. If it is objectively uncertain whether the government will act, the efficient level of investment will be less than y_1 and greater than y_0 .

4. Nuisance

In discussing tortious accidents, my example was a railroad train emitting sparks that sometimes burned a farmer's fields. Instead of describing such fires as tortious accidents, however, the farmer might have described the sparks as a nuisance. The choice of description has no effect on the nonlegal aspects of the situation, such as the need for bilateral precaution, but there is a difference in the legal remedy. The traditional remedy for tortious accidents is compensatory damages, while the traditional remedy for nuisance in property law is injunctive relief.

When the remedy is injunctive, and not compensatory, the paradox of compensation does not arise. Nonetheless, injunctions do give rise to efficiency problems. An injunction is a coercive order issued by a court. Assuming a failure in private negotiations by the disputants, if a coercive order is to be efficient, it must demand efficient behavior. However, the authorities who issue the order may be too remote from the facts to know what behavior is efficient, or they may not be motivated to demand it.

The preceding argument recapitulates the economists' critique of regulation. A regulation is a coercive order issued by a government agency. People subject to a regulation are likely to possess information that the regulator needs to identify the correct command, but it may be difficult for the regulator to obtain this information. This is so because the cost of gathering such information is high, and because the people who possess such information have incentives not to divulge it. The economists' critique of "command and control" regulation is that it requires too much information, as well as disinterestedness, on the part of

$$\text{Yvonne's profits} = -y + (1 - p)[R_r(y) + D] + pR_{nr}(y).$$

The actual damage caused by regulation is the lost revenue $R_{nr}(y) - R_r(y)$. If the damages paid to Yvonne are by rule equal to the lost revenue, then D will be an increasing function of investment y . If D is an increasing function of investment y , then the marginal benefit to Yvonne of additional investment includes the marginal value of the transfer D ; therefore, Yvonne will overinvest. However, if damages are stipulated in an option, then D is a predetermined constant denoted \bar{D} . Because the value of this constant does not affect Yvonne's marginal benefit from investment, she will internalize marginal benefits and costs and will thus have incentives to act efficiently.

regulators.⁵⁰

Economists therefore urge regulators to adopt methods that alter incentives and redirect information instead of issuing commands, so that affected parties can work out the best course of action among themselves. This approach suggests viewing nuisances as a subject for private bargaining, a view that has been developed at length in the continuing commentary on the Coase Theorem.⁵¹ The central conclusion of this literature is that private bargaining among a small number of people with well-defined rights usually has an efficient outcome. Experimental evidence also suggests that breakdowns are rare in two-person bargaining games with clear stakes but are more common when several people must agree.⁵²

These conditions—small numbers of bargainers and well-defined rights—are often satisfied in property disputes. In economic terms, a nuisance is external harm imposed by one property's use upon another. The externality often is limited to contiguous pieces of real estate, which limits the number of affected property owners. To illustrate, noise, foul odors, and pollution diminish rapidly with distance from the source. The owners of property contiguous to the nuisance, who are the ones substantially harmed by it, are thus often few in number.

For some kinds of nuisance the rights are well-defined, and contiguity keeps the number of affected parties small, suggesting a presumption of efficient private bargaining. The central claim of the Coase Theorem is that private bargaining will achieve efficiency regardless of who is assigned the well-defined rights, because the rights will be bought and sold

50. See C. SCHULTZE, *THE PUBLIC USE OF PRIVATE INTEREST* (1977); Breyer, *Analyzing Regulatory Failure: Mismatches, Less Restrictive Alternatives, and Reform*, 92 HARV. L. REV. 547, 575-78 (1979).

51. See Coase, *supra* note 10; Cooter, *supra* note 6. The Coase Theorem proposes that "the structure of the law which assigns property rights and liability does not matter so long as transaction costs are nil; bargaining will result in an efficient outcome no matter who bears the burden of liability." Cooter, *supra* note 6, at 14.

52. See Hoffman & Spitzer, *The Coase Theorem: Some Experimental Tests*, 25 J.L. & ECON. 73 (1982). The number of affected people should influence the willingness of courts to give injunctive relief. In recent years courts have sometimes relaxed the traditional right to injunctive relief in nuisance cases affecting many people and awarded damages instead. See, e.g., *Spur Indus. v. Del E. Webb Dev. Co.*, 108 Ariz. 178, 494 P.2d 700 (1972) (injunction granted, but conditioned on plaintiffs' indemnification of defendant's reasonable costs); *Boomer v. Atlantic Cement Co.*, 26 N.Y.2d 219, 257 N.E.2d 870, 309 N.Y.S.2d 312 (1970) (injunction granted to enjoin nuisance, but conditioned on defendant's payment of damages). However, bargaining can break down for strategic reasons, even when only a few people are involved.

The proposition that people cannot cooperate even in simple bargaining situations has been called the "Hobbes Theorem," which is the antithesis of the Coase Theorem. See Cooter, *supra* note 6, at 18. Hobbes apparently thought that a sovereign, having power sufficient to coerce everyone and to resist attempts to coerce him, was required to preserve peace among his squabbling subjects. The apparent implication is that people cannot spontaneously cooperate for mutual advantage because they always fall to quarreling over the division of the cooperative surplus.

until the final owner values them more than anyone else. It does not matter from an efficiency perspective whether the injurer has the right to make a nuisance or the victim has the right to enjoin it. To illustrate, if the law gives the injurer the right to create a nuisance, and the victim values freedom from the nuisance more than the injurer values his right to create the nuisance, then the victim can always buy the right from the injurer. Conversely, if the law gives the victim the right to enjoin a nuisance, and the injurer values the ability to make a nuisance more than the victim values being free from it, then the injurer can always buy the right from the victim.⁵³

One purpose of the remedy of injunctive relief in nuisance cases is to strengthen the bargaining position of victims. The right to an injunction enables victims to bargain from a position of strength. If victims have the right to enjoin a nuisance, they will not accept an injurer's settlement offer unless it involves a combination of abatement and compensation that the victims prefer to an injunction. In economic jargon, the right to injunctive relief establishes the victims' threat point in bargaining; the injurer cannot induce the victims to settle unless the terms of the cooperative solution benefit the victims more than the advantage they derive from exercising their threat.

Because of private bargaining, the right to injunctive relief against nuisances offers the potential for combining compensation with efficiency. However, these two goals are usually not achieved unless the parties settle. Exercising the right to an injunction usually indicates a breakdown in the bargaining process. When bargaining breaks down, an injunction cannot cause efficient behavior unless the coercive order prescribes it, which is unlikely given the court's limited information. Consequently, from an efficiency perspective, injunction is an appropriate remedy for classes of cases in which settlement is usual and trials are rare. From this perspective, therefore, injunctive rights are socially desirable creations in inverse proportion to the frequency with which they are exercised.

C. Summary of Part I

Tort, contract, and property law all allocate the cost of harm. For many types of harm, efficiency requires precaution by both injurer and victim. Incentives for precaution are efficient when both parties are responsible for the harm caused by their marginal reductions in precaution (double responsibility at the margin). An absolute rule, such as strict liability, erodes the victim's incentives for precaution. Conversely, a rule

53. Of course, giving the legal right in the first instance to the party who values it most saves the cost of a transaction.

of no liability erodes the injurer's incentives for precaution. There are at least three mechanisms in the common law that combine compensation and incentives for efficient precaution.

The first mechanism is the fault rule. When an injurer satisfies the legal standard of care, a small reduction in his precaution will make him negligent. Thus, he is liable for the harm resulting from marginal reductions in his precaution. Furthermore, when the injurer satisfies the legal standard of care, the victim bears residual responsibility and is responsible for harm resulting from any reduction in her own precaution. Thus, a negligence rule encourages double responsibility at the margin—the injurer takes efficient precaution to avoid legal responsibility and the victim takes efficient precaution because she bears residual responsibility.

