

Spring 2010

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Recommended Citation

Shawn J. Bayern, *The Limits of Formal Economics in Tort Law: The Puzzle of Negligence*, 75 *BROOK. L. REV.* 707 (2010),
Available at: <http://ir.law.fsu.edu/articles/45>

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ARTICLES

The Limits of Formal Economics in Tort Law

THE PUZZLE OF NEGLIGENCE

Shawn J. Bayern[†]

Legal scholars commonly see tort law as the jewel of the law-and-economics movement. “The law of accidents was one of the first bodies of private law successfully analyzed using formal economic models,”¹ a leading law-and-economics textbook confidently declares. Leading commentators, even when critical of law and economics, commonly suggest that tort law has succumbed to fairly straightforward economic modeling.²

This Article challenges the view that economic modeling has explained and justified tort law by demonstrating that it has failed to explain or justify tort law’s basic negligence rule. A rule of negligence, versus alternatives like strict liability, holds injurers liable in tort only if they have not taken reasonable precautions.³ An economic understanding of negligence, such as the one commonly known as the Hand Formula, defines “reasonable precautions” as those that are

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¹ ROBERT COOTER & THOMAS ULEN, *LAW & ECONOMICS* 324 (5th ed. 2008).

² *E.g.*, Leo Katz, *A Look at Tort Law with Criminal Law Blinders*, 76 B.U. L. REV. 307, 308 (1996) (resisting a solely economic view in criminal law but referring to “law and economics’ admittedly remarkable success at explaining tort law”).

³ See DAN B. DOBBS, 1 *THE LAW OF TORTS* § 116, at 275 (2001) (“Negligence is conduct that creates or fails to avoid unreasonable risks of foreseeable harm to others.”).

cost-justified.⁴ In general, the models that economists have constructed to justify economic conceptions of negligence rules seem persuasive on the surface, but on closer analysis they suffer from significant problems that make them either logically problematic or impossible to administer. Ultimately, the economists' formal models do not serve to justify negligence rules.

Many commentators, from a variety of perspectives, have already criticized particular forms of economic reasoning in tort law. Some, like Richard Wright, have argued persuasively that courts have diverged from the reductionist view now dominant in American legal academia, and thus that economic reasoning has not, in fact, explained or captured American tort law.⁵ My goal in this Article, however, is normative rather than descriptive: my aim is not to suggest that law-and-economics arguments have failed to influence courts, but rather that they have failed on their own terms to justify the efficiency of negligence rules.

Separately, it is common to see arguments that injurers do not respond to incentives in the way economists predict because people are simply not rational, are not aware of the law, or have more pressing concerns than distant and relatively weak financial incentives.⁶ I am sympathetic to these critiques and believe they are largely correct, but my goal here is somewhat different: my aim is to advance the discussion of tort law by showing that the leading formal, deductive conceptions of negligence rules fail in fundamental ways, essentially on their own terms, even if we accept for argument's sake most or all of their reductionist assumptions about human behavior. In

⁴ RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 167-71 (7th ed. 2007).

⁵ Richard W. Wright, *Hand, Posner, and the Myth of the "Hand Formula"*, 4 *THEORETICAL INQUIRIES IN LAW* 145 (2003) (showing that even Learned Hand and Richard Posner, two judges who, respectively, developed and promoted the Hand Formula, have not generally applied it in tort cases before them); Richard W. Wright, *Justice and Reasonable Care in Negligence Law*, 47 *AM. J. JURIS* 143, 145 (2003) ("The [leading economic understanding of negligence], although pervasive in the secondary literature and mentioned by a small minority of courts, is almost never used by the courts to decide whether particular conduct was negligent. Instead, the courts employ . . . a number of different criteria . . . based on the principles of justice."); see also Michael D. Green, *Negligence = Economic Efficiency: Doubts*, 75 *TEX. L. REV.* 1605, 1611 (1997) (questioning the role of economics in positive tort law); Benjamin C. Zipursky, *Sleight of Hand*, 48 *WM. & MARY L. REV.* 1999, 2002, 2026 (2007) (offering a similar rejection of the Hand Formula as a positive account of negligence law's standard of care and listing other commentary that has done so).

⁶ See Gary T. Schwartz, *Reality in the Economic Analysis of Tort Law: Does Tort Law Really Deter?*, 42 *UCLA L. REV.* 377 (1994) (surveying the state of such arguments).

other words, my goal is to take the leading formal economic conceptions of negligence rules off the table as serious contenders for the sole principled basis for tort law, *even if* humans were generally capable of behaving as simple slaves to rationality.

It is important to say that my goal is *not* to show that economic reasoning has provided no insight into tort law or that a proper understanding of tort law would ignore economic analysis. Indeed, I think economic reasoning has been, and can continue to be, helpful. To understand and justify tort rules, however—even on instrumental grounds—courts and commentators need to look beyond model-based deductions.

Similarly, my argument here is not against negligence rules, which may be supported by sound reasons of morality and policy. My argument is just that these rules cannot be derived in ways that leading legal economists appear to purport to derive them.

In Part I, I review the basic economic features of negligence and strict-liability rules and show why early attempts at analyzing tort law economically provided virtually no help in choosing between those two rules—and indeed how, in fairness, they often were not even meant to. For instance, although it is occasionally thought that the early law-and-economics scholars developed economic analyses that favored negligence rules over strict-liability rules,⁷ even those early scholars often admitted that theoretical microeconomics could not help judges or policymakers choose between negligence and strict liability.⁸ As an example, one early straightforward

⁷ See Gary T. Schwartz, *Mixed Theories of Tort Law: Affirming Both Deterrence and Corrective Justice*, 75 TEX. L. REV. 1801, 1819-20 (1997) (“From an economic perspective the Hand formula makes excellent sense. The formula can be seen as designed to encourage efficient investments in safety and risk reduction; as such, it has served as a cornerstone for economic analysis.”); Frank J. Vandall, *Judge Posner’s Negligence-Efficiency Theory: A Critique*, 35 EMORY L.J. 383, 404 (1986) (referring to “[e]conomists’ preferences for negligence”).

⁸ See Mark M. Hager, *The Emperor’s Clothes Are Not Efficient: Posner’s Jurisprudence of Class*, 41 AM. U. L. REV. 7, 44 (1991) (“Although Posner has attempted to defend the efficient character of the negligence standard, his arguments closely read have concentrated on the modest claim that negligence is *no less efficient* than strict liability.”); Vandall, *supra* note 7, at 404 (“Economists’ preference for negligence is undermined by the fundamental admission that ‘after two decades of writing on the subject, we still cannot say with certainty whether strict liability or negligence is the most efficient rule in most areas of accident law.’” (quoting Henry Hansmann, *The Current State of Law-and-Economics Scholarship*, 33 J. LEGAL EDUC. 217, 226 (1983))); J. Hoult Verkerke, *Notice Liability in Employment Discrimination Law*, 81 VA. L. REV. 273, 312 (1995) (“According to the conventional economic analysis,

understanding of negligence rules was that they are efficient because they give self-interested injurers incentives to take efficient precautions.⁹ But even if this proposition is correct, as a defense of negligence rules over strict-liability rules it would be entirely hollow: strict-liability rules give self-interested injurers similar incentives to take efficient precautions, as the pioneers of law and economics well understood.

In Part II, against this backdrop, I explain and then refute what is currently the leading theoretical economic understanding of negligence rules in tort law—a view that top analysts like Robert Cooter and Steven Shavell have helpfully adopted, clarified, and defended.¹⁰ This view has two components: First, it suggests that negligence rules efficiently create incentives for *bilateral precaution*—that is, for both injurers and victims to behave carefully in cases where the actions of both can decrease the likelihood of injuries. (For some economists, nearly all cases of injury are cases of bilateral precaution. As an example, if a car hits a pedestrian on a sidewalk, it might seem like the car's driver was the only one who could have prevented the accident, but economists point out that the pedestrian might have decreased the likelihood of an accident by staying at home.)¹¹ Negligence rules are said to promote bilateral precaution, loosely speaking, by serving as a threat of liability to both injurers and victims simultaneously: both parties are said to know that if they don't behave carefully, they may be made to bear the costs of an accident that occurs. Second, the leading economic view sets forth a formal understanding of who should bear the costs of an accident when both injurers and victims behave carefully. Economists answer this question by turning to arguments

the choice between strict liability and negligence ordinarily does not affect precautions.”).

⁹ Richard A. Posner, *A Theory of Negligence*, 1 J. LEGAL STUD. 29, 33 (1972) [hereinafter Posner, *A Theory of Negligence*] (“If . . . the benefits in accident avoidance exceed the costs of prevention, society is better off if those costs are incurred and the accident averted, and so in this case the [injurer] is made liable, in the expectation that self-interest will lead it to adopt the precautions in order to avoid a greater cost in tort judgments.”).

¹⁰ See generally COOTER & ULEN, *supra* note 1; Steven Shavell, *Strict Liability Versus Negligence*, 9 J. LEGAL STUD. 1 (1980) [hereinafter Shavell, *Strict Liability*].

¹¹ See, e.g., COOTER & ULEN, *supra* note 1, at 338 (suggesting that in the case where a “moving car hits [a] parked car,” the victim might “park [the] car in [a] safer space,” and that pedestrians hit by a car might “walk more safely”). Of course, Cooter and Ulen are not suggesting that a victim *should* necessarily do so, just that it is possible. See *infra* text accompanying notes 38-39 for more on this distinction.

about *activity levels*.¹² An activity-levels argument is one that is sensitive to the possibility that potential injurers and victims might engage in *too much* of an activity (like driving), even if they engage in it safely. For instance, if I know that as a driver I can avoid all liability for accidents simply by driving safely, I might therefore drive *inefficiently often*, thereby leading to more accidents than would be efficient.¹³

For several reasons, neither of these components of the modern theoretical understanding of negligence can successfully justify negligence rules over their alternatives. In short, the defense of negligence as promoting bilateral precaution fails because it depends on an exceedingly fragile formal model that cannot adapt even to features of the world that, by the model's own terms, it ought to address. For instance, it cannot accommodate a rational party's probabilistic assessment that another party may act irrationally or with incomplete information, nor can it address a variety of other limitations. As a result, the model does not serve either as a general explanation or a general justification for negligence rules.

The use of activity-levels arguments is flawed too. As a way to assign liability among innocent parties, activity-levels arguments are ordinarily unhelpful because of problems that courts would face if they tried to administer a tort regime based on them, and also because they create several important kinds of inefficiencies on their own. These inefficiencies relate to a sort of conceptualism that has colonized tort law under the banner of economic modeling: commentators tacitly or explicitly observe that the goal of their models is to reduce the net costs of precautions and accidents, but in fact an instrumentally optimal tort law in the real world would be sensitive to other costs, such as incorrect pricing of activities.

As a result, we reach the perhaps surprising conclusion that formal economics has failed to explain or justify, after decades of attempts, the basic features of negligence law. Again, this does not mean economists have provided no insight into the law of torts; indeed, many of their conceptions of negligence rules have been useful in clarifying some of the problems that tort law aims to address. Nonetheless, for a coherent basis of tort law, this Article suggests that we

¹² For the seminal analysis of activity levels in tort law, see Shavell, *Strict Liability*, *supra* note 10.

¹³ See *id.* at 2-3.

probably need to look beyond the models that even the best law-and-economics scholars, like Shavell, Cooter, and Ulen, have provided.¹⁴

I. BASIC ECONOMIC FEATURES OF NEGLIGENCE AND STRICT LIABILITY

This Part reviews the basic economic landscape in which tort law operates, both to provide enough background to understand modern economic conceptions of tort law and to clarify why the simpler economic understanding of tort rules that preceded the presently prevalent models was not sufficient to justify the efficiency of negligence rules over strict-liability rules.

An example that has become conventional in tort law, as a result of its use by Ronald Coase, involves a railroad that passes by a field and potentially causes damage to it because of sparks from its engine.¹⁵ I borrow Robert Cooter's formulation of the example for ease of exposition, because in Part II I will take up Cooter's arguments (among others) at length:

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.¹⁶

In this example, there is potential harm that results, in at least some senses,¹⁷ from the interaction between Xavier and Yvonne's business activities. A rule of *no liability* would make Yvonne, the owner of the cornfield, bear the entire cost of the harmful interaction by preventing her from recovering any

¹⁴ See generally COOTER & ULEN, *supra* note 1; Shavell, *Strict Liability*, *supra* note 10.

¹⁵ Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 29-31 (1960).

¹⁶ Robert Cooter, *Unity in Tort, Contract, and Property: The Model of Precaution*, 73 CAL. L. REV. 1, 5 (1985).

¹⁷ According to what Mark Kelman has called "the most basic Coasean insight," no cases of tortious harm occur without both parties in some sense causing the harm, because, at a minimum, the harm can't occur without both of their existence. Mark Kelman, *The Necessary Myth of Objective Causation Judgments in Liberal Political Theory*, 63 CHI.-KENT L. REV. 579, 579 (1987) ("[G]iven that . . . injury cannot have occurred unless the plaintiff . . . existed, . . . [i]t will never be the case that injury could occur without the plaintiff, such that the defendant is entirely causally responsible.").

money from Xavier in the event of damage to her cornfields. A rule of *strict liability*, by contrast, would make Xavier bear the entire cost of the interaction by requiring that he pay Yvonne for any harm she incurs as a result of the railroad's sparks. A rule of *negligence*, in contrast to both other rules, would make Xavier responsible for paying Yvonne only if some social judgment disapproves of Xavier's actions in running his railroad next to Yvonne's cornfields in a way that potentially hurts Yvonne.

A chief feature of the economic analysis of tort law is the economic conception of negligence rules—that is, a reduction of such rules to a cost-benefit test. This particular formulation, whose popularity is commonly traced to an opinion by Judge Learned Hand,¹⁸ *United States v. Carroll Towing*,¹⁹ would decide Xavier's liability based on the costs and benefits of the precautions he might have taken (per the example, "installing spark arresters, . . . running the trains more slowly, or . . . running fewer trains").²⁰ As an example, if the potential sparks from the railroad are estimated to cause fires that lead to \$4000 worth of expected damage to Yvonne's cornfield, Xavier would be liable if *any* of the precautions he might take are expected to cost less than \$4000. If not, he won't be liable.²¹

Analyzed from society's perspective (rather than either Xavier or Yvonne's private perspectives), economists point out that we want Xavier to take precautions only if their social cost is less than their social benefit. That is, even though it seems harsh to say so, there is some sense in which we *want* Yvonne's cornfield to burn down if it is too expensive to prevent fires. Of course, in an ideal world we wouldn't want to see Yvonne suffer this harm, but given the real-world choice between cornfield fires and the precautions necessary to prevent them, from an efficiency perspective we prefer whichever is cheaper.²² Or, as

¹⁸ E.g., Posner, *A Theory of Negligence*, *supra* note 9, at 32 ("The essential clue . . . [to the economic analysis of tort law] is provided by Judge Learned Hand's famous formulation of the negligence standard . . .").

¹⁹ 159 F.2d 169 (2d Cir. 1947).

²⁰ Cooter, *supra* note 16, at 4.

²¹ There are several significant problems with even this simple formulation of the negligence standard. For a more complete discussion, see *infra* Part II.D.

²² Nothing, certainly, mandates that we analyze this scenario only from the perspective of efficiency. For instance, we might think it is unfair to let Xavier cause fires for which he doesn't have to pay. But the instrumental economic view does capture an important insight, which is that Xavier and Yvonne are in some sense symmetric: if the law made Xavier pay for his fires' harm to Yvonne, then Yvonne's

Richard Posner, one of the chief proponents of this efficiency-oriented view, puts it:

If the cost of safety measures or of curtailment—whichever cost is lower—exceeds the benefit in accident avoidance to be gained by incurring that cost, society would be better off, in economic terms, to forgo accident prevention.²³

Consider how no-liability, strict-liability, and negligence rules fare under this view of social efficiency. If Xavier is *never* liable for fires regardless of how much damage they cause, and if he is selfish, he will have insufficient incentives to take precautions against fire. For instance, it could cost him only \$40 to install spark arresters, but he might not want to incur this expense even if fires are expected to cause many thousands of dollars of harm to Yvonne's fields. There may, of course, be many reasons Xavier would in practice bear a small expense even if the law does not require him to do so. He might, for example, have internalized moral norms, be afraid of feeling guilty for hurting Yvonne, empathize with Yvonne or have positive feelings for her, be concerned about adverse publicity, fear retaliatory action by Yvonne, or even consume corn personally and worry that the price of corn will rise if he repeatedly burns down Yvonne's fields. But if he is both selfish and interested only in maximizing his business profits, it is accurate to say that he will not have proper incentives to take efficient precautions against potentially catastrophic losses.

Consider, next, a rule of negligence. The chief feature of the early economic analysis of negligence rules was that, if these rules are conceived economically (as under Judge Hand's formula), they give Xavier incentives to take efficient precautions.²⁴ An economic conception of negligence under the Hand Formula essentially tracks the social-cost analysis described earlier: Xavier is called negligent (or unreasonable) if he didn't take socially efficient precautions, and he's called nonnegligent (or reasonable) otherwise. For example, if spark arresters could have prevented \$4000 fires at a cost of \$40, and if Xavier does not install spark arresters, he is said to be

choice to grow cornfields will have caused harm to Xavier. And it may not be fair, always, to require Xavier to suffer this harm.

In any event, because my purpose in this Article is to show that the economic accounts of negligence fail on roughly their own terms, I do not dwell, here, on the noneconomic problems with viewing all legal rules too instrumentally.

²³ Posner, *A Theory of Negligence*, *supra* note 9, at 32.

²⁴ *See id.*

negligent for not doing so. But if the spark arresters (and all the other precautions) cost more than \$4000, he is not negligent.

Recall that from the perspective of social efficiency, we want Xavier to take efficient precautions and do not want him to take inefficient ones. Because a negligence rule gives Xavier incentives to take efficient precautions and not to take inefficient ones, the early economic analysts of law presented it as an efficient rule. For instance, as Posner wrote:

If . . . the benefits in accident avoidance exceed the costs of prevention, society is better off if those costs are incurred and the accident averted, and so [injurers are] made liable, in the expectation that self-interest will lead [them] to adopt the precautions in order to avoid a greater cost in tort judgments.²⁵

From the way the early legal economists presented negligence rules, it was possible to infer that their instrumental analysis supported those rules, and only those rules. For instance, early in the economic analysis of law, Posner wrote as follows:

A rule making [an] enterprise liable for the accidents that occur [when precautions are more expensive than accidents] cannot be justified on the ground that it will induce the enterprise to increase the safety of its operations.²⁶

Posner seems to be saying that negligence rules are sufficient to ensure that potential injurers like Xavier behave efficiently, and as a result, rules like strict liability are unnecessary.

But even early on, economic analysts of law recognized that negligence rules and strict-liability rules provided similar incentives to injurers.²⁷ To see why this is so, recall that a negligence rule gives Xavier an incentive to spend \$40, but not \$8000, on spark arresters that prevent \$4000 fires. But a strict-liability rule does as well. Under a rule of strict liability, Xavier will be liable for *all* cornfield fires that his railroads cause, regardless of their costs and the costs of various precautions. So Xavier will have to pay both (1) the costs of any precautions he takes and (2) the costs of the fires. Given that he faces both these costs, he will have incentives to take efficient precautions. For instance, if spark arresters cost \$40 but fires

²⁵ *Id.* at 33.

²⁶ *Id.* at 32-33.

²⁷ *See id.*

cost \$4000, he will need to pay only \$40 if he installs the spark arresters but \$4000 if he does not. And if spark arresters cost \$8000 but fires still cost \$4000, he will need to pay \$8000 if he installs the spark arresters but only \$4000 otherwise. As a result, he has incentives to take precautions only when they are efficient.

In other words, it is indeed true that a rule of strict liability (compared to negligence) “cannot be justified on the ground that it will induce [injurers] to increase the safety of [their] operations.”²⁸ But it is *also* true that negligence itself cannot be justified in that way (compared to strict liability). The two rules are just as good at providing efficient incentives to injurers, at least when they are applied to the schematic representation of injuries with which we have been dealing.

The early economists, of course, recognized this symmetry. Posner saw it clearly as early as 1973, when he wrote: “Economic theory provides no basis, in general, for preferring strict liability to negligence, or negligence to strict liability, provided that some version of a contributory negligence defense is recognized.”²⁹ This was true, as Posner also recognized fairly early, even after considering the effects of negligence rules and strict-liability rules on the costs of adjudication.³⁰

Accordingly, the early economic analysis of law appears to justify the proposition that *either* strict-liability or negligence rules are better than rules of no liability. Of course, this proposition is uncontroversial; few were seriously arguing in the 1960s and 1970s for a complete absence of tort liability (or for some other standard far less than negligence liability).³¹ But the early economic analysis, perhaps, spelled out clear efficiency-related reasons for this.

Beyond this basic observation, however, that early analysis offered less than commentators sometimes suppose.

²⁸ *Id.*

²⁹ Richard A. Posner, *Strict Liability: A Comment*, 2 J. LEGAL STUD. 205, 221 (1973) [hereinafter Posner, *Strict Liability*].

³⁰ RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 442 (2d ed. 1977) (“No clear-cut prediction of the impact on the aggregate costs of the procedural system of substituting strict for negligence liability emerges from our analysis.”).

³¹ To be sure, some commentators have suggested that historically, tort law imposed liability less often than it does today because of the prevalence of “no duty” rules and other roadblocks to recovery. See, e.g., Robert L. Rabin, *The Historical Development of the Fault Principle: A Reinterpretation*, 15 GA. L. REV. 925, 928-44 (1981).

Posner and others believed,³² and generally still believe,³³ that this early form of economic analysis of tort law demands, from the point of view of social efficiency, that we conceive of the negligence standard in terms of the Hand Formula. To make this point clear, it is important to distinguish two possible normative conclusions from the kind of economic analysis I have discussed in this Part.

First, the analysis purports to address the choice between no liability, negligence, and strict liability. As I have noted, the analysis is correct, at least on its own terms, if it means to suggest that rules of negligence *or* strict liability are superior to a complete absence of tort liability (at least to the extent that the tort regime aims to govern the conduct of injurers).

Second, the analysis purports to give *form* to negligence rules, by observing that under the Hand Formula, negligence rules give injurers incentives to take efficient precaution. But this purported conclusion is only partially correct. It is true that a standard of negligence that requires *less* than the Hand Formula would be inefficient, at least in the schematic situations we have described involving Xavier and Yvonne. For example, if spark arresters cost \$3000, fires cost \$4000, and the legal standard for negligence liability calls Xavier reasonable (or nonnegligent) based on an arbitrary decision that nobody needs to install spark arresters on railroads, then Xavier will not have incentives to install (efficient) spark arresters. To put it differently, such a legal standard would be insufficient because it falls below the standard of the Hand Formula.

But a legal standard that exceeded, or perhaps even just tended to exceed, the Hand Formula could well be efficient. If spark arresters cost \$5000 and fires cost \$4000, but the legal standard for negligence liability calls Xavier reasonable only if he spends \$5000 or more on spark arresters, then he would still prefer to pay for the fires than for the (inefficient) spark arresters. More generally, a negligence standard based on broad social judgments (rather than narrower cost-benefit tests) can give injurers efficient incentives if those social judgments tend to require more precaution than a cost-benefit test would suggest, thereby imposing a standard between negligence and strict liability. For instance, consider a social

³² See Posner, *A Theory of Negligence*, *supra* note 9, at 32 (referring to the Hand Formula as “one of the few attempts to give content” to the negligence standard).