The second common law mechanism is invariant damages, as exemplified by liquidation of damages provisions in the law of contracts. A liquidation clause stipulates a dollar amount to be paid as compensation in the event of breach.⁵⁴ When damages are liquidated, the breaching party is responsible for the stipulated damages and the victim of the breach is responsible for actual damages. Thus, invariant damages encourage double responsibility at the margin—the promisor balances the cost of precaution against the stipulated damages and the victim balances the benefits of reliance against the potential loss.

The third mechanism is the coercive order from a court, such as an injunction against a nuisance. Economists are unenthusiastic about coercive orders for reasons that are developed at length in the economic critique of regulation.⁵⁵ However, the right to an injunction may have desirable economic effects if it is used as a bargaining chip rather than actually exercised. Unlike coercive orders, bargaining solutions have desirable economic properties.⁵⁶ The right to obtain an injunction may enable nuisance victims to achieve adequate compensation by private agreement with the injurer, and the parties to the bargain will desire to make its terms efficient.

Fault rules are prominent in tort law, invariant damages are frequently found in contracts, and injunctions are a common remedy in property law; however, each of the three mechanisms can be found in

54. This is an idealized liquidation clause. Often the contract will instead contain clauses that stipulate how damages are to be computed in the event of an accident, rather than stipulating an exact dollar amount.

55. Two recent examples of the economists' critique of regulation are C. SCHULTZE, *supra* note 50 and Breyer, *supra* note 50. A standard work on the law of injunctions is O. FISS & D. RENDLEMAN, *INJUNCTIONS* (2d ed. 1984).

56. Cooter & Marks, *Bargaining in the Shadow of the Law: A Testable Model of Strategic Behavior*, 11 J. LEGAL STUD. 225 (1982) develops the theory of dispute resolution through bargaining, while Hoffman & Spitzer, *supra* note 52, provide empirical evidence on bargaining experiments conducted in the laboratory setting.

other branches of the law. For example, workers' compensation law stipulates damages for accidents, the purchase of an option entitling the state to buy private property effectively stipulates damages for a taking, and specific performance provides an injunctive remedy for breaches of contract.

II

SELECTED LEGAL DOCTRINES AND INSTITUTIONS

Part I developed the simple model of precaution for the common law; this Part applies that model to selected legal doctrines. Most legal doctrines are overdetermined in the sense that they can be justified by resort to any of several different theories. The model of precaution describes one such theory. This Part uses the model of precaution to explain and partially justify the following generalizations about the law: (i) damages for breach are often stipulated in contracts and rarely stipulated in legislation concerning tortious accidents; (ii) fault rules often apply to tortious accidents and seldom apply to breaches of contract; (iii) damages are more circumscribed and more predictable for breaches of contract than for tortious accidents; and (iv) government can regulate without paying compensation.

A. Stipulated Damages for Accidents and Breach of Contract

Why are stipulated damages common for contracts and unusual for torts? This can be answered by applying the argument developed in Part I. The most familiar example of stipulated damages for accidents is workers' compensation.⁵⁷ Workers' compensation legislation imposes liability, without regard to fault, on employers for injuries to employees occurring as a consequence of employment. At the same time, employer liability is limited to economic loss.⁵⁸ The amount of damages for many physical injuries is specified—so much money for loss of a hand, so much for loss of a leg, and so forth.⁵⁹

It is possible to imagine a comprehensive system of stipulated damages for accidental injuries that would replace case-by-case court adjudication.

57. Despite workers' compensation legislation, businesses often attempt to limit their liability for accidents. See Fleming, *Exculpatory Clauses*, in *LAW IN THE UNITED STATES OF AMERICA IN SOCIAL AND TECHNOLOGICAL REVOLUTION* 105 (J. Hazard & W. Wagner eds. 1974). For example, the Warsaw Convention limits liability for personal injuries arising from international air travel to \$75,000, as readers of the backs of airline tickets are well aware. Contracts to ship commodities or rent machinery usually contain terms limiting liability or stipulating damages for certain kinds of accidents. See also U.C.C. § 2-719 (1978) (permitting contractual limitation or modification of available remedies); *id.* § 2-316 (permitting contractual limitation of implied warranties).

58. For a history of workers' compensation legislation, see Friedman & Ladinsky, *Social Change and the Law of Industrial Accidents*, 67 *COLUM. L. REV.* 50 (1967).

59. See, e.g., *CAL. LAB. CODE* § 4660 (West 1984).

cation. For example, the compensation value of an automobile destroyed in an accident could be set at bluebook value by legislative fiat. For personal injuries, legislation could apply the workers' compensation schedule of damages to *all* accidents, including those outside the workplace. Under such a system, a jury could determine who destroyed what and who injured whom, but the amount of compensation would be set as a matter of law. Under this scheme, tort damages would resemble liquidated damages in contracts.

There is an efficiency problem, however, related to the differing incentives of tort victims under workers' compensation plans and promisees under liquidated damage clauses. Under workers' compensation statutes, compensation is imperfect, so each worker and his employer bear part of the cost of the worker's injury. Consequently, any time a worker takes additional precaution, he splits with his employer the value of the anticipated benefit of fewer accidents. As a result, workers' compensation reduces the worker's incentive to take precaution.⁶⁰

By contrast, liquidation of damages for breach of contract causes the victim to bear the full cost of actual reliance. Since she therefore enjoys the full reduction in the expected cost of breach that results from less reliance, there is no erosion of her incentives. Furthermore, when damages are liquidated, the promisee's actual reliance has no direct effect upon the promisor's incentives for performance.

The crucial difference between contracts and torts can be summarized in three sentences: If damages are stipulated in advance, then the victim has efficient incentives to reduce the *extent* of injury, much as if there were no compensation. By contrast, the victim's incentive to reduce the *probability* of injury is reduced in part by payment of damages, and is thus lower than if there were no compensation. Precaution against tortious accidents can reduce both their probability and gravity, whereas reduction of reliance on a contract can affect the extent of harm caused by breach, but not the probability of breach.⁶¹

60. I do not mean to assert that this reduction in incentive causes a large change in workers' precaution. The magnitude of change on levels of precaution is an unanswered empirical question concerning the elasticity of the supply of precaution.

61. Reliance usually increases the harm caused by breach, but not the probability of breach, whereas precaution by accident victims often decreases the probability of an accident, as well as the resulting damage. In other words, the probability of breach is controlled by the promisor, not the promisee, whereas the probability of an accident is often controlled by the victim as well as the injurer. There are, of course, circumstances for which this generalization is untrue. For example, Part III discusses how the victim can influence the injurer's level of precaution by affecting his information.

The argument can be restated succinctly in mathematical terms. The probability of avoiding an accident depends on injurer's and victim's precaution: $p = p(x,y)$. By contrast, the probability of avoiding breach is under the exclusive control of the injurer, so it depends on the injurer's precaution: $p = p(x)$. Suppose that the compensation for harm is a stipulated constant \bar{a} . The expected compensation equals $(1 - p)\bar{a}$. By varying reliance y , the victim cannot influence the expected

This difference is the reason why stipulation of damages resolves the problem of efficient reliance on contracts but not the problem of efficient precaution against accidents. In general, stipulating damages in a contract puts the full risk of reliance on the promisee, where it belongs for purposes of efficiency. Stipulating damages for tortious accidents, however, does not put the full risk of accidents on the victim. As compared to contract damages, there is less motivation to stipulate tort damages, through either legislation or private agreement, because stipulation does not solve the efficiency problem.⁶²

B. *Fault for Accidents and Breach*

Why are fault rules more common in tort law than for breach of contract? When the cost of performance exceeds the cost of harm caused by breach, it is often reasonable for the promisor to breach the contract.⁶³ However, the fact that breach is reasonable is not a ground for escaping liability. This observation indicates that the liability rule for breach of contract is not a negligence rule. A similar observation can be made about reliance by a promisee. Courts are often willing to inquire into the existence of the promisee's reliance,⁶⁴ the extent of her reliance,⁶⁵ or the foreseeability of her reliance,⁶⁶ but they are reluctant to inquire into the reasonableness of her reliance.⁶⁷

It is easy to imagine how contract law might apply a fault rule to breach and reliance. Instead of requiring compensation for breach whenever specific excuses are absent, the courts could excuse nonperformance whenever the promisor took reasonable steps to perform. Similarly, the courts could impose a duty of reasonable reliance upon the victims of breach, which would be similar to a defense of contributory negligence in

compensation from breach, $[1 - p(x)]\bar{a}$, so the victim's optimal reliance on the contract is unaffected by stipulated compensation. However, by varying precaution y the accident victim can influence the expected compensation for an accident, $[1 - p(x,y)]\bar{a}$, so the victim's optimal precaution against accidents is affected by stipulated compensation.