³³ See POSNER, *supra* note 4, at 167-71.

judgment that it is wrong, without a significant overriding justification, to cause preventable fires through industrial activity.³⁴ Based on that judgment and the numeric figures I used above, a tort regime that holds Xavier liable for all preventable fires caused by his railroad can be just as efficient as a tort regime based exclusively on an economically conceived negligence rule.³⁵

Accordingly, what the early economic analysis of law justified, even if all its assumptions about human behavior were correct, is less than is often imagined. On its own terms, the early analysis justified only two propositions: (1) that either negligence or strict liability can give injurers efficient incentives and (2) that an efficient negligence standard needs to be *at least* as strict as the Hand Formula, but it could well be stricter.³⁶ In short, the early economic analysis told us why we need a legal standard that is *at least* as strict as negligence liability, but it told us little more than this. Of course, this point was probably not controversial; it is not clear that anyone had seriously been arguing for modern tort rules that were weaker than the Hand Formula. But while the early economic analysis justifies at least that standard, it is important to recognize that it would be a mistake to take the early analysis as even slightly suggesting that *no greater* a standard would be efficient. The early economic analysis is compatible with many possible negligence standards, as long as they provide liability when a Hand Formula analysis would.

³⁴ Cf. Stephen G. Gilles, *Inevitable Accident in Classical English Tort Law*, 43 EMORY L.J. 575, 576-77 (1994) (suggesting that old English law imposed liability for accidents that could have been prevented, rather than imposing liability only for those that *should* have been prevented).

³⁵ My point in the text, more strictly, is that it is *possible* for a tort regime with a higher standard than that of a negligence regime to be efficient. Not all such regimes are necessarily efficient, however. Cooter and Ulen, in their textbook, give one reason a legal regime with a standard higher than that of negligence could be inefficient: it could encourage excess precaution when the legal standard is slightly higher than that of the negligence standard, because injurers would prefer to pay for slightly excess precautions rather than to pay for lower precautions plus the expected cost of accidents. See COOTER & ULEN, *supra* note 1, at 356. Cooter and Ulen's conclusion appears to be too strong, however. They conclude that "[i]n general, [the] injurer's precaution responds exactly to court errors in setting the legal standard under a negligence regime." *Id.* However, if the legal standard of conduct exceeds what they call the "social optimum" standard sufficiently, it will typically be more efficient for injurers to conform to that standard than to the legal standard. This is a technical point, however, and further details concerning it are beyond the scope of this Article.

³⁶ See Posner, *Strict Liability*, *supra* note 29, at 221; Posner, *A Theory of Negligence*, *supra* note 9, at 32; *supra* note 35 and accompanying text.

With this background, we can now consider, in Part II, more sophisticated modern economic conceptions of negligence rules.

II. THE LIMITS OF MODERN FORMAL ECONOMIC CONCEPTIONS OF NEGLIGENCE

In contrast to the early economic analysis discussed in Part I, the arguments at the center of economic discussions of tort law (and therefore a significant part of tort-law discussions in the United States) are substantially more complex. They aim to address a wider range of problems and to provide more specific recommendations concerning when injurers should or should not be liable for the harms they cause.

Robert Cooter and Steven Shavell have rearticulated, in slightly different ways, the leading modern analysis of negligence rules.³⁷ These rules depend on the recognition that many torts cases potentially demand *bilateral precaution*, which means that both injurers and victims (Xavier and Yvonne) can take steps to reduce the likelihood or severity of accidents. Recall that in Cooter's example,

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.³⁸

Not all cases involve bilateral precaution, but it is a feature of many cases—more than most students initially suppose when presented with the idea. A pedestrian afraid of being hit by cars can avoid walking on sidewalks; a homeowner afraid of airplanes falling from the sky can live in a location

³⁷ STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS 187-88 (2004); Cooter, *supra* note 16, at 4.

³⁸ Cooter, *supra* note 16, at 5. The economic model that forms the basis of both Cooter's and Shavell's restatements of the reasons that negligence rules are efficient in cases of bilateral precaution appears to originate with John Prather Brown, *Toward an Economic Theory of Liability*, 2 J. LEGAL STUD. 323, 347 (1973). Brown recognized, interestingly, some features of the fragility of his model. For instance, he observed: "The standard of care is critical, for, when it was changed to [a particular alternative formulation], the identity between equilibrium and optimality was destroyed." *Id.* I develop further reasons the model is fragile in Section II.B, *infra*. For ease of exposition, and to ensure that I respond to arguments in the forms in which they remain influential, I address my discussion of bilateral precaution in the text to Cooter's and Shavell's more recent formulations.

For further notes on the history of the economic analysis that informs modern academic understanding of tort law, see SHAVELL, *supra* note 37, at 192-93.

where fewer airplanes pass overhead; and so forth. In saying that a case involves bilateral precaution, there is no inherent moral or normative judgment; for instance, when economists say that pedestrians can walk more safely, this does not mean, on its own, that a pedestrian *should* do so or is *at fault* for not doing so.³⁹ To an economist, normative judgments depend on costs. Accordingly, a pedestrian should, as a general matter, walk more safely if doing so is less expensive, overall, than asking drivers to drive more safely. Whether it is cheaper might, of course, depend on complicated and possibly subjective social calculations.

In this Part, I first, in Subpart A, lay out the modern economic understanding of tort rules by explaining and elaborating Cooter's and Shavell's analysis. This understanding is based on two principles: (1) that negligence rules provide bilateral threats of liability and (2) that activity levels can generally inform liability decisions. In Subpart B, I respond to the argument that negligence rules provide efficient bilateral threats of liability, demonstrating that the economic models that underlie the leading economic understanding are exceedingly fragile and almost impossible to apply. In Subpart C, I respond to the argument that activity levels can serve as a principled way to assign the costs of accidents between two innocent parties, showing that modern activity-levels arguments are both narrow and unadministrable. In Subpart D, I address further problems that apply generally to the Hand Formula and similar attempts to conceive negligence solely using economic models.

A. *The Modern Understanding: Bilateral Liability Threats and Activity Levels*

1. Bilateral Precaution

The term *bilateral precaution* can refer to two slightly different concepts, and it is important to keep them separate. Consider again the case of Xavier (an injurer) and Yvonne (a victim). In the example we have been using, both Xavier and Yvonne can take precautions against railroad fires, and in that

³⁹ British comedian Jimmy Carr has used this distinction as a source of humor. Discussing drunk driving, he says: "I think the people that make the drink-driving ads should be forced to make an advert aimed specifically at pedestrians, simply saying, 'Pedestrians: Watch where you're going; some of us have had a drink.'" DVD: Jimmy Carr: Comedian (Bwark Productions 2007).

sense the *available* precautions are bilateral. But ordinarily, economic analysis of bilateral-precaution cases assumes that the case has an additional property—namely, that the *optimal* mix of precautions to be taken in a given situation includes some measures within Xavier’s control and others within Yvonne’s control.⁴⁰ To say this differently, given the optimal set of precautions that can be taken, the injurer will be able to take at least one of those precautions more cheaply than the victim, and the victim will be able to take at least one of those precautions more cheaply than the injurer.⁴¹ Throughout this Article, when I refer to cases of bilateral precaution, I refer to the second kind of case.

In bilateral-precaution cases, it is easy to see that rules of either strict liability or no liability will, on economic grounds, come up short. This is because rules of strict liability give incentives for injurers to take precautions (but not victims), and rules of no liability give incentives for victims to take precautions (but not injurers). For example, in the case of Xavier the railroader and Yvonne the cornfield owner, a rule of strict liability would place the whole cost of fires on Xavier, leading him to take precautions (spark arresters, slower trains, or fewer trains) against fires if it is efficient for him to do so; by contrast, a rule of no liability would place the whole cost of fires on Yvonne, leading her to take precautions (growing corn further away from the tracks, growing a crop more resistant to fires, or not growing anything) against them if it is efficient for her to do so. But in neither case will *both* Xavier and Yvonne—assuming they are purely rational and self-interested, and assuming that they have no other relevant incentives—take precautions against fires.

The modern formal economic conception of negligence rules in tort law attempts to address this problem in cases of bilateral precaution—i.e., those where the only efficient mix of precautions would come from both Xavier and Yvonne, the injurer and the victim. In short, the modern understanding of

⁴⁰ See, e.g., COOTER & ULEN, *supra* note 1, at 341 (“[W]e consider the case in which *both* the victim and injurer *can* take precaution, and efficiency *requires* both of them to take it. We call this condition the assumption of *bilateral precaution*.”); SHAVELL, *supra* note 37, at 182-83 (“[E]xamples can obviously be constructed in which it is optimal only for injurers to take care or only for victims to take care (or for neither to do so). These possibilities are not the focus [of the bilateral-precaution discussion].”).

⁴¹ See Cooter, *supra* note 16, at 6 n.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.”).

negligence rules is that they provide efficient incentives to *both* parties by making both think that they may be liable if they don't live up to their efficient standard of care. As Cooter says:

[T]he paradox [of encouraging both Xavier and Yvonne to behave efficiently] can be resolved by adopting fault [i.e., negligence] 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.⁴²

Shavell puts it similarly:

As in the unilateral model, if the courts choose due care to equal the socially optimal level [i.e., if negligence is set via the Hand Formula], then injurers will be led to take due care. Victims too will be induced to take the optimal level of care because they will bear their losses if injurers take due care. (Drivers will be led to take due care; and knowing that they will bear their losses, bicyclists [that the drivers might hit] will decide to take appropriate care.)⁴³

In other words, a negligence rule appears to encourage injurers to take whatever precautions are efficient for them to take. But then, because victims will expect injurers to take these precautions and thus avoid liability, the victims will fear that they're going to suffer the costs of accidents themselves. As a result, the victims, too, will take efficient precautions.

For those without economic training, what economists mean when they refer to some precautions that victims can take may seem counterintuitive. Why is it a "precaution" for Yvonne, for example, to avoid growing anything in her fields at all? The answer is that by not growing corn, she prevents any social waste that comes from investing in corn. A fire to an empty field might well cause no "harm." By not planting anything in her field, Yvonne is able to remove the possibility that fires caused by trains will cause her to waste money in growing corn that will simply be burned down. Of course, by not planting anything, Yvonne presumably suffers some loss

⁴² Cooter, *supra* note 16, at 6-7.

⁴³ SHAVELL, *supra* note 37, at 185-86.

because her field is not being put to productive use. But to an economist, this loss is exactly the same kind of loss that Xavier himself would suffer by having to install spark arresters (or to run fewer trains). In other words, Xavier and Yvonne interact to cause a social loss, even if Xavier is the one whose sparks cause fires in Yvonne's fields. Stripped of all moral dimensions and other kinds of social judgments, both parties simply face potential costs from two sources: (1) planning in advance of an accident in order to reduce the expected harm from it, and (2) either harm from the accident (in Yvonne's case) or a requirement to pay for harm from the accident (in Xavier's case).⁴⁴

An example of the economists' overall argument about negligence rules' effects on bilateral precaution may be in order. Suppose that in the case of Xavier and Yvonne, two precautions are said to be optimal: as the cheapest mix of accident-avoidance and harm-avoidance, imagine that it is efficient (1) for Xavier to install spark arresters at a cost of \$1200 and (2) for Yvonne to avoid planting corn within ten feet of the railroad track, and instead to install nonflammable rubber in that space at a cost of \$800 (which includes both the cost of the rubber and the cost of the forgone corn). Why would such a mix be optimal? Just for the sake of the hypothetical, suppose that fires are hugely expensive, causing \$40,000 worth of damages. Now, also suppose that if Yvonne didn't leave a buffer of ten feet, Xavier would have to install super-safe spark arresters at a cost of \$8000 in order to prevent fires. But suppose, conversely, that if Xavier didn't install any spark arresters, Yvonne would have to leave a buffer of fifty feet, at a cost of \$6000 (as a result of the greater amount of forgone

⁴⁴ Brown's formalization of the case he describes is a clear and helpful aid to the intuitions that underlie economists' understanding of the bilateral tort model:

Consider a small device, a black box, which is attached to some otherwise useful object such as a railway crossing, an airplane, or a sidewalk. The only function of the device is to emit a bill for a large amount of money from time to time, so we shall call it a liability generator. . . .

On the liability generator are two controls, X and Y. . . . Increasing either or both increases the probability that the accident will be avoided Examples of what will be meant here by controls are built-in safety devices and careful driving in the railway crossing case, defect-free radar and careful flying in the airplane case, and shoveling snow and careful walking in the sidewalk case.

Brown, *supra* note 38, at 324. The description shows the economic symmetries between victims and injurers in a case of bilateral precaution.

corn), to prevent the huge costs of fires. Given this mix, the particular efficient state of affairs is for both Xavier and Yvonne to spend some money on precautions.

According to Cooter and Shavell, under a negligence regime both Xavier and Yvonne can be encouraged to take these precautions, in this case. This is because, if the legal standards for negligence are set correctly, they believe both Xavier and Yvonne will be afraid of suffering the \$40,000 harm from fires if they don't take the relatively cheap—and more importantly, optimal—precautions available to them. So they both will do so, and together they will create a social surplus (over other scenarios in which money is wasted either on precautions or on fires).

It sounds attractive enough. And on the surface, the models appear to work out the way that Cooter and Shavell suggest. But beneath the surface, the models face significant technical problems that prevent them from being applied determinatively in at least many kinds of tort cases. I will describe those problems in Subpart B, *infra*. But first, it will be helpful to explain the other central features of the modern understanding of liability rules in tort law.

2. Residual Liability

Even if negligence rules could be implemented in a way that encourages efficient bilateral precaution, there remains an incompleteness in the model: what happens when both parties live up to their efficient standard of care? Just as under the early, straightforward economic models, which suggested that both negligence rules and strict-liability rules could encourage efficient precaution, the bilateral-precaution model is consistent with assigning the cost of accidents either to injurers or to victims when both act reasonably.

To see why this is so, consider that an ordinary rule of negligence is symmetric with a rule of “strict liability with a defense of contributory negligence.”⁴⁵ If a rule of simple negligence encourages an injurer to take precautions, and then encourages a victim to take precautions because the injurer avoids liability and leaves the victim holding the bill, then a rule of strict liability combined with contributory negligence can do something very similar, but opposite in one important

⁴⁵ COOTER & ULEN, *supra* note 1, at 346; *see also* SHAVELL, *supra* note 37, at 184-87.

way. Specifically, it can serve as a threat of liability to both parties, causing both of them to behave efficiently, but then leave the injurer (instead of the victim) responsible for any harms that occur.⁴⁶

So, for instance, in our last example, Xavier and Yvonne might both be encouraged to take small precautions. But if a large spark occurs from the railroad and causes a fire anyway, Yvonne will suffer the harm under a negligence rule: both parties met their standard, and Yvonne cannot claim in court that Xavier was negligent. Under a strict-liability regime that incorporates a defense of contributory negligence, by contrast, Xavier will have to pay for Yvonne's harm in such a case.

Given this symmetry, how can we distinguish among the potential rules? Indeed, there are not just two possible rules. In addition to (1) negligence and (2) strict liability with a defense of contributory negligence, other possibilities that lead to similar results (because they all achieve bilateral liability threats in theory) are (3) negligence with a defense of contributory negligence, and (4) comparative negligence.⁴⁷ Perhaps surprisingly, the economic analysis of all these rules—including comparative negligence—is essentially the same, at least in the basic cases I have outlined here.⁴⁸ The supposed incentives are the same; the only difference is who ends up with the cost of accidents that occur when everyone behaved efficiently (nonnegligently).

Nothing in the analysis of bilateral precautions lets us distinguish, then, between these various possible tort regimes.⁴⁹ A different kind of analysis needs to serve that role, and in the

⁴⁶ The liability threats under such a regime work as follows: the victim will take efficient precautions knowing that if she doesn't, she will be held liable because the injurer will be able to show that the victim was contributorily negligent. But then the injurer will fear liability himself, because the victim has behaved properly and the rule is one of strict liability. So the injurer will take efficient precautions too. The mechanism by which the incentives operate is simply the mirror image of a negligence regime's.

⁴⁷ See COOTER & ULEN, *supra* note 1, at 344-47; SHAVELL, *supra* note 37, at 184-89. Both Cooter and Shavell explain how these rules achieve similar bilateral liability threats, which should not be a surprise: the mechanism is essentially the same under all these regimes.

⁴⁸ For a more complete economic analysis, see Robert D. Cooter & Thomas S. Ulen, *An Economic Case for Comparative Negligence*, 61 N.Y.U. L. REV. 1067, 1070-71 (1986) (arguing that comparative negligence is superior to other negligence-based rules only when parties face particular informational limitations).

⁴⁹ Cf. COOTER & ULEN, *supra* note 1, at 348 ("[T]he . . . model [of bilateral liability threats] provides a policy reason to prefer a negligence rule whenever precaution is bilateral. The simple model does not, however, provide a reason for preferring one form of the negligence rule to another.').

modern economic understanding of tort law, it comes from an analysis of activity levels.

3. Activity Levels

To figure out whether a rule of negligence is more efficient than a rule of strict liability (with a defense of contributory negligence)—which is to say, to figure out who should bear the cost of an accident when both injurers and victims have behaved reasonably (nonnegligently)—economists have turned to an understanding of *activity levels*, as pioneered by Shavell.⁵⁰ The concept is simple, though perhaps unfamiliar to most lawyers. As Shavell originally put it:

By definition, under the negligence rule all that an injurer needs to avoid the possibility of liability is to make sure to exercise due care if he engages in his activity. Consequently *he will not be motivated to consider the effect on accident losses of his choice of whether to engage in his activity or, more generally, of the level at which to engage in his activity*; he will choose his level of activity in accordance only with the personal benefits so derived. But surely any increase in his level of activity will typically raise expected accident losses (holding constant the level of care). Thus he will be led to choose too high a level of activity; the negligence rule is not “efficient.”⁵¹

Consider the activity of driving.⁵² Under a negligence regime, drivers are encouraged to drive safely (because if they don't, they have a greater risk of being held liable for their dangerousness). If they drive safely—that is, if they are confident that they will always be able to drive safely—then they know that they won't be held liable for car accidents. But if their very decision to drive increases the likelihood of accidents—after all, more cars will be on the road if more people drive, there will likely be more congestion, and perhaps some accidents to pedestrians arise even when both drivers and pedestrians behave safely—then they will drive *too much*, even while driving safely.

Of course, it is reasonable to wonder why courts would not simply judge drivers negligent if they drive too often, if indeed excessive driving increases the risks of accidents. For instance, a driver out “on a mere whim”⁵³ could be held liable

⁵⁰ See Shavell, *Strict Liability*, *supra* note 10, at 2.

⁵¹ *Id.*

⁵² This example—now standard in the activity-levels literature—is drawn from Shavell. See *id.* at 2-3.

⁵³ *Id.* at 2.

more readily than an ambulance on an urgent errand, even if both drivers were handling their vehicles with similar care. Or a driver on a trip with virtually no social utility could be judged negligent, when he gets into an accident, merely for being out on the road. But courts do not make determinations like these in practice, and in general it would be difficult for them to do so. I return to problems concerning the distinction between individual choices and activity levels in Part II.D.1, *infra*.

Modern law-and-economics scholars relate an understanding of activity levels to liability judgments in the following way: they argue that, when both the injurer and the victim behave nonnegligently, liability should be assigned to the party whose choices about activity level have a greater chance to reduce accidents efficiently. Thus, for instance, Cooter and Ulen write as follows: “Usually one party’s activity level affects accidents more than the other party’s activity level. Efficiency requires choosing a liability rule so that the party whose activity level most affects accidents bears the residual cost of accidental harm.”⁵⁴ Shavell puts it similarly, although perhaps in a way that accommodates broader considerations: “Strict liability [with a defense of contributory negligence] will result in greater social welfare [than a rule of negligence] if it is more important for society to control injurers’ levels of activity than victims’.”⁵⁵

As an example, consider the kinds of “abnormally dangerous” activities described in the *Restatement (Second) of Torts*.⁵⁶ In destroying buildings with dynamite, it appears (at least on the surface) that those using dynamite influence the likelihood of harm more via their choice of activity level than those who operate stores on nearby streets. To summarize the modern economic approach to tort cases, analyzing this case would work as follows: (1) both store owners and blasters can take precautions against harm from dynamite in a variety of ways, and the case is accordingly one of bilateral precaution; (2) as a result, in terms of basic precautions, any negligence-based rules (including either (a) negligence or (b) strict liability with a defense of contributory negligence) will be optimal; (3) to choose between them, we note that blasters’ activity levels influence accident costs more than store owners’; (4) as a

⁵⁴ COOTER & ULEN, *supra* note 1, at 349.

⁵⁵ SHAVELL, *supra* note 37, at 202.

⁵⁶ RESTATEMENT (SECOND) OF TORTS § 520 (1977).

result, the efficient rule is strict liability with a defense of contributory negligence.

Having laid out this modern economic understanding, my goal now is to demonstrate why it comes up short if its goal is to justify or recommend particular legal rules. In Subpart B, I address the problems with the basic bilateral-precaution model, arguing that it insufficiently justifies negligence rules in the first place. In Subpart C, I demonstrate that even if we assume that negligence rules (including strict liability with a defense of contributory negligence) are efficient, activity-level arguments—at least as understood economically—are of little help in choosing among them. As a result, economics remains of perhaps surprisingly little help in determining when to assign tort liability. In Subpart D, I address a variety of other issues that affect the applicability of the reigning economic models, showing that fundamentally noneconomic social judgment, rather than discrete economic cost-benefit tests, would be needed even if the models otherwise worked as economists intend.

B. The Limits of Models of Bilateral Liability Threats

As I have noted, there are two central features of the modern economic understanding of negligence rules: (1) bilateral threats of liability and (2) activity levels as a mechanism to decide who bears residual liability when all parties behave optimally.⁵⁷ In this Subpart, I describe several fundamental problems with the first of these pillars.

1. A Mathematical Demonstration of the Prevailing Economic Model

To do this, it will be necessary to consider a little more deeply, and mathematically, the formal models at issue. For ease of exposition, I will draw in part, at first, from a particularly clear summary of these views by Cooter and address variations of this model later.⁵⁸

Consider, again, the example of Xavier (a railroader) and Yvonne (a cornfield owner). Formally, the total social cost from fires from Xavier's railroad that burn Yvonne's corn are

⁵⁷ See *supra* Part II.A.

⁵⁸ The material in the first part of this section is, accordingly, based on Cooter. See Cooter, *supra* note 16, at 8-11.

$$SC = x + y + p(x,y)a$$

In this formula, SC is the total social cost, x is the cost of Xavier's precautions (like installing spark arresters), y is the cost of Yvonne's precautions (like growing less corn), $p(x,y)$ is the likelihood of a fire, and a is the cost if there is a fire.⁵⁹

A few features of this formalization are worth specially noting. First, the cost of accidents when they occur, a , is held constant.⁶⁰ This is a reduction, and most reductions threaten the ultimate applicability of formal models; however, this particular reduction is not one I need to challenge for the purposes of this Article, so I accept it in the remaining discussion.

Second, more importantly, the probability of fire-related accidents is expressed as $p(x,y)$. Here, p is a function—a mapping of some values to others. The important feature of the way that the probability of fires is expressed, here, is that it depends on both x and y —that is, on the precautions that both Xavier and Yvonne take. If the probability were expressed simply as $p(x)$ or $p(y)$, it would depend wholly on Xavier's or Yvonne's precautions, respectively, and the case would therefore be one of unilateral precaution. That the probability is expressed as $p(x,y)$ means the case is potentially one of bilateral precaution. (I say "potentially" because the optimal x or y could still be zero.)