62. The reader may wonder how to square this argument with the existence of workers' compensation systems. The purpose of workers' compensation must be found in considerations other than victims' incentives, such as the costs and uncertainties of litigation as a method of dispute resolution or the high cost of individual insurance. For example, workers' compensation legislation has long been viewed as a way of reducing legal costs arising from industrial accidents and of transferring liability to employers who could distribute the costs among consumers of their products. See, e.g., Friedman & Ladinsky, *supra* note 58. Such considerations as transaction costs and insurance are discussed briefly *infra* in Part III.

63. Breach is reasonable in these circumstances because both the injurer and the victim can be made better off as a consequence.

64. This inquiry is necessary to establish a right to compensation for donative purposes.

65. This inquiry is necessary whenever reliance damages are awarded.

66. This is the famous rule of *Hadley v. Baxendale*, 9 Ex. 341, 156 Eng. Rep. 145 (1854).

67. Note that RESTATEMENT (SECOND) OF CONTRACTS § 90 (1982) does not require that the extent of reliance be reasonable, but speaks only to whether it is reasonable to expect reliance.

a torts suit. As in torts, fault rules for breach of contract can provide efficient incentives by creating double responsibility at the margin.

As explained above, invariant damages for tortious accidents do not produce double liability at the margin, so fault rules are necessary to provide efficient incentives for precaution. Unlike tort law, however, invariant damages in contract law will produce efficient incentives. If the promisor is responsible for invariant damages stipulated by law or in the contract and the promisee is responsible for the actual damage, there is double responsibility at the margin, resulting in efficiency.

Given a choice of efficient mechanisms, it is easy to see why economic considerations favor invariant damages over fault rules. The main argument for no-fault tort rules is that administrative costs are low, because courts need not make a factual determination of fault,⁶⁸ and the main argument against no-fault rules in tort is that they erode incentives for precaution.⁶⁹ In contracts, however, although the argument for a no-fault rule applies, the argument against it does not. Strict liability for breach reduces the cost of resolving contract disputes while invariant damages resolve the problem of efficient incentives. This is one reason why no-fault rules are more common in contracts than in torts.

Even though the fundamental rule governing breach of contract is a strict liability rule, ancillary contract rules based upon fault do exist. For example, individuals must take reasonable precaution in the use of the conventional symbols and signs for indicating offer and acceptance. A person who carelessly points to an attractive light fixture on the ceiling of the auction room may inadvertently make a contract with the auctioneer. Similarly, the victim of breach has a duty to take reasonable steps to mitigate damages. These negligence-type rules in contract could probably be justified by the model of precaution,⁷⁰ at least in part.⁷¹

68. See J. O'CONNELL, ENDING INSULT TO INJURY 11-24 (1975); J. O'CONNELL, THE INJURY INDUSTRY AND THE REMEDY OF NO-FAULT INSURANCE 110-16 (1971).

69. The argument that no-fault rules erode incentives for precaution against tortious accidents is a persistent theme in the economic analysis of law, dating back at least to John Brown's classic article, *supra* note 14.

70. The following sketch of an efficiency argument may help to explain why courts are willing to inquire into the reasonableness of mitigation, but are reluctant to inquire into the reasonableness of reliance. The difference between reliance and mitigation is that the former occurs before breach is known, whereas the latter occurs afterwards. The reasonableness of reliance depends on the contract's profitability if the promisor performs, so that ascertaining the reasonableness of reliance after a breach involves a difficult counterfactual question: How profitable would various levels of reliance have been if the promisor had performed instead of breaching? By contrast, mitigation of damages occurs after the breach is known, so there is less uncertainty surrounding the issue of reasonable mitigation. The comparative ease of determining whether mitigation is reasonable or unreasonable is part of the explanation for the use of a fault rule.

71. I have tried to explain the legal rules allocating the cost of breach by an efficiency argument. The reader may feel that only a moral argument could be persuasive. To illustrate, some commentators have attempted to justify the legal institution of contracts by reference to the moral

C. Variability in Damages

In personal injury cases, juries are allowed wide scope to determine compensatory damages, and this practice invites variability in awards.⁷² Furthermore, punitive damages are far more common in torts than in contracts,⁷³ and punitive damages are notoriously unpredictable. Consequently, there is more variability in damages awarded to accident victims in tort cases than to victims of broken promises in contract cases. This Section argues that variability in damages is more tolerable in a system with fault rules than in a system where no-fault rules apply, because the injurer's precaution is less responsive to awards of fault-based damages than is the case under no-fault rules.⁷⁴

To explain, a fault rule partitions behavior into permitted and forbidden zones, with the boundary formed by the legal standard of precaution. An actor who wishes to be in the permitted zone must bear the cost of sufficient precaution to satisfy the legal standard. An actor in the forbidden zone bears the cost of his precaution, if any, and is liable in the event of an accident. As the actor increases his precaution past the boundary, his expected costs drop abruptly, because a small increase in precaution taking him into the permitted zone shifts liability for the costs of actual accidents. (This drop in costs at the legal standard of fault is represented in Figure 1a by the dotted vertical line connecting the two sections of the cost curve.)

As a consequence of this drop in costs, it is *substantially* cheaper for most actors to satisfy the legal standard than to fall short of it. Most

institution of promising. Moral conventions allow promises to be broken if there is a sufficiently strong reason for doing so, but do not condone promise breaking merely because the balance of considerations slightly favors doing so. For the moral basis of contract law, see C. FRIED, *CONTRACT AS PROMISE* (1981); for the balancing of reasons for promise breaking, see Raz, *Promises and Obligations*, in *LAW, MORALITY, AND SOCIETY: ESSAYS IN HONOUR OF H.L.A. HART* 210, 219-23 (P. Hacker & J. Raz eds. 1977). This line of reasoning may suggest that a negligence rule is inappropriate for contracts because it is not the moral rule governing promises. My own view is that there is no conflict between this moral theory and my economic theory, because the two approaches are joined in the conception of achieving efficient justice. To defend this view, however, would involve a philosophical discourse far from my main topic.

72. "[A] defendant may find himself liable for a given item of damage on the ground that it is foreseeable where he is sued for tort, but not liable for the same item of damage where he is sued in contract." D. DOBBS, *supra* note 29, at 804. "[T]he tendency of many courts was to exclude mental or physical injury entirely from cases considered to rest on 'contract' rather than 'tort.'" *Id.* at 806.

73. See Sullivan, *Punitive Damages in the Law of Contract: The Reality and the Illusion of Legal Change*, 61 MINN. L. REV. 207 (1977); see also Comment, *Punitive Damages on Ordinary Contracts*, 42 MONT. L. REV. 93 (1981). Generally, punitive damages are unavailable in breach of contract actions. See RESTATEMENT (SECOND) OF CONTRACTS § 342 (1982); cf. *Seaman's Direct Buying Serv. v. Standard Oil Co.*, 36 Cal. 3d 752, 686 P.2d 1158, 206 Cal. Rptr. 354 (1984) (holding that punitive damages in tort are available when a party in bad faith and without probable cause denies the existence of a contract).

74. This argument is developed at length in Cooter, *Prices and Sanctions*, 84 COLUM. L. REV. 1523 (1984).

actors are at a level of precaution where the private benefit from increasing precaution to the legal threshold substantially exceeds the cost. Since the private benefit of conformity to the legal standard substantially outweighs its cost, moderate changes in the costs will not change the actor's willingness to conform. Thus, variability in damage awards will not affect the precaution of most actors under a fault rule.

By contrast, under a no-fault rule such as strict liability, the potential injurer can be expected to balance the cost of additional precaution against the resulting reduction in his expected liability. Thus, he places himself at the margin where the private benefits and costs of incremental precaution are equal. (This is represented graphically in Figure 1b by the fact that a tangent line to the cost curve at the optimal point has zero slope.) Since the benefits and costs of precaution are in balance, the actor will respond to a small change in his liability. Thus, variability in damage awards will affect the precaution of most actors under a no-fault rule.

If liability is strict and compensation perfect, the potential injurer internalizes the costs and benefits of precaution, as required for efficiency. Small imperfections in assessing damages will induce changes in the potential injurer's precaution, however, so the computation of damages under strict liability must be perfect to induce efficient precaution by the injurer. By contrast, the assessment of damages need not be perfect under a fault rule, because moderate variability in damages will not affect precaution. In economic jargon, the supply of precaution is more elastic with respect to damages under strict liability than under a fault rule. On the other hand, for fault rules the boundary between permitted and forbidden actions must occur at exactly the right place in order to achieve efficient incentives for precaution.

To illustrate by the use of the railroad example, suppose that a negligence rule requires the railroad to install spark arresters on its trains. If the trains are not equipped with spark arresters, the railroad is negligent and liable for the damage from fires caused by sparks from its trains. If the trains are equipped with spark arresters, the railroad is nonnegligent and not liable for fires caused by sparks from its trains. The spark arresters do not entirely eliminate fires, but they entirely eliminate legal fault and thus liability.

When deciding whether or not to install spark arresters, Xavier will balance their cost against their potential for reducing his liability. Under the negligence rule, spark arresters entirely eliminate liability, so installing them will probably be a lot cheaper than not installing them. Even if victims do not sue in some cases and damage awards fall short of full compensation in others, the railroad will probably prefer to conform to the negligence standard. In contrast, under a rule of strict liability, spark arresters do not entirely eliminate liability, so the railroad may prefer not

to install spark arresters. Victims do not always sue and damage awards do not always fully compensate the victims; therefore, installing the arresters may not be much cheaper than doing without.

In general, variations in damages influence precaution levels more under a rule of strict liability than under a negligence rule. Under a negligence rule, injurers will tend to conform to the legal standard in spite of imperfect damage assessments. Thus, under negligence, precaution tends to be efficient if the legal standard is efficient, even though damages are assessed imperfectly and some accident costs are externalized.⁷⁵ In contrast, under a rule of strict liability, injurers' precaution tends to be efficient only if damages are assessed perfectly and marginal social costs are fully internalized. Under strict liability, imperfections in assessing damages, which cause them to be too low, cause injurers' precaution to fall below the efficient level. Thus, it makes economic sense to tolerate greater variability in computing accident damages in torts than in computing breach damages in contracts.

D. *No Compensation for Regulations*

Economists routinely assume that consumers and producers are self-interested, and they have extended this assumption in recent years to the study of the behavior of government officials. Some economic hypotheses formulated along this line of thought state that public choice results from self-interested majority rule,⁷⁶ from electoral competition among parties,⁷⁷ and from bureaucratic autonomy.⁷⁸

These economic assumptions notwithstanding, there is a difference in the ideals of public and private behavior: actors in the private sector are expected to pursue their self-interest within the bounds of law and morality, whereas government officials are ideally supposed to serve the public interest rather than pursuing private advantage. Insofar as the public ideal is realized, the government will not be as self-aggrandizing as private persons.⁷⁹ Assume for the sake of argument, and for the sake of

75. For purposes of this argument, the law governing breach of contract can be treated as a rule of strict liability, which implies that damages for breach must be computed perfectly in order to induce efficient breach. For example, a small reduction in the damages stipulated for late completion of the construction project will induce Xavier to take a little less precaution against breach. Xavier's precaution against breach is responsive to small changes in computing damages because he is balancing costs and benefits at the margin.

76. This hypothesis is examined in D. BLACK, *THEORY OF COMMITTEES AND ELECTIONS* 55-75 (1958).

77. A. DOWNS, *AN ECONOMIC THEORY OF DEMOCRACY* 24-31 (1957).

78. Niskanen, *Nonmarket Decision Making: The Peculiar Economics of Bureaucracy*, 58 AM. ECON. REV. PAPERS & PROC. 293 (1967).

79. In contrasting liberal and conservative economists, it is sometimes said that the former believe that governments correct market failures as required by the public interest, whereas the latter believe that governments are devices for rent seeking. See G. STIGLER, *THE CITIZEN AND THE*

understanding the law of takings, that this ideal is achieved, at least to a limited extent. As explained earlier, if victims and injurers both need incentives for precaution, then double responsibility at the margin is required for efficiency. However, if one party can be trusted to take correct precaution without the usual economic incentives, efficiency can be achieved by making the other party responsible.

This argument is useful to explain why courts allow governments to regulate without paying compensation for the harm that regulation inflicts on property owners. If the government is not self-aggrandizing, so that regulations are formulated in light of the public interest, the government can be trusted not to overregulate. Conversely, private individuals are assumed to pursue self-interest, so incentives are required to prevent them from overinvesting in projects the value of which will be destroyed by regulation. Not compensating for such investment causes private individuals to internalize this risk. Thus, regulation without compensation provides efficient incentives for private property owners, who need such incentives, and no incentives to local government, which, by hypothesis, does not.⁸⁰

In permitting extensive regulation without compensation, the courts have acted as if governments will exercise the power to regulate in the public interest, even when regulation is costless to government officials, while private individuals will distort their investment decisions unless they bear the costs of regulation. Courts have traditionally shown deference to local governments in the standard of judicial review for such matters as regulating private property,⁸¹ although the wisdom of this practice has, of course, been challenged.⁸²

STATE: ESSAYS ON REGULATION 114 (1975). Incentive systems are often designed to insulate public officials from opportunities for private gain. For example, federal judges enjoy life tenure and income that is independent of their decisions.

80. This argument, that property owners injured by regulation should not be compensated, is similar to the argument for no-liability rules in tort. No-liability tort rules provide efficiency incentives to the victim, but not to the injurer. Consequently, no-liability rules are more desirable when victims otherwise lack incentives to take precautions, and when injurers otherwise have little need for such incentives.

81. J. Murphy, *Rationality and Constraints on Democratic Rule* (October 1984) (forthcoming in 28 NOMOS: JUSTIFICATION (1985)) (on file with the *California Law Review*).

82. Regulation is supposed to serve a public good, and one economics tradition holds that public goods tend to be undersupplied. Nonetheless, the hypothesis that local governments regulate in order to create private value for politically powerful interests has also been argued forcefully. See Ellickson, *Suburban Growth Controls: An Economic and Legal Analysis*, 86 YALE L.J. 385, 467-75 (1977).