To summarize so far, the total social costs (SC) are the sum of Xavier's precautions, Yvonne's precautions, and the expected costs (the probability times the magnitude) of the fire's harms. For the economists who have set forth these models, the goal is simply to reduce SC through tort rules.⁶¹

Ultimately, social costs in this case depend only on x and y . That is, given particular levels of precaution by Xavier and Yvonne, there is an associated social cost (which consists, again, of the costs of those precautions and the expected harm from fires, which itself just depends on the precautions that Xavier and Yvonne take). To economists, accordingly, the goal

⁵⁹ Cf. *id.* at 8. I have simplified Cooter's formula somewhat in ways that do not affect the argument. Specifically, for Cooter, $p(x,y)$ is the likelihood that an accident will *not* occur, whereas in my example, $p(x,y)$ is the likelihood that it *will* occur. Accordingly, Cooter uses $(1 \cdot p(x,y))$ to represent the likelihood of an accident.

⁶⁰ Cf. *id.* at 8 n.24.

⁶¹ See *id.* at 8 ("Efficiency is achieved when social costs are minimized.").

is to find rules that give parties incentives to adopt an optimal pair of values for x and y . Call these optimal values x^* and y^* .⁶²

Now, consider the private costs that Xavier and Yvonne face individually. These private costs will depend on tort law's liability rules, because Xavier and Yvonne can respond to tort law's incentives. The central conclusion of the economists' models is that negligence rules (including, again, rules of strict liability with a defense of contributory negligence)⁶³ create efficient incentives for Xavier to adopt x^* as his level of precaution and for Yvonne to adopt y^* as hers.

Consider first Xavier, the potential injurer. Under a negligence rule, Xavier's costs can be separated into two distinct cases: (1) if he pays for enough precaution to satisfy tort law's standard, then his only cost is that of the precaution, because he won't have to pay for any of the costs of fires; (2) if he does *not* pay for enough precaution, then his cost is that of whatever precautions he does pay for, plus the costs of fires, because tort law will hold him liable for the damages from the fire. In the first case, we can express Xavier's costs simply as x . In the second, Xavier's costs are $x + p(x,y)a$.

And in this formulation, we reach the first central stumbling block of the economic model. Because this is a case of bilateral precaution, Xavier's costs in this case depend in part on the precautions that Yvonne adopts (y). This means that, if all we know is x , there is no way to determine Xavier's costs. If we admit that we do not know what Yvonne's costs might be, there is little more we can say about Xavier's cost. Economists, accordingly, specify one more piece of information. They state, as an example, that "Yvonne's precaution is held constant at the efficient level ($y = y^*$)."⁶⁴

This additional assumption, though it may appear minor, severely undermines the model's applicability to real tort cases. But before I explain its problems, it will first help to understand what it allows the formal model to do. By holding

⁶² Cf. *id.*

⁶³ In the remainder of this section, I will use simple negligence rules as an example of the class of rules that includes strict liability with a defense of contributory negligence, negligence with a defense of contributory negligence, and comparative negligence. This is a simplification without any loss of generality; the economists' arguments at stake in this section, and my responses to them, treat all models in the same way. See *supra* Part II.A.2.

⁶⁴ Cooter, *supra* note 16, at 9. Shavell's formulation is similar, although not identical (for reasons I explain *infra* Part II.C.1): "[I]njurers will exercise optimal care given that victims take due care, because then injurers will be liable for accident losses." SHAVELL, *supra* note 37, at 184-85 (emphasis added).

Yvonne's costs constant at the optimal level, Xavier's costs can now be expressed solely as a function of his own precaution. Assuming that tort law's negligence standard (as applied to Xavier's behavior) is optimal, Xavier's costs are: (1) x if $x \geq x^*$, and (2) $x + q(x)a$ if $x < x^*$, where $q(x)$ simply represents the cost of accidents given Xavier's level of precaution x , assuming Yvonne behaves optimally.

Essentially, Xavier gets to pick between choices 1 and 2, based on the level of x he chooses. Because $x + q(x)a$ is greater than x (because $q(x)a$ is positive), Xavier would prefer to pay only x . The way for him to do this is to choose his level of precaution x to equal x^* , the optimal amount of precaution and the legal negligence standard for him. Consider his choice in the following way: if he chooses less precaution than x^* , he will have to pay for accident costs *plus* whatever precaution he takes; if he choose a level of precaution equal to x^* , he avoids liability and pays only x^* . Therefore, he will (under the model) choose a precaution equal to x^* .⁶⁵

Yvonne's decisions are the mirror image of Xavier's. When considering her costs, the economists tell us similarly to hold Xavier's precautions constant at the optimal level.⁶⁶ Then, she can choose either a cost of y or $y + p(x^*, y)$ depending on whether y is less than y^* (the legal standard for *her*, based on what precautions are socially optimal for her to take). For reasons that track the discussion of Xavier's incentives, the economists conclude that Yvonne will adopt the optimal level of precaution, y^* . Accordingly, negligence rules are said to give both Xavier and Yvonne efficient incentives; the economists expect that Xavier will choose x^* and Yvonne will choose y^* , their respectively optimal levels of precaution.

2. Limits of the Model

As I have suggested, however, the model is flawed, or at least limited in its applicability to many kinds of cases. The internal flaws of the model—as opposed to those that highlight the model's incorrect or incomplete assumptions about human

⁶⁵ For a more mathematical elaboration of this point, see Cooter, *supra* note 16, at 9-10. For an even more formal proof of essentially the same conclusion, see generally the original discussion in Brown, *supra* note 38.

⁶⁶ See SHAVELL, *supra* note 37, at 185 (“The specific reasoning [for victims] is analogous to that in the explanation . . . of why injurers will take due care under the negligence rule.”); Cooter, *supra* note 16, at 10 (premising the conclusions for the victim's case on the assumption “that the injurer is nonnegligent”).

behavior—derive from a feature to which I drew attention in the previous section: namely, that Yvonne's behavior is held constant when considering Xavier's, and that Xavier's behavior is held constant when considering Yvonne's.

To put this more succinctly, Xavier's optimal behavior depends on Yvonne's, and Yvonne's depends on Xavier's. Or, more formally, x^* depends on y^* , which depends on x^* . This may seem circular, and in a sense it is, but the internal problem with the economic model isn't precisely that it is *logically* circular. Variables can depend on each other, in this sense, without collapsing a mathematical model. Indeed, this kind of codependence between variables underlies much of game theory: in a game, the actions of one party influence the actions of another, which in turn can influence the actions of the first, until an equilibrium is reached.⁶⁷

The central problem comes instead from what the mirror-image dependence demands, in this particular model's case. The only way to determine what the legal standard for Xavier (x^*) should be is to know what the legal standard for Yvonne (y^*) should be, and vice-versa. Accordingly, before we can set the particular negligence rules that govern *either* Xavier and Yvonne, we have to know what the optimal behavior is for *both* of them. That knowledge must come as a package, and if the economic model is to work, we must use it to set the standards for both parties.

More precisely, for the economic model even to get off the ground, we need to imagine that Xavier and Yvonne can determine such optima *ex ante* and also that they expect that a court analyzing the situation *ex post* will be able to infer the same optima. If Xavier and Yvonne cannot determine the optima themselves, they have no way to plan their behavior accordingly. And if they do not expect courts to be able to determine the proper standards *ex post*, then being purely rational and selfish, they will have no reason to plan their behavior in view of the correct legal standards.⁶⁸

⁶⁷ For a short introduction to game theory and the analysis of equilibria, see COOTER & ULEN, *supra* note 1, at 32-42.

⁶⁸ Shavell clearly outlines this requirement for his argument: “[T]o ascertain the optimal level of due care for just one party, a court must generally determine (if only implicitly) the optimal level of care for the other as well, because the optimal level of care for one party will in principle depend on the other's cost of, and possibilities for, reducing risk.” SHAVELL, *supra* note 37, at 188. “This latter point,” Shavell admits, “makes the comparison of liability rules with respect to their ease of application different from what it might at first seem to be.” *Id.* Shavell also recognizes that

The central difficulty with the formal model of bilateral precaution arises from the impracticality of knowing in advance, with perfect accuracy, what the optimal costs and benefits are for parties like Xavier and Yvonne. Economists, to be sure, do not think parties or courts (or regulators) have access to this kind of perfect knowledge, or that parties in Xavier and Yvonne's positions will have access to perfect information about one another.⁶⁹ But if the model is to be applied to tort cases in practice, the legal economists' arguments implicitly depend on the belief that the model nonetheless provides a useful idealization of the world, and that minor variations from the model's assumptions will only slightly degrade the model's normative power.⁷⁰

That may be true of some models, but it is not true of this one—at least not at the level of generality at which formal deductions about law operate. Recall that the reason a situation involves bilateral precaution in the first place is that the injurer and the victim face different costs in the precautions they might take.⁷¹ (Otherwise, the case could more easily be treated as one of unilateral precaution, in which a single party takes all the care needed to reduce the costs of accidents to an optimal level.) Accordingly, a small change in the precautions Xavier *actually* takes can mandate a very large change in the precautions Yvonne should *efficiently* take, and vice-versa.⁷² As an example, Yvonne's optimal behavior (from both her perspective and an overall social one) might look very different depending on whether Xavier does or doesn't install spark arresters on his railroads, even if those spark arresters are very cheap.

"courts must generally consider the entire tableau of costs and effectiveness of care for the two parties to determine optimal care for either." *Id.* at 188 n.17. One way of understanding my central argument in the text about the model's fragility is that this "entire tableau of costs and effectiveness" need not, in any situation, exhibit any regularity or predictability. *Id.* Minor changes to it (based on, for instance, small changes in what courts expect injurers and victims to do) can radically change courts' beliefs about which precautions are optimal.

⁶⁹ See, e.g., Brown, *supra* note 38, at 343-47 (analyzing, as a variation on the economic model that came to underlie economists' modern understanding of tort law, the effects of informational limitations for injurers and victims).

⁷⁰ Cf. COOTER & ULEN, *supra* note 1, at 347 (suggesting, with specific reference to the bilateral-liability-threat model of tort law, that "[i]t is usually best to build theory from clean results and then handle any messy results as exceptions").

⁷¹ See *supra* notes 40-41 and accompanying text.

⁷² More formally, a small change in x can require a large change in y^* , and a small change in y can require a large change in x^* .

As a result, the central internal problem with the prevailing formal models of negligence is that they are untenably *fragile*: they do not resist minor modification to the parties' behavior. To say this differently, the models are premised on a theoretical perfection, and the slightest variation from this perfection can make their equilibrium collapse entirely, rather than degrade gracefully. Instead of providing an approximation of the real world, they threaten to provide virtually nothing in the real world.

As an example, even if we can narrow x^* down to a relatively small range (say, a rough projected expenditure on a few different kinds of spark arresters), this may not be sufficient to determine what y^* is. In the general case, we need *full* information about x^* in order to specify y^* , and vice-versa. There is little opportunity to reach a second-best result: admitting that we are not sure of x^* means we cannot be sure of y^* , and nothing in the economic model guarantees that this uncertainty will not spiral out of control, so that we are no longer even roughly sure of x^* .⁷³ Even a very good prediction based on aggregate or generally constant behavior is insufficient to ensure that the model reaches what economists call a convergent—that is, a stable—result. Slight changes to one party's precaution can have unpredictable effects on those that the other parties should take.

To be clear, I am not arguing that the model cannot work in any case, no matter how stylized; my criticism is that the model cannot be applied to the general case and that therefore, it cannot justify negligence rules as a general matter. In the general case, even when an injurer can estimate victims' precaution reasonably well and a victim can represent injurers' precaution reasonably well, the model cannot tell us what to do.

Moreover, even if we assume that injurers, victims, and courts have perfect information about what precautions would be socially optimal given the expected probability and harm from accidents, there are additional reasons that the model's fragility is triggered as soon as it is applied to any real case.

⁷³ Of course, it is unfair to expect an economic model to provide stronger conclusions than are justified by the information available to us in the real world. My objection to the model is not that it cannot yield an optimal result given suboptimal information. Rather, my argument is that the model cannot work at all in the general case, in the way it was intended, without perfect information.

For one thing, even if an individual party is perfectly rational and has perfect information, he or she must accommodate the possibility—even in just a probabilistic sense—that other parties will not behave perfectly rationally or have perfect information. In other words, even if both parties turn out to be perfectly rational and fully informed, they would have to account for the possibility that other people are not.

As an example, consider a simple game in which a group of people are asked to choose numbers from zero to one hundred.⁷⁴ The group's numbers will be averaged. The winner of the game is the member of the group who chose a number closest to half the group's average. In a game populated only by fully rational players, the optimal choice would be zero.⁷⁵ But in practice, even a fully rational agent would not choose zero, because he or she would expect error or irrationality in other people's choices.⁷⁶ In other words, it is fully rational to expect irrationality or lack of information in others, at least probabilistically.

The problem that this observation poses for the bilateral-liability-threat model is that it cannot in practice be efficient to dictate efficient legal standards, x^* and y^* , based on the presumption that both parties will expect the other to behave perfectly. Xavier and Yvonne cannot (and should not) plan their behavior in view of that assumption. But once we recognize this, the model unravels; again, without shared knowledge of the optimal pair of values for x^* and y^* , neither can be set in the general case. We can try to guess what precautions Xavier will in fact choose, and set the legal standard for Yvonne accordingly; then, we can try to guess what Yvonne will in fact choose, based on this standard, and set the standard for Xavier accordingly. But then this change in the standard will alter Xavier's behavior, which in turn will

⁷⁴ This example, called a "*p*-beauty contest game," is drawn from HERVE MOULIN, *GAME THEORY FOR THE SOCIAL SCIENCES* (2d ed. 1982); see also Avinash Dixit, *Restoring Fun to Game Theory*, 36 J. ECON. EDUC. 205 (2005) (discussing this game from a pedagogical perspective).

⁷⁵ If all players in the group chose one hundred, the best choice would have been fifty. Members of the group, knowing this, could all choose fifty. But then, all players could figure out that fifty would be the average, so they would want to choose twenty-five, and so on.

⁷⁶ For experimental results of this game in practice, see Rosemarie Nagel, *Unraveling in Guessing Games: An Experimental Study*, 85 AM. ECON. REV. 1313 (1995) (demonstrating that people do not behave as if they assume everyone else were perfectly rational).

alter Yvonne's behavior, and nothing guarantees that an efficient equilibrium will result in the general case.

There is another, perhaps simpler, way to express this problem and related ones: we can analyze the situation from the perspective of the parties, rather than the policymakers setting x^* and y^* . For example, Cooter is rightly concerned, throughout much of his analysis of legal rules, with what he calls the "paradox of compensation"⁷⁷—the notion that when efficiency requires "double responsibility at the margin"⁷⁸ from multiple parties, there is no single efficient legal rule that provides the right incentives to everyone. This was, in short, the problem we saw with rules of strict liability and no liability earlier: strict liability might give injurers efficient incentives, but it leaves victims free to take no precautions at all, at least in theory, because all their harms are compensated by injurers. Rules providing for no liability do the reverse: they give victims incentives to take precautions, because they bear the costs of harm, but injurers are free to do as they please. In defending the bilateral-liability-threat model of negligence rules, economists have offered it as a solution to this "paradox" of compensation.

But the problem is that a mere *threat* of liability cannot solve this paradox. Even a fully rational Xavier, or Yvonne, will know under a negligence regime that there is some chance they will avoid liability and some chance they will not. For instance, suppose that the legal standard sets x^* (Xavier's efficient precautions) to \$80, which might correspond to a requirement to install spark arresters. The economic model that justifies negligence rules suggests that Xavier will choose \$80 as his level of precaution because he fears liability if he doesn't.⁷⁹ But this liability is not certain under all negligence rules, even if perfect enforcement of the law is assumed. For instance, under a rule of negligence with a defense of contributory negligence (unlike a rule of pure strict liability), Xavier knows that there is some chance that Yvonne will not meet her standard of liability (y^*). As a result, it may not be efficient for Xavier to spend \$80 on precautions in all cases, even if he is fully

⁷⁷ Cooter, *supra* note 16, at 3-4.

⁷⁸ *Id.* at 4.

⁷⁹ See SHAVELL, *supra* note 37, at 184-85; Cooter, *supra* note 16, at 9-10.

rational.⁸⁰ Instead, he may spend less under some conditions because he may expect that he will sometimes be able to avoid liability altogether (because of Yvonne's own negligence).⁸¹ But given this possibility, then—as before—the y^* that courts have chosen for Yvonne may not be socially optimal in a second-best sense, which in turns means that the x^* that courts have chosen for Xavier may not be optimal in that sense, and so on. The model threatens to unravel, again, because of the slightest perturbation.

Moreover, given also the probabilistic nature of the harms in question—that is, fires in Xavier and Yvonne's case are not certain but merely possible—construction of purportedly optimal standards is made even more difficult. As Shavell notes, the economic models in question are meant specifically to address probabilistic harms.⁸² But this means that x^* and y^* may change slightly as a result of new information that comes to light; for instance, if the likelihood of a train-related fire for the next year is estimated to be 1 in 200,000 on March 22, the likelihood may go down to 1 in 240,000 as the result of greater-than-expected ambient humidity (which makes fires less likely) in late March. This kind of minor perturbation in probabilities would not pose a significant problem for a robust model, but given the kinds of

⁸⁰ This result is well understood in the economic literature. See, e.g., John E. Calfee & Richard Craswell, *Some Effects of Uncertainty on Compliance with Legal Standards*, 70 VA. L. REV. 965 (1984).

⁸¹ In other words, there is no reason to assume that Xavier will assume that the probability of Yvonne's compliance with her legal standard (y^*) is equal to 1. To elaborate the discussion in the text, consider that the formal economic model guarantees that Xavier's total cost when he chooses $x < x^*$ will be at least as great as his cost when he chooses $x = x^*$, because if the total social costs of accidents were lowest at a point smaller than x^* (given a constant y^*), then x^* itself ought to be lowered to that point. But nothing guarantees that Xavier's *expected* costs, in view of the probability of Yvonne's compliance with her legal standard y^* , are not lower when $x < x^*$. These expected costs are essentially a weighted average between x and $(x + p(x,y)a)$ when $x < x^*$ (weighted by Xavier's estimated probability of Yvonne's compliance), and such an average might be smaller than x^* .

Of course, if both parties assume the other will make calculations of this kind, the analysis becomes even more complicated. The particular expected results depend on a variety of case-specific features and cannot be derived in the abstract, and there is no reason to assume it will result in an efficient equilibrium in the general case.

This situation shares some features with a continuous iterated prisoner's dilemma. For an interesting analysis of that phenomenon from a biological perspective, see generally Stephen Le & Robert Boyd, *Evolutionary Dynamics of the Continuous Iterated Prisoner's Dilemma*, 245 J. THEORETICAL BIO. 258 (2007).

⁸² SHAVELL, *supra* note 37, at 177 ("We will assume that accidents and consequent liability arise probabilistically.").

fragility in the model that I have described, it is hard to be confident that a stable justification for purportedly efficient standards (that is, for specific values of x^* and y^*) will exist in many cases. If nothing else, the economic model's dependency on full knowledge of both parties' efficient precautions makes it less likely that either side's efficient precautions can be specified in any given case.

In short, while some idealizations—including economic ones—can serve as useful approximations of the world from which we can later veer, the bilateral-liability-threat model underlying modern economists' view of tort law is untenably fragile if its goal is to justify application of negligence standards to real cases. An idealization cannot justify specific policy propositions in law when the slightest change in information or behavior threatens chaotic results.⁸³ Far from explaining the central feature of Anglo-American tort law, the purported economic justification of the negligence standard provides very little justification for the rule in practice.

3. Alternative Formulations of the Economic Model

My observations and analysis in the prior section addressed a *continuous* version of the model—that is, one that allows precautions to vary to any possible levels, so that a level of precaution might be set to \$74.82, or \$100.64, and so on.⁸⁴ We might alternatively formulate the bilateral-liability-threat model as discrete rather than continuous, which is to say that we might imagine (say) four particular on-or-off precautions that the parties might take. For instance, in a particular situation, we might observe that Xavier has a choice of two spark arresters, one that costs \$80 and reduces the likelihood of fires by fifty percent, and one that costs \$240 and reduces the likelihood of fires by ninety percent. If these are Xavier's

⁸³ I mean “chaotic” in both a lay sense and a technical sense. For more information on chaos theory, which characterizes (among other things) the way in which small changes in the inputs to a system can cause wild swings in its output, see Robert Bishop, *Chaos*, in STANFORD ENCYCLOPEDIA OF PHILOSOPHY (2008), available at <http://plato.stanford.edu/entries/chaos/>.

⁸⁴ Strictly speaking, dollar values are not in practice continuous because they do not extend beyond two decimal places (to cover cents). But because the value of a cent is so small, familiar statements of value in dollars and cents are for most practical purposes better treated as continuous rather than discrete.

only choices, his precaution is said to be *discrete* (or *discontinuous*) rather than *continuous*.⁸⁵

Shavell's most recent statement of the purported economic basis of tort law is framed in largely discrete terms. For instance, though his argument tracks the one I have already laid out, and though it is formalized in the same way,⁸⁶ his particular example involves three possible levels of precaution: "none," "moderate," and "high."⁸⁷

The reason that the difference between discrete and continuous models may be important here is that discreteness, versus continuousness, may save a model from its own fragility. In other words, if Xavier has only three levels of precaution available to him, then minor perturbations in probabilities as he understands them, or in his expectations of Yvonne's conduct, are less likely to be significant enough to cause him to change from an efficient option to a distinct, inefficient one.

While it is possible that the discreteness of available precautions will allow an efficient equilibrium to converge in some cases, there are several reasons that the flaws of the continuous model may still apply in practice to many cases. The world ordinarily offers many options, rather than just two or three. Drivers setting air-conditioning levels in their cars might have only a few levels to choose from (off, low, high, and so on), but in choosing the speed of their cars they face possibilities that are continuous rather than discrete. Pedestrians have enough options in choosing their speed, location, and how often they look at traffic for us to imagine, plausibly, that they face essentially a continuous range of choices about the amount of precaution they take. Railroaders usually won't have only a simple option of spark arresters, but an array of choices in both the *kind* of precautions they choose (spark arresters versus alternative track design versus alternative track location) and the *level* of the precautions they choose (perhaps facing a menu of eighty different spark arresters they might purchase from a variety of suppliers). The same is true of many other decisions, like what kind of

⁸⁵ Cf. COOTER & ULEN, *supra* note 1, at 247 ("Notice that buckling a seat belt is a discontinuous choice (yes-no). For discontinuous precaution, the relative efficiency of different rules depends upon particular facts.").

⁸⁶ See SHAVELL, *supra* note 37, at 179.

⁸⁷ *Id.*

seatbelts an automobile manufacturer should install, what sort of fence to use to surround a swimming pool, and so forth.

In any event, as the legal economists recognize, the success or failure of the formal economic model at stake here depends on the adequacy of the continuous model, rather than a discrete analogue of it, because it is the continuous model that expresses in a general form the conclusions that result from formal proof. As Cooter and Ulen write, “In general, discontinuous variables and cost functions yield messy results about optima, whereas continuous variables and cost functions yield clean results. It is usually best to build theory from clean results and then handle any messy results as exceptions.”⁸⁸ If the bilateral-liability-threat model depends on “messy results” in specific cases, that would, if nothing else, sharply limit its force as a general explanation of tort law’s negligence standard.

C. *The Limits of Activity Levels*

The other pillar of the modern economic analysis of tort law is the view that residual liability—that is, decisions about whether the injurer or the victim should bear the costs of accidents when both have behaved innocently (nonnegligently)—should be determined based on an analysis of activity levels. Specifically, the leading economists’ argument is that residual liability should depend either on “[w]hether injurers’ levels of activity are more important to control than victims”⁸⁹ or on which party’s “activity level most affects accidents.”⁹⁰

The problem with this view is that, while an understanding of activity levels sheds significant insight into the formal economic analysis of tort law, it ordinarily cannot serve as a basis for decisions in real cases. There are several reasons for this; they involve problems related to administrability and to a limitation in the analysis’s scope that makes it difficult for present economic models to promote efficient incentives, even for rational parties.