III REALITY INTRUDES: THE REINTRODUCTION OF EXCLUDED COSTS

In real cases, in contrast to the simple model of precaution, bearing risk, contracting, resolving disputes, and obtaining information entail significant costs. These aspects of reality were assumed out of the simple model in accordance with the common practice in microeconomic analysis of beginning by assuming that transaction costs are insubstantial, that parties are risk neutral, and that information is symmetrical. This Part opens a window onto reality by relaxing these assumptions. A complete treatment of transaction costs, risk aversion, and asymmetry of information is impossible in this brief Article; thus, the approach will be more impressionistic than systematic.

A. *Risk Aversion*

One cost omitted from the simple model is the premium for bearing risk. Suppose there is a ten-percent probability that \$1,000 will be lost as a result of an accident, a breach of contract, or a taking. The expected loss—that is, the loss that occurs on average over the long run—is $0.10 \times \$1,000 = \100 . A person who would pay more than \$100 to have someone else assume the risk of losing \$1,000 with ten-percent probability is risk averse. Suppose that the maximum amount a risk-averse person would be willing to pay to avoid this risk is \$150. Then the true cost of making the risk-averse person bear this risk is \$150, not the expected loss of \$100.

The difference between the true cost of bearing risk and the expected loss is called the risk premium, which equals \$50 in the preceding example. By definition, the risk premium is positive for a risk-averse person and zero for someone who is risk neutral. The general rule in economics is that individuals and organizations are risk averse with regard to large gambles and risk neutral with regard to small gambles.⁸³ The size of the gamble is to be measured against the wealth or income of the party taking the risk. If only a small fraction of the wealth or income of the decisionmaker is at risk, the risk premium is small.

The cost of bearing risk is part of the total cost of harm (including accidents, breaches of contract, takings, and nuisances), which is minimized by an efficient set of laws. This Section suggests that the model of precaution can be extended to include the cost of risk premiums and thus can encourage efficient allocation of that risk.

Instead of assuming risk neutrality, suppose that one party is more

83. See K. ARROW, *The Theory of Risk Aversion*, in *ESSAYS IN THE THEORY OF RISK BEARING* 90 (1971).

averse to risk than the other. For example, consumers may be more averse to risk than producers since producers may be able to distribute their risk among many customers. The party who is less averse to risk requires a smaller risk premium in order to be willing to hold risk. Applied to risk bearing, efficiency requires assignment of risk to the party who requires the smallest premium in order to hold it.

To illustrate, consider the risk of injury to consumers from exploding soda bottles. For any individual consumer, the cost of such injury may represent a significant proportion of his wealth and he will not want to risk injury even in return for a proportionately less expensive product. However, the bottler may be able to spread the cost of liability across many consumers by charging a slightly higher price, in which case the bottler approaches risk neutrality. Thus, the real cost of bearing risk, as measured by the risk premium, is lower if liability is assigned to the bottler rather than to the consumer.

Sometimes, it is easier for one party to bear the risk and the other to take precautions against harm. This creates a dilemma: Should liability be assigned to the party who can bear risk at the lowest cost, or to the party who can take precaution at the lowest cost? For example, a car rental company can insure its vehicles more cheaply than can the renter, but the renter can prevent accident damage more effectively than the company. In these circumstances, the gain from cheaper risk bearing must be balanced against the loss of incentives to take precaution. Specifically, if the company assumes responsibility for injury to the cars and purchases insurance, risk is spread efficiently but incentives for precaution are inefficient. Conversely, if the renter is liable, incentives for precaution are efficient but risk is spread inefficiently.

In the simple model of precaution, all parties are assumed to be risk neutral, so the tension between efficient precaution and efficient risk bearing does not arise. In reality, however, there are areas of law in which this tension is fundamental. One such area is the law of takings. Governments spread the cost of takings over many taxpayers, but the value of property taken from any one individual may represent a large proportion of his wealth. The fact that the government can spread the risk of takings better than individual property owners suggests that the government should be liable. However, property owners have control over investments in their property, the value of which may be diminished by a taking. If property owners were completely reimbursed when their properties were taken, they would have no incentive to restrain investments that may be jeopardized by a contemplated taking. The courts must balance these considerations when deciding whether a proposed government action is a taking or a mere regulation.

The need to balance these considerations is also present in contract

law as stipulation of contract damages can change the allocation of risk. For example, if courts ordinarily award full compensation for a certain class of broken contracts, the full risk is on the party who breaches. Stipulating damages at a level that is less than the actual harm caused by the breach, however, shifts some risk to the victim of breach. The parties must therefore balance these considerations when they decide the level at which to stipulate damages.⁸⁴

Before leaving the topic of risk aversion, some remarks are in order about insurance markets. As noted, the risk premium measures the extra cost of bearing risk (over the statistically predictable loss) for a particular party. Insurance companies assume risks in exchange for a fee equal to the expected loss plus part of the risk premium. By pooling the risk of many policyholders, the insurance company achieves risk neutrality, so that the cost to the insurance company of holding the risk equals only the expected loss.

The tension that sometimes arises between efficient risk bearing and efficient precaution can occur in insurance contracts as well. The insurer can more efficiently spread risk, but the insured party can more efficiently take precautions against that risk. Insurance thus undermines the incentives of the policyholder to take precaution against the insured event. This may explain why cars insured against theft may be left unlocked, and why houses insured against fire may not be rewired.

The insurance industry employs various devices for combatting "moral hazard," which is the descriptive term for this tendency of insurance to cause people to take less precaution. For example, deductibles impose part of the cost of an accident on the insured person. Experience rating, the practice of increasing insurance rates when claims on the policy have been made, is a similar device. Deductibles and experience rating in effect divide liability between insured and insurer, giving the insured incentive to take more precaution than he would have otherwise.

The moral hazard in insurance contracts can also be reduced by the two devices discussed previously for the simple model of precaution: stipulation of damages and fault rules. Stipulation of damages clauses are found in many insurance contracts, such as the face amount of a life insurance contract, payment of the bluebook value for destruction or theft of an automobile, or designated payments for loss of a particular limb. When damages are stipulated, the victim bears the actual harm and the insurance company pays the stipulated amount. Some insurance contract clauses operate like negligence rules to bar recovery when the insured's precaution is at fault. A life insurance contract, for example,

84. See Polinsky, *Risk Sharing Through Breach of Contract Remedies*, 12 J. LEGAL STUD. 427 (1983).

may be voidable if the cause of death is suicide. Similarly, coverage under a fire insurance policy may be conditioned on meeting certain code requirements.

B. *Costly Dispute Resolution*

Another of the cost elements omitted from the simple model is the cost of dispute resolution. A rule of law is efficient if it minimizes total social costs, including the cost of resolving disputes. Dispute resolution expenditures may be reduced either by lowering the cost of resolving particular disputes, or by reducing the number of such disputes. Precaution reduces the frequency and severity of accidents and thereby the total number of disputes. The more costly it is to resolve a dispute, the more precaution against the causes of dispute is required for efficiency. Efficiency is achieved when the law is structured so that there is double responsibility at the margin for the cost of dispute resolution, as well as for the cost of harm.

The application of this argument to fault rules is straightforward. If accidents cause costly disputes, as well as injury, then the legal standard of care (the level at which an injurer is relieved of responsibility for actual harm) should be set higher than would be necessary if accidents caused only injury. It should be set higher because the efficient level of precaution is higher. Moreover, the level of precaution taken by most actors is responsive to adjustments in the legal standard of care under a fault rule, and unresponsive to modest variations in damages.⁸⁵ Thus, an adjustment in the legal standard of care is necessary to take account of costly dispute resolution, whereas an adjustment in damages is less urgent.⁸⁶

By contrast, the underlying rule in contracts is strict liability for nonperformance. In order for the promisor to internalize the full cost of breach, the cost of resolving the dispute caused by the breach must be included in the computation of damages. For example, the stipulation of damages in a liquidation clause should include the costs that the promisee would otherwise bear in resolving a dispute. More generally, invari-

85. See *supra* notes 72-75 and accompanying text.

86. As dispute resolution costs increase in proportion to the magnitude of harm, the total cost of accidents, including the cost of resolving the disputes, goes up, so more precaution should be taken to avoid accidents. Under a negligence rule, raising the legal standard will cause more precaution to be taken in order to escape liability. On the other hand, under a negligence rule, increasing the level of damages to include the cost of resolving the dispute as well as the direct harm caused by the accident will not affect the precaution taken by most injurers. This is because most injurers will take enough precaution to satisfy the legal standard in any case. Thus, adjusting the standard of care to take account of dispute-resolution costs has a better effect upon injurer incentives and is more likely to induce efficient care than inclusion of these costs solely in a damage measure that follows determination of liability.

ant damages should include the costs of dispute resolution borne by the promisee in order to create efficient incentives for precaution by the promisor.

There are different rules in different jurisdictions for allocating the costs of dispute resolution.⁸⁷ In the United States the basic pattern is for each side to bear its own legal expenses with the taxpayers subsidizing the court system itself. Nonetheless, in some civil disputes, at least part of the court costs are shifted to the loser. In the United Kingdom, by contrast, the basic pattern is for the loser at trial to bear all the costs of resolving the dispute. The allocation of trial costs has little effect on precaution by potential injurers under a fault rule, but the existence of these costs requires a higher legal standard of care.⁸⁸ Under a no-fault rule, however, the allocation of trial costs will affect precaution.

C. *Asymmetry of Information*

Often one party may have a better idea of the probability of possible injury or the extent of potential damage. The party with inferior information is likely to make a costly mistake. In such situations, the law tends to direct the flow of information to eliminate the asymmetry. This theme cannot be developed systematically in this Article, but some examples will be helpful.

1. *Penalties and Liquidated Damages*

Penalty and liquidated damages clauses are both stipulations of damages in contracts, but liquidation clauses are enforced by the courts while penalty clauses are set aside. Various criteria have been offered to distinguish liquidation clauses from penalty clauses.⁸⁹ The most important criterion is that a liquidation clause stipulates compensation equal to the damage actually expected to occur as a consequence of breach.⁹⁰ By contrast, a penalty stipulates compensation that is arbitrary or exceeds the damage actually expected to occur.⁹¹

The conventional explanation for this distinction in treatment has been that courts are in the business of compensating victims, not penaliz-

87. See Cooter & Marks, *supra* note 56, at 244-47; Shavell, *Suit, Settlement, and Trial: A Theoretical Analysis under Alternative Methods for the Allocation of Legal Costs*, 11 J. LEGAL STUD. 55 (1982).

88. The argument for this higher standard of care parallels the argument set forth *supra* in note 86.

89. The traditional rationales are discussed in Clarkson, Miller & Muris, *Liquidated Damages v. Penalties: Sense or Nonsense?*, 1978 WIS. L. REV. 351.

90. See Goetz & Scott, *supra* note 35, at 554.

91. The distinction is perhaps less a factual one than a statement of a legal conclusion, i.e., that penalty clauses are those that courts will not enforce (perhaps because they are inefficient), and liquidated damage clauses are those they will. Presented in this way, the distinction resembles a fault-like conclusion of insufficient (or inefficient) calculation of expected damage.

ing injurers.⁹² This answer is unconvincing, however. Courts are in the business of enforcing contracts, and damage clauses are as much part of the parties' agreement as any other clause. What, then, explains why courts scrutinize damage clauses more critically than other contract clauses?

A simple economic statement answers this question: If stipulated damages exceed anticipated actual damages, and such stipulations are enforceable, incentives are usually inefficient. An inflated stipulated damages clause is analogous to an insurance policy written for more than the value of the insured item. The result is that the victim of breach, like the beneficiary of the insurance policy, would prefer the injury to the alternative. If the victim is enthusiastic, rather than reluctant, toward nonperformance or injury, incentives are perverse.

The effect of perverse incentives is subtle. In the simple model of precaution, the promisor's precaution influences the probability of breach, but the promisee's reliance does not. In reality, the promisee can indirectly influence the promisor's precaution by influencing the promisor's information. The inefficiency in enforcing excessive damage stipulations is that the party with superior information has an incentive to withhold it. Without correct information, precaution may be inefficient.

There is another way to express this argument. Excessive stipulated damages are simply a form of gambling, because there is usually no economic reason for stipulating excessive damages except as a kind of wager.⁹³ The fact that the parties are willing to make such a wager indicates that they have different beliefs about the probability of breach. Nevertheless, reliance and precaution against breach will be more efficient if both parties have complete information. By refusing to enforce wagers, the courts destroy the incentive to withhold information.

To illustrate, recall the hypothetical contract between Xavier and Yvonne. Suppose that Yvonne alone knows that a plumber's strike will prevent Xavier from completing the building on time. Yvonne might try to take advantage of Xavier's ignorance by insisting on a stipulation of very large damages for late completion, assuming such a stipulation were enforceable. But Xavier needs to know the truth in order to plan efficiently his construction schedule and avoid waste. If courts refuse to enforce such stipulations, then Yvonne no longer has this incentive to withhold the facts from Xavier. Thus, the knowledge that courts set aside penalty clauses will encourage the parties to disclose information needed for efficient contract formation.

92. See the discussion of the "penalty doctrine" in Goetz & Scott, *supra* note 35, at 554-56.

93. For a theory of risk aversion incorporating this wager notion, see K. ARROW, *supra* note 83.

2. Other Examples

In contracts, the doctrine of foreseeability, which limits recovery for breach of contract to foreseeable damages,⁹⁴ directly addresses the asymmetric information problem. The party with superior information must either give adequate notice to the other party or bear the cost of harm that the information might have avoided.⁹⁵ In principle, the foreseeability doctrine should induce an exchange of information whenever the cost of transmitting it does not exceed the resulting savings in accident costs.

Consumer product safety provides another solution to the problem of asymmetrical information. Consumers may underestimate or overestimate the probability that, say, a cola bottle will explode. In either case, consumers are unlikely to be aware of changes in the level of precaution taken by manufacturers of cola bottles, at least if the changes do not alter the bottle's appearance. Consequently, consumer demand for cola is unlikely to respond to safety improvements in bottling, and therefore the market will not provide adequate incentives for safety. Consumer misperception, combined with a no-liability rule that imposes the risk of accidents on consumers, creates an "adverse selection" process in which the product safety level prevailing in the market is too low.⁹⁶

This inefficiency can be corrected by a rule of strict liability, at least in principle.⁹⁷ If the manufacturer is held strictly liable for the actual harm suffered by consumers of his product, he is, in effect, required to provide an insurance policy with each bottle. Under perfect competition, the cost of the insurance will be exactly reflected in the price of the product. Consequently, the manufacturer will take this cost into account in setting levels of quality control, and the consumer will respond to the higher price of more dangerous products by consuming less of them, much as if he possessed accurate information about the greater danger.

SUMMARY AND CONCLUSION

Economic theory is unified because its theorems are derived from its axioms. Consequently, the economic analysis of law must be capable of being unified insofar as it is an application of economic theory. Identifying unity in the economic analysis of law is a matter of finding the correct order in which to make simplifying assumptions. The starting point in

94. The seminal case articulating the foreseeability doctrine is *Hadley v. Baxendale*, 9 Ex. 341, 156 Eng. Rep. 145 (1854).

95. It is this insight that animates the Uniform Commercial Code's imposition of an implied warranty of fitness for particular purpose. See U.C.C. § 2-315 (1978).

96. This is the "market for lemons" made famous by Akerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, 84 Q.J. ECON. 488 (1970).