⁸⁸ COOTER & ULEN, *supra* note 1.

⁸⁹ SHAVELL, *supra* note 37, at 202.

⁹⁰ COOTER & ULEN, *supra* note 1, at 349.

1. Problems of Administrability

At the outset, it is important to consider whether economists have even attempted to offer a clear operational role for activity levels in determining tort rules. Consider, for example, Shavell's most recent explanation of how activity levels should matter in tort law:

Whether injurers' levels of activity are more important to control than victims' will depend on the context. As discussed before, when an activity of injurers (walking dogs of a vicious breed) creates substantial risks despite their exercise of due care, the activity will be desirable to control. This point is not fundamentally altered if account is taken of the activities of victims that expose them to risk. Especially if the victims' activities are just the activities of ordinary life (walking about, going to work), we would not want the activities constrained in favor of injurers' more dangerous activities. Conversely, when an activity of injurers (playing baseball) is not very dangerous if appropriate care is taken, the importance of controlling the activity will not be great; instead, we may see some advantage in reducing certain activities of victims that subject them to particular risks (such as pushing a baby in a stroller across a baseball field while a game is in progress).⁹¹

Though motivated primarily by efficiency, this formulation seems essentially noneconomic in nature, as if economic analysis has led us to a point where other considerations ought to reign, or where the costs and benefits are too complicated for present-day economics to study. If this is the case, there is little more to say except to note my agreement, for my goal here is to show that formal economics is insufficient on its own to determine optimal legal rules.

To say this differently, Shavell's explanation, read broadly, is a sensitive balancing test—so sensitive that it appears to allow essentially noneconomic considerations, or at least considerations very hard to quantify through narrow economic analysis, to influence tort rules. It is not clear, ultimately, that Shavell disagrees with me that formal economic analysis on this point is not especially helpful.

The formulation in Cooter and Ulen's textbook, though more specific, appears to be incomplete, at least on a narrow reading. They describe the role of activity levels as follows:

Usually one party's activity level affects accidents more than the other party's activity level. Efficiency requires choosing a liability

⁹¹ SHAVELL, *supra* note 37, at 202-03.

rule so that the party whose activity level most affects accidents bears the residual costs of accidental harm.⁹²

But, of course, looking only at which party's activity level more directly causes *accidents* violates the general economic observation that the law needs to be sensitive not just to costs of activities but to their benefits. Extra driving might indeed affect the level of accidents more than extra pedestrian activity on sidewalks, but it is at least possible that the benefit drivers get from extra driving is worth this extra cost. On economic terms alone, Cooter and Ulen's conclusion should likely be read more broadly and interpreted to assign liability in ways that reduce the total costs of precaution (including limited activity) plus the total expected costs of accidents. In other words, it is not the party whose activity most increases the likelihood of accidents that needs to bear residual liability, but the party who can restrict activity in ways that reduce social costs optimally.

Even on this broader reading of Cooter and Ulen's (and perhaps Shavell's) conclusion, however, activity-levels arguments would face serious problems as soon as courts or other parties tried to apply them. As I noted when introducing activity levels,⁹³ there is in principle little difference between choices about levels of care and choices about levels of activity, except that courts judge the former but tend not to judge the latter. But there are several reasons, in fact, that it makes sense for courts to avoid making judgments related to activity levels, and these reasons apply regardless of whether it is courts or other policymakers (or commentators) who set or defend particular legal rules.

To begin with, as Shavell's formulation of the role of activity levels seems to recognize,⁹⁴ there are many cases in which *more activity* does not lead to *more accidents*, as long as the activity is conducted safely. Does more walking on the sidewalk necessarily lead to more accidents between cars and pedestrians, assuming the pedestrians are all safe? It seems unlikely: safe pedestrians keep to the sidewalk (and crosswalks), look for oncoming traffic, and in general don't get hit by cars unless those cars veer off the road. Now, it is

⁹² COOTER & ULEN, *supra* note 1, at 349.

⁹³ See *supra* Part II.A.3.

⁹⁴ SHAVELL, *supra* note 37, at 203 (referring to activity that "is not very dangerous if appropriate care is taken").

possible that increased pedestrian activity increases the likelihood that people will get hit by cars, even if the pedestrians are careful, because there might be some cases in which cars veer onto sidewalks but avoid accidents only because those sidewalks were empty. In other words, there might be cases in which empty sidewalks result in harmless veering by cars, whereas full sidewalks result in serious accidents. But in practice, this situation is vague and unlikely to matter: there is enough physical space in the world, and on most sidewalks, that it seems implausible that there is even a measurable increase in the likelihood of an accident between a car and a pedestrian just because there are more pedestrians on the sidewalk.

Many cases are like this on both sides. Despite frequent assumptions that faultless accidents are commonplace, it is not, in fact, even clear that many car accidents result from mere activity, when the activity is safe. Ordinarily in a car accident there is some culprit, perhaps unidentified, who was at least careless: machinery fails because of a defect, a driver was driving unsafely given road conditions, a tire was under- or over-inflated, or something else was done incorrectly. Perhaps some car accidents are truly unavoidable even when everyone involved has behaved reasonably safely, but it is not clear that there are many such accidents or that the possibility of such accidents should dictate tort policy.

A separate problem is that the force of activity-levels arguments depends in part on the proposition that parties expect to be able to avoid liability when they act safely. But in many cases, this proposition assumes too much: many people who engage in potentially dangerous activities do not *know* that they are able to maintain a high level of safety, and in fact many know otherwise. For example, drivers cannot ensure that they are not going to be careless.⁹⁵ If nothing else, people's general knowledge that they cannot avoid carelessness mitigates the force of activity-levels arguments.

But perhaps the most significant problem applying activity levels to real tort cases is that reasoning in view of activity levels requires classificatory judgments that are nearly impossible to make in a principled fashion. For one thing, there

⁹⁵ See Mark Grady, *Res Ipsa Loquitur and Compliance Error*, 142 U. PA. L. REV. 887, 900 (1994) ("It is impossible to drive a car for any period of time without missing a required precaution."); see also MARC FRANKLIN ET AL., TORT LAW & ALTERNATIVES 46 (8th ed. 2006) (discussing Grady's article).

are many situations in which injurers and victims are similarly situated, or in fact engaged in the same activity (or an activity that might as well be the same). For instance, what would an understanding of activity levels suggest for accidents between two automobiles? Both drivers chose to drive. What about for airplane crashes, as between the airline and its passengers? Both the airline and the airplane passengers chose to take the particular flight that crashed.⁹⁶

Even when parties are situated differently in noticeable ways, there is generally not a principled economic method to determine whose activity level makes more of a difference (including both its costs and its benefits) and thus is more worth regulating. What of accidents between cars and pedestrians, where both were behaving safely? If such cases indeed occur frequently enough to worry about, whose activity makes more of a difference, accounting for both costs and benefits, and responds better to incentives? On what basis could a court decide?

Even Shavell's examples of supposedly clearer cases raise many of these problems. When considering "walking dogs of a vicious breed," for example, it is important to ask whether this activity really is dangerous "despite [the] exercise of due care."⁹⁷ And, though pushing a baby in a stroller through the middle of a baseball game is obviously an activity that should be minimized (and indeed not one that would appear to reflect the exercise of due care in a way that even triggers activity-levels arguments, because the activity can be judged unsafe on its own), what should we do about baseball stadiums and the people who live (or build houses) behind them, such that baseballs might break their windows? The levels of activity of both injurers and victims in cases like this appear to be symmetric, and recognizing activity levels does not break the symmetry.

Dynamite cases, and other activities where "a commercial actor has come to the type of location where [some] sort of dangerous thing is not normally done,"⁹⁸ reflect perhaps the strongest case for activity-levels arguments, in view of the

⁹⁶ See, e.g., Robert Cooter & Ariel Porat, *Liability Externalities and Mandatory Choices: Should Doctors Pay Less?*, 1 J. TORT L. (2006), available at <http://www.bepress.com/jtl/vol1/iss1/art2> (observing the same thing, in a related context, about doctors and patients).

⁹⁷ SHAVELL, *supra* note 37, at 203.

⁹⁸ Stephen D. Sugarman, *Rethinking Tort Doctrine: Visions of a Restatement (Fourth) of Torts*, 50 UCLA L. REV. 585, 608 (2002).

administrative problems I have just discussed. In these cases, there is perhaps a clear social understanding that an accident can be attributed to the level of one party's, rather than another party's, activities. Still, even these cases involve something of a noneconomic value judgment. For one thing, in theory, victims can still choose where to live in a way that minimizes the costs to them of activities like dynamite blasting, and the proper comparison of costs and benefits, on their own, seems hard to derive without empirical data. What seems to matter in cases of abnormally dangerous activities is that one party did something unexpected or unusual, *changing* a baseline level of activity that was occurring in an area and thereby violating social expectations.⁹⁹ But an analysis that depends on considerations like that is at least somewhat broader than a formal economic one.

2. Problems of Efficiency: Allocative Versus Redistributive Negligence

Even if activity levels could serve as a principled and administrable basis for assigning residual liability, there are powerful reasons that we probably would not want it to—at least without a kind of economic analysis that has not yet been done. This is because the economic study of torts has limited its focus¹⁰⁰ to the optimization of allocative efficiency through incentives for injurers and victims to take precaution. In doing so, it has neglected broader effects of tort rules on social costs.

Consider the ordinary case of what I call *allocative negligence*—that is, negligence that directly creates an allocative inefficiency, in terms of the costs of precaution and the costs of accidents. For example, suppose Xavier has the opportunity to install \$80 spark arresters to prevent \$4000 accidents, and he chooses not to do so. If the law supported his choice, there can be a clear misallocation of resources: spark arresters ought to be installed, but Xavier has no incentive to install them.¹⁰¹

⁹⁹ *See id.*

¹⁰⁰ *E.g.*, RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 69-70 (1st ed. 1972) (giving the classic allocative-efficiency argument for negligence rules).

¹⁰¹ Of course, in a world without transaction costs, Xavier and Yvonne might bargain over the installation of spark arresters. *See generally* Coase, *supra* note 15 (demonstrating that with no transaction costs, assignments of rights in nuisance law do not affect allocative efficiency).

But in casting problems this way, focusing on the particular relationship between injurers and victims, economic tort analysts often ignore a potential problem. I call this the problem of *redistributional negligence*—that is, distorted incentives (ultimately allocative in nature) that arise from tort regimes that give some parties the opportunity to engage in activity that is largely or even primarily redistributive. Of course, such opportunities for opportunistic redistribution may also be unfair, but for the purposes of this Article I need only criticize them on economic grounds, and on those grounds the problem is as follows: the opportunity to externalize costs can lead to incentives to engage in activity that is productive but also redistributive.

To say this somewhat differently, selfish rational actors who can choose between a variety of productive activities will not choose the one that is socially most productive. Instead, they will choose the one that earns *them* the most. However, some activities are more profitable to actors because they externalize costs onto others, not because they are more productive overall. With sufficient capacity to redistribute wealth through externalities, sanctioned by law, activities can function as capitalistic black holes, drawing in resources and effort even if they would be more productively applied elsewhere.

For example, return to the example of Xavier and Yvonne. It is common to see this kind of two-party example in economic analyses of tort law. But consider the following variation of the situation, which both (1) makes particular costs and benefits clear and (2) looks beyond the two activities in question (railroading and cornfield growing).