97. See Spense, *Consumer Misperceptions, Product Failure and Producer Liability*, 44 REV. ECON. STUD. 561 (1977).

contracts, torts, and property is the relationship between precaution against injuries and the allocation of the cost of injuries. The analysis of this interaction is called the model of precaution.

The usual situation is one in which injurers and victims can both influence the harm suffered by victims. The injurer can reduce harm by taking precautions against accidents, preventing the events that cause breaches of contract, conserving on land taken for public purposes, or abating nuisances. Similarly, the victim can reduce the cost of injury by taking precaution against accidents, relying less upon contracts, restraining investment to improve property that is likely to be taken, or avoiding nuisances.

Efficiency requires both parties to balance the cost of further precaution against the consequent reduction in harm and to act accordingly. Incentives to act in this way exist when each party is responsible for the cost of the harm. To put it succinctly, efficiency requires double responsibility at the margin.

Courts often construe justice as requiring the party at fault to compensate the innocent party, but compensation changes the incentives of the victim and injurer. If the foreseeable cost of harm is reduced, the victim may be encouraged to take too little precaution and rely instead on compensation to make him whole. Thus, combining justice with efficient incentives is difficult. Torts and contracts each have a characteristic solution to this problem. The tort solution conditions the responsibility of one of the parties on reasonable precaution. A negligence rule induces reasonable precaution by one of the parties by offering an escape from further responsibility, and by the other party because of her residual responsibility.

The contract solution sets damages at an invariant level with respect to the victim's reliance. Invariant damages are exemplified by liquidated damages, but other legal doctrines for computing damages often have the same effect. Liquidated damages make the injurer liable for the stipulated damages and the victim responsible for the actual damage. This contract remedy is also applicable to takings when the government purchases an option entitling it to buy property at a stipulated price. If the property is subsequently taken, the government is liable for the stipulated price, and the property owner is responsible for the actual loss. Stipulating damages or stipulating the purchase price creates double responsibility since the injurer bears the stipulated cost and the victim bears the actual loss.

There are many simplifications in this model. For example, dispute resolution is assumed to be costless, decisionmakers are assumed to be risk neutral, and all parties are assumed to have the same information. Notwithstanding these simplifications, the model can explain the eco-

nomic purpose of many features of law: For example, why negligence rules are more common in torts than in contracts, why stipulated damages are more common for breach than for accidents, why penalty clauses in contracts are unenforceable, and why the harm caused by regulation is not compensated.

I conclude with a few remarks about the connection between theory and practice. Because practitioners infrequently rely directly on theory, they tend to imagine that they are free from its influence. But theory has a way of intruding upon practical thought and insinuating itself into the fabric of decisions. This observation prompted Keynes' quip about businessmen: "Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist."⁹⁸ Although practicing lawyers may never be fluent with the model of precaution, it is nevertheless an abstraction of the very arguments they make daily. Understanding the model of precaution can improve the quality of practical arguments and can lead to wholly new insights.

98. J.M. KEYNES, *THE GENERAL THEORY OF EMPLOYMENT, INTEREST AND MONEY* 383 (1935).

MATHEMATICAL APPENDIX

An abstract presentation of the model of precaution requires some mathematics. The mathematical model is developed in this Appendix, although generality is sacrificed for simplicity.

I adopt the following notation:

- x = injurer's expenditure on precaution (accidents)/abatement (nuisance)/performance (breach)/conservation (takings);
- y_r = victim's expenditure on reliance (breach)/improvements (takings);
- y_p = victim's expenditure on precaution (accidents)/prevention (nuisance);
- p = probability of no accident/no nuisance/no breach/no taking;
- $1 - p$ = probability of accident/nuisance/breach/taking
- b = victim's benefit;
- a = cost imposed upon victim by accident/nuisance/breach/taking;
- D = damages awarded by court to victim.

The injurer, Xavier, undertakes precaution x and pays damages D in the event of an injury, which occurs with probability $1 - p$. His expected costs are:

$$\text{injurer's costs} = x + (1 - p)D. \quad (1)$$

In the breach/takings model, the victim, Yvonne, undertakes expenditure y_r in reliance. In the event of an injury, which occurs with probability $1 - p$, she suffers costs a and receives damages D . Whether or not an injury occurs, she receives benefits b . Thus the victim's expected costs, net of benefits and damages, can be written:

$$\text{victim's costs} = y_r + (1 - p)(a - D) - b. \quad (2a)$$

In the accidents or nuisance model, the victim, Yvonne, undertakes expenditure y_p on precaution/prevention. The other terms remain unchanged from the breach or takings model, so the victim's expected net costs are:

$$\text{victim's costs} = y_p + (1 - p)(a - D) - b. \quad (2b)$$

The expenditures on precaution/reliance affect benefits and injury costs. Specifically, the probability of avoiding an injury is higher when the injurer or victim takes more precaution:

$$p = p(x, y_p) \text{ and } p_1 \geq 0, p_2 \geq 0.$$

The benefits are greater from more reliance,

$$b = b(y_r) \text{ and } b' \geq 0,$$

but the injury from breach/taking is also greater if there is more reliance,

$$a = a(y_r) \text{ and } a' \geq 0.$$

Also, an increase in victim's precaution y_p reduces the damage from an accident/nuisance:

$$a = a(-y_p) \text{ and } a' \geq 0.$$

Each individual minimizes his or her costs as given by equations 1 and 2. The rule of liability determines the value of the damages D in equations 1 and 2. The optimization problem will be described when each person is responsible for the harm and when each person is immune. The injurer is responsible for the full cost of the injury if damages equal the actual loss to the victim: $D = a$. The victim is responsible if damages are nil: $D = 0$. Thus the cost minimization of each party when fully responsible (double responsibility) can be written:

$$\text{injurer } \min_x x + (1 - p)a \text{ where } p = p(x, y_p) \quad (1')$$

responsibility

$$\text{victim } \min_{y_r} y_r + (1 - p)a(y_r) - b(y_r) \text{ where } p = p(x, 0) \quad (2')$$

or

$$\min_{y_p} y_p + (1 - p)a(-y_p) - b \text{ where } p = p(x, y_p)$$

The injurer is immune if damages are nil: $D = 0$. The victim is immune if damages equal the actual injury: $D = a$. Thus, cost minimization when each is immune can be written:

$$\text{injurer: } \min_x x \text{ (where } x \geq 0) \quad (1'')$$

immunity

$$\text{victim: } \min_{y_r} y_r - b(y_r) \quad (2'')$$

or

$$\min_{y_p} y_p - b \text{ (where } y_r \geq 0).$$

Note that the cost of the injury is internalized under liability and externalized under immunity. This can be seen from the fact that expressions 1' and 2' contain the expected injury cost $(1 - p)a$, but expressions 1'' and 2'' do not contain $(1 - p)a$.

The joint costs J are the sum of the individuals' costs, or equation 1 plus equation 2:

$$J = x + (y_r \text{ or } y_p) + (1 - p)a - b.$$

reliance/
injury
benefit

precaution

Note that the damages D cancel and disappear from J , because the victim's gain in the form of a court award is the injurer's loss. Efficiency requires joint costs to be minimized:

$$\min_{xy_r} J = x + y_r + (1 - p)a(y_r) - b(y_r) \text{ where } p = p(x, 0) \quad (3)$$

or

$$\min_{xy_p} J = x + y_p + (1 - p)a(-y_p) - b \text{ where } p = p(x, y_p).$$

The values of x , y_r , and y_p that minimize joint costs are the efficient values, which will be denoted \bar{x} , \bar{y}_r , and \bar{y}_p .

Double liability is efficient in the sense that joint costs are minimized. This is easily proved since the solutions to expressions 1' and 2' are the same as the solution to expression 3. In both cases a minimum is achieved when the marginal cost of precaution and reliance equals the marginal benefit:

$$1 = p_1 a$$

cost of reduction in
precaution accident costs
by injurer

$$1 = b' - (1 - p)a'$$

cost of benefit of
reliance reliance

or

$$1 = (1 - p)a' + p_2 a$$

cost of benefit of
precaution precaution
by victim

Having shown that double liability is efficient, the problem is to identify legal instruments that impose double liability at the margin. There are two types of legal instruments used in torts, contracts, and property law that accomplish this result. I shall show that these solutions are efficient in equilibrium. The equilibrium concept is the standard one, i.e., a full-information Nash equilibrium.

It is easy to show that liquidating damages can induce efficient behavior. Assume that damages D are stipulated to equal some dollar value \bar{a} . Substituting \bar{a} for D in equations 1 and 2 gives the injurer's and victim's costs:

$$\text{injurer's costs} = x + (1 - p)\bar{a} \quad (1''')$$

$$\text{victim's costs} = (y_r \text{ or } y_p) + (1 - p)(a - \bar{a}) - b \quad (2''')$$

Note that Yvonne will receive \bar{a} in damages and bear the actual damages a . The stipulated damages \bar{a} are a constant which will not influence her *marginal* costs or benefits, so the stipulated damages will not influence her optimal level of reliance; i.e., choosing y_r to minimize $2'''$ is the same as choosing y_r to minimize $2'$. Yvonne, therefore, fully internalizes the cost of breach as required for efficiency.

Suppose that Xavier and Yvonne stipulate damages \bar{a} which equal the damages actually expected to occur in the event of breach. In equilibrium the damages that actually occur in the event of breach are the damages expected to occur, i.e., $\bar{a} = a$. In that case Xavier will fully internalize the cost of breach as required for efficiency. As already noted, Yvonne internalizes marginal costs and benefits. Since both parties internalize costs, precaution and reliance will be efficient.

What reason do the parties to the contract have for stipulating damages equal to the level actually expected to occur? From a legal viewpoint, any other level of damages may cause the courts to refuse to enforce the damage clause. From an economic viewpoint, any other level of damages will reduce the surplus of trade, which the parties to the contract can split between them. In other words, both parties benefit from structuring the contract efficiently so that the gains from trade are maximized; and the gains from trade are maximized when damages are stipulated at the level of the harm actually expected to occur from breach.

Turning to the tort remedy, the next task is to show that efficiency can be achieved by making immunity conditional upon reasonable protection. Let x^* and y_p^* be legal standards such that failure to meet them constitutes negligence. There are four rules which single out someone for liability:

- R1. Negligence: Injurer is liable if and only if $x < x^*$.
- R2. Negligence with contributory negligence: Injurer is liable if and only if $x < x^*$ and $y_p \geq y_p^*$.
- R3. Strict liability with contributory negligence: Victim is liable if and only if $y_p < y_p^*$.
- R4. Strict liability with dual contributory negligence: Victim is liable if and only if $y_p < y_p^*$ and $x \geq x^*$.

If the legal standard of care or reliance equals the efficient level ($x^* = \bar{x}$, $y_p^* = y_{\bar{p}}$), then each of the rules R1 through R4 will induce efficient behavior (for proof of this result, see Brown, *supra* note 14). For example, the negligence rule will induce the injurer to take efficient precaution in order to achieve immunity, while the victim will take efficient precaution because of her residual liability.

This argument assumes that the legal standard of care equals the efficient level. Is there any way to adjust the legal standard in order to

bring it to the efficient level? There is a simple method of adjustment that achieves this result. If the legal standard of care is raised whenever the marginal benefit of precaution exceeds the marginal cost, and lowered whenever the marginal cost of precaution exceeds the marginal benefit, then the legal standard will converge over time to the efficient level. This process of convergence can be interpreted as a sequence of precedents obtained from the well-known Hand formula. (See sources cited *supra* in note 18).

A few mathematical details warrant attention. First, it is easy to show that reliance and expectation damages induce the same level of reliance by Yvonne. Interpret Yvonne's benefit $b(y_r)$ as the revenue that she receives from selling goods in her store and interpret her reliance y_r as the cost of her goods. Her profit, therefore, is revenue less cost, or $b(y_r) - y_r$. For simplicity assume that nonperformance by Xavier will result in destruction of the goods ordered by Yvonne (e.g., the fruit spoils if the store is not opened on time): $a(y_r) = b(y_r)$. Full compensation requires replacement of the lost revenues: $D = a(y_r) = b(y_r)$.

Full compensation restores Yvonne's profits to the level that would be achieved in the event of performance, so setting $D = b(y_r)$ may be interpreted as awarding expectation damages. Awarding reliance damages compensates Yvonne for her costs only: $D = y_r$. Substituting these values for D into equation 2 gives Yvonne's expected net costs:

reliance damages: victim's net costs = $p(y_r - b(y_r))$.

expectation damages: victim's net costs = $y_r - b(y_r)$.

The same value of y_r minimizes both expressions, which proves that reliance is the same under either measure of damages.

There is an intuitive explanation for this result. If expectation damages are awarded for breach, then the victim acts as if performance were certain because her revenue is the same in either case. If reliance damages are awarded for breach, however, then the victim acts as if performance were certain because reliance is free in the event of breach.

Furthermore, the incentives for injurer precaution are not the same under the two measures of damages. The injurer has more incentive to take precaution under the expectation measure than under the reliance measure, because damages are at least as great under the former as under the latter.

Another mathematical detail concerns compensation for takings. Government may take one of the rights of ownership, as when it condemns an easement, or it may take title. Taking an easement reduces the rents of private ownership, whereas taking title completely expropriates these rents. Thus $b(y_r)$ may be interpreted as the stream of future rents from the property in the event that nothing is taken, and y_r may be inter-

puted as the expenditure on improving the property. The accident cost, denoted a , may be interpreted as the fall in rents caused by the taking, where $a = b$ if title is taken and $a < b$ if an easement is taken. The expected stream of rent accruing to the property from investment y equals $b - y_r - (1 - p) - a$.

If damages D must be paid when property is taken, then D must be added to the rents to determine the expected net benefits of ownership:

$$\text{net benefits} = b - y_r - (1 - p)(a - D).$$

Note that this equation is the same as equation 2a, after changing the sign to convert from net benefits to net costs. The market value of the property prior to improvement y_r is the maximum net benefits of ownership:

$$\begin{array}{l} \text{market value} \\ \text{before} \\ \text{improvement} \end{array} \quad mv = \max_{y_r} b(y_r) - y_r - (1 - p)(a(y_r) - D). \quad (4)$$

After improvement y_r has been made, y_r becomes a sunk cost:

$$\begin{array}{l} \text{market value} \\ \text{after} \\ \text{improvement} \end{array} \quad mv = b(y_r) - (1 - p)(a(y_r) - D). \quad (5)$$

Compensation for taking title is ordinarily based upon the market value of the property at the commencement of eminent domain proceedings. In order to compute the compensation that would be required after investment y_r has been made and title is taken, set $a(y_r) = b(y_r)$ and $D = mv$, then solve equation 5. The solution is $D = mv = b(y_r)$, i.e., compensation at market value requires replacement of rents $b(y_r)$ expropriated by the government.

Suppose that the property owner knows that taking title will be compensated at the market value of the property. How much investment y_r will maximize market value? To answer this question, set $a(y_r) = b(y_r)$ and $D = b(y_r)$, then substitute into expression 4, yielding:

$$\max_{y_r} b(y_r) - y_r. \quad (6)$$

This expression means that certain compensation at market value will induce the property owner to make improvements as if the probability of a taking were nil, which is obviously inefficient. Note that expression 6 is the same as 2'' but for the sign, i.e., certain compensation at market value is like immunity from the cost of injuries. It is easy to extend the model to show that market value will fall if compensation is uncertain or incomplete.