Xavier has recently graduated from business school. He has little chance to obtain credit, but he has an inheritance that he can use to invest in the business of his choice. His skills and experience make two choices salient: he can set up either a railroad company or a hotel. Both choices would consume his entire inheritance and require his full-time attention. Given all the costs and benefits associated with the opportunity to set up a hotel, Xavier's calculation of the expected value¹⁰² from that

¹⁰² Ordinarily, particularly as a business-school graduate, Xavier would engage in a net-present-value calculation that would consider the lifetime of the opportunity, the discount rate of income streams over that lifetime, and similar considerations. I put aside those details to keep the discussion in the text simple; they have no bearing on questions relevant to my discussion.

opportunity is \$20,000.¹⁰³ To compute the expected value of the railroading opportunity, Xavier considers the following information he has learned: running the railroad would be worth \$40,000 to him, but the expected costs of fires from the railroad to Yvonne's adjacent cornfields are \$37,000. Accordingly, the railroading opportunity is worth only \$3000 to Xavier if tort law makes him liable for these fires; if not, the opportunity is worth \$40,000. Thus, given the figures in this example, the tort regime directly influences Xavier's decision between his two business opportunities. Under a strict-liability regime, Xavier will choose the hotel, because the railroad—though profitable—has a large part of its value set to pay for the harms it causes. Under a negligence regime, however, Xavier can ignore these harms, because his \$40,000 value exceeds the \$37,000 cost to the cornfield and is thus deemed “reasonable.”¹⁰⁴ In that case, we expect that he will choose the railroad over the hotel, even though it is less socially valuable, because it gives him an opportunity to redistribute more wealth to himself through the externalities he causes.¹⁰⁵

An analysis of activities limited to whether a railroader or a corn grower's activity “most affects accidents”¹⁰⁶ (or similar formulations) as between those two parties misses an important feature of the situation in our example: from the perspective of allocative efficiency, assuming we have a choice between railroading and no railroading, we *want* railroading. It creates more value than the fires it causes. But we may want other things *more*, and if capital and other resources are limited, we want a tort system that discourages relevant parties from making decisions based on how much of other people's wealth they can redistribute to themselves by externalizing costs onto others.¹⁰⁷

¹⁰³ We can take this as an opaque figure, although it would be possible to specify details about the costs and benefits of the hotel opportunity and to assess the liabilities that Xavier could face as the owner-operator of a hotel. For the purposes of the example, however, I assume (just for simplicity) that the hotel gives rise to no significant liability or cost externalization, whereas the railroad does. This assumption does not change the force of the argument in the text.

¹⁰⁴ Assuming, again, that he is strictly rational and selfish, does not fear negative publicity, and so on.

¹⁰⁵ Cooter and Porat call this situation a “liability externality,” and agree generally that legal rules “should discourage activities with negative liability externalities.” Cooter & Porat, *supra* note 96, at 1 (emphasis omitted).

¹⁰⁶ COOTER & ULEN, *supra* note 1, at 349.

¹⁰⁷ To say this differently, economists who promote negligence rules for reasons only of narrow microeconomic conceptions of allocative efficiency would subject tort victims to Nozick's “utility monsters,” who derive so much value from some

Of course, if every wealth-producing business opportunity can be pursued—for instance, if capital markets are perfectly efficient and other significant transaction costs are minimal—then we may not care whether Xavier becomes a hotel operator or a railroad operator. In a world with no transaction costs and unlimited resources, whichever opportunity he forgoes (with its attendant wealth-producing and externalizing effects) will be taken up by someone else anyway. But as long as resources are not infinite and there are significant inefficiencies in the ability to nimbly pursue new business opportunities (because of resource limitations, borrowing costs, capital-market inefficiencies, and so on), social efficiency requires such opportunities to be priced as correctly as possible. To say this differently, it is not enough to say that we want to limit activities to levels at which they are still wealth-producing; it may also be vital to overall allocative efficiency for activities to be appropriately priced.

Note that this recognition, alone, doesn't solve the central problem that faces tort law, because it does not specify precisely what it means for activities to be priced appropriately. As commentators have long recognized,¹⁰⁸ there is a symmetry between injurers and victims: strict liability for railroaders, though it prevents railroaders from engaging in redistributive, cost-externalizing activity, might mean that corn growers have too much of an incentive to engage in corn growing, compared to other activities. But for tort law's solutions to this problem to be efficient, they cannot conceptualistically restrict their scope to the costs of accidents and precautions; they need instead to face all social costs and benefits squarely.

To summarize, analysis *internal* to a particular activity, or to the interaction between one activity and another, may well be insufficient to decide even the efficiency (much less the broader social appropriateness) of tort regimes that govern that activity. It may well be necessary to look at the "entire tableau"¹⁰⁹ (to borrow Shavell's phrase) of social costs and

activities that others must suffer in order to satisfy their appetites. See ROBERT NOZICK, ANARCHY, STATE, AND UTOPIA 41 (1974). If utility monsters are rewarded, however, then an allocatively inefficient result more broadly obtains: there is too much incentive to become like them, and not enough to engage in other activity.

¹⁰⁸ See, e.g., POSNER, *supra* note 30, at 138-40 (making the point, among others, that strict liability gives injurers but not victims efficient incentives to research new precautions, and vice versa).

¹⁰⁹ SHAVELL, *supra* note 37, at 188 n.17.

benefits—not just for the individual activities in question but for those activities as compared with other activities—in order to decide who should pay for which costs. Each activity, and its costs and benefits, are only part of a broader economic landscape.

Of course, Shavell is ultimately right—if we interpret him broadly enough—that our focus in deciding between strict liability and negligence depends on which activity is “more important to control.”¹¹⁰ But there is no reason to suppose that the question can be decided by the kind of activity-levels arguments that economists have marshaled so far. Instead, deciding between strict liability and negligence seems to demand a significantly broader judgment about which activities should bear the costs of accidents and which should not. Abstract and formal methodologies, unsurprisingly, have little aid to offer those seeking to make that kind of judgment. In any event, it would be a mistake—even on grounds of efficiency alone—to focus only on incentives to take precautions in deciding questions of tort liability, because the prices of activities can have broader incentive effects in society.

D. *Precautions and Activity Levels*

The Hand Formula itself occasionally suffers from classificatory problems similar to those faced by activity-levels arguments.¹¹¹ These are best conceived as problems of time-framing, though I mean something different by this than many other discussions of time-framing in this context.¹¹²

To see these problems, consider again the example of Xavier and Yvonne, the railroader and the cornfield owner. In this example, which we borrowed from Cooter, Xavier was said to have three precautions available to him: installing spark arresters, running trains more slowly, and running fewer trains.

Running fewer trains sounds like an activity-levels concern, in that it would be hard to judge from a single instance whether Xavier had run inefficiently many trains.

¹¹⁰ *Id.* at 202.

¹¹¹ See *supra* text accompanying notes 95-100.

¹¹² Cf. Douglas Husak & Brian P. McLaughlin, *Time-Frames, Voluntary Acts, and Strict Liability*, 12 LAW & PHIL. 95, 96 (1993) (discussing “time-framing” problems raised by Mark Kelman and Larry Alexander that concern how individual acts are to be judged).

Consider, for instance, an accident that occurs on May 13, 2006, at 12:10 a.m. It makes little sense to ask whether Xavier was running too many trains at that particular point in time; the question is not “What should Xavier have done at time *T*, the moment the accident occurred?” because the decision to run more or fewer trains goes beyond that particular time. More precisely, there are multiple time intervals that include time *T*, and there is no clear way to choose among them. What does it mean to say that Xavier should have run fewer trains? Fewer trains on May 13, 2006? In May 2006? In all of 2006 up to that point? Or over a broader period? What if Xavier had planned to run fewer trains later in the year, after the fateful accident happened (unfortunately) to arise? Could he convince a court that this plan was genuine, or would he have an inefficient incentive under an economically informed negligence rule to reschedule his trains evenly throughout the year (even if this weren’t otherwise optimal) in order to be confident that he could demonstrate that he ran fewer trains? Because courts cannot easily answer these questions, running trains is classified as an activity-levels problem, not as one about which courts can judge care or precaution directly.¹¹³

Unfortunately for tests like the Hand Formula, however, the same kind of reasoning applies to questions that are not so readily seen as activity-levels problems. For instance, what does it mean that on May 13, 2006, Xavier didn’t use spark arresters on his trains? Perhaps he had decided that, given the expected wear on spark arresters and the expected cost of fires, it was optimal to use them some but not all of the time.¹¹⁴ Over what period are we to evaluate that question? In some sense, every question about precaution under the Hand Formula can be reframed as a potentially intractable activity-levels problem.¹¹⁵

¹¹³ Cf. *supra* Part II.A.3. Note that decisions about activity levels suffer from a similar problem: in addressing which party’s activity more directly affected accidents, or whatever else, questions of time framing may be decisive.

¹¹⁴ Cf. Grady, *supra* note 95 (distinguishing the adoption of standards of precaution with *compliance* to those standards, and observing that “[i]n most activities, courts require perfect compliance; in others they do not”).

¹¹⁵ Shavell admits that there are other, somewhat similar concerns about the Hand Formula. For instance, “there may be dimensions of injurers’ care (such as the frequency with which drivers look in their rearview mirrors) that courts would not take into account in the determination of negligence because of difficulties in assessing them.” SHAVELL, *supra* note 37, at 189.

III. CONCLUSION

Perhaps surprisingly, then, we reach the conclusion that the prominent economic models still struggle fundamentally with the most basic question in tort law: when should there be liability? Far from having easily succumbed to formal economic analysis, tort law has firmly resisted simple or reductive explanations.

That said, my goal here has not been to minimize the insights of economists or to suggest that they be ignored. Indeed, law-and-economics scholars have successfully explained why the negligence standard is a *minimal* standard of liability. That is, liability must ordinarily be awarded *at least* in those cases where it would be inefficient, from the perspective of allocative efficiency, *not* to do so. I have called these cases of negligence, where precautions are clearly cheaper than the expected costs of the accidents they are designed to prevent, cases of *allocative negligence*, and economic analysis has indeed helped illuminate questions related to these cases.

Of course, such cases have not been especially controversial. The fundamental questions concerning negligence rules in tort law are whether they are better or worse than greater standards, not lesser ones. Perhaps the most basic question in tort law is whether behavior ought to be governed by rules of negligence, rules of strict liability, or perhaps something roughly in between. Economic analysis has helped characterize this question, but on its own, it does not provide an answer.

There are several reasons formal economic analysis of negligence rules is insufficient, even for commentators who believe that concerns about efficiency are paramount. For one thing, the prevailing formal defense of the efficiency of negligence standards—what I have called the bilateral-liability-threat argument—rests on a fragile economic model that breaks down rapidly, rather than degrading gracefully, as soon as assumptions are recognized to be slightly imperfect. It is one thing for a model to approximate the real world rather than purport to describe it perfectly. But the bilateral-liability-threat model threatens to unravel, in the general case, upon slight modifications to its assumptions.

The other pillar of the modern economic analysis of tort law is an understanding of activity levels, but arguments based on this understanding have limited force for courts and other

policymakers. The chief reason is that rules based on activity levels ordinarily cannot be applied to real cases; there are problems of framing, classification, information, and relevance that undermine attempts to put the theoretical understanding into practice, even if actors were rational and selfish and other classic assumptions of law-and-economics commentators were true. Moreover, the scope of activity-levels arguments, and perhaps of much economic analysis of tort law generally, has been too narrow. It has limited itself to only a few kinds of costs and benefits. As a result, the analysis is in danger of ignoring the problem that I have called *redistributional negligence*, where activity, although allocatively desirable, is priced incorrectly because of socially inefficient tort rules that nonetheless comport with leading economic models.¹¹⁶

¹¹⁶ This incorrect pricing helps explain, at least broadly, several other kinds of efficiency-related problems that others have observed. *See, e.g.*, David Gilo & Ehud Guttel, *Negligence and Insufficient Activity: The Missing Paradigm in Torts*, 108 MICH. L. REV. 277 (2009) (arguing that negligence standards might not lead only to *too much* safe activity, as traditional activity-levels analysis suggests, but also to *too little* safe activity). It should not be surprising that such problems exist under the prevailing economic models.