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TORT DAMAGES

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Abstract

This chapter surveys the literature on tort damages, including damages for serious physical injury and death. Section A presents the basic analysis of tort damages for injuries to replaceable commodities, focusing on the relationship between liability rules and optimal damage rules. Section B discusses damages for physical injury and death, examining, among other issues, the deterrence and insurance values of life. Section C examines special topics, such as optimal liability when corporations are defendants, whether recovery should depend on defendants' wealth, economic and nonpecuniary losses, and the calculation of damages. An exhaustive bibliography is attached at the end.

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1. Introduction

Efficient damages awards are critical to the optimal functioning of the tort system. A rich literature now exists on the subject of efficient damage awards. This analysis has shown that no one damage rule is optimal in every situation, and that, contrary to common wisdom, damage awards need not necessarily fully compensate victims. Rather, the optimal damage award depends on: (1) the nature of the injury (harm to replaceable versus irreplaceable commodities); (2) the relationship of the parties and type of risk (unilateral, bilateral or market risks); (3) the liability rule (strict liability or negligence); (4) whether liability is individual or vicarious and (5) any existing imperfections, such as information costs, uncertainty, and judgment-proof problems. This analysis reveals that current rules governing recovery for replaceable losses may be optimal, but those governing recovery for death and physical injury generally are not.

A. Replaceable Goods: Basic Analysis

This section considers efficient tort damages for purely replaceable commodities. A commodity is replaceable if its owner believes that equivalent commodities are available on the market (Cook and Graham, 1977, pp. 144-146). A person can be fully compensated for the loss of a replaceable commodity if he is paid the market price of the good since he can use this money to buy a perfect substitute. Items such as cars, clothing and money generally are replaceable.

2. Efficiency Criteria and Initial Endowments

Although the essential goal of economics is to maximize social welfare, law and economics scholars employ a number of different efficiency criteria to determine when this goal is satisfied. Some employ the Pareto criterion: a state of the world is Pareto efficient if no one's utility can be increased without decreasing someone else's utility. Others employ social utility maximization: under this criterion a tort rule is efficient if it maximizes the total utility of society, even if some people are made worse off by the change. Finally, others employ the Kaldor-Hicks criterion under which a change is an improvement if those who benefit from the change *could* compensate the losers monetarily for their losses and still come out ahead. A state of the world is Kaldor-Hicks efficient when there is no way to increase anyone's utility in such a way that the winners could compensate the losers.

Under any efficiency criterion, tort liability must minimize the joint costs of accidents and accident prevention. This in turn implies that tort liability and damage rules must induce optimal care-taking (defined as the efforts individuals undertake to avoid an accident given that they are engaged in the risky activity) and induce optimal activity levels (defined as the frequency with which individuals engage in the risky activity). In addition, a tort regime should induce optimal risk-spreading by any risk-averse parties by ensuring that they are optimally insured against risk, either through the insurance system or the tort system, whichever is most effective.

The Pareto criterion imposes an additional requirement: to be Pareto efficient injurers' risk-taking must make no one worse off than they would be otherwise, in the status quo ante. This requires that damage awards ensure that potential victims are left no worse off than they would have been 'otherwise'. What that status quo ante is depends on the initial allocation of entitlements (see discussion below).

3. Optimal Deterrence Damages Under Strict Liability

Under the traditional economic model of accidents, the efficient tort damage rule for injury to replaceable commodities is simple: fully compensate victims for their losses. Specifically, victims should be awarded the market price of the good destroyed.

Under a strict liability regime, this damage rule will optimally deter wrongdoing, ensure efficient risk-spreading by victims, and - depending on the liability rule and initial endowments - may satisfy the requirements for Pareto efficiency that no one be left no worse off than he would be otherwise. Risk averse injurers will not optimally spread their risk, however, unless they are able to purchase first-party insurance (Shavell, 1980, 1987).

In the standard economic model of accidents, injurers impose risk on victims who are 'strangers' to them (that is, not in a market relationship with them) (Brown, 1973). The injurer can reduce the risk imposed on the victim both by taking 'care' in the manner in which he undertakes his activity and also by controlling the frequency with which he engages in the risky activity (Shavell, 1980). For simplicity, this section will assume that all parties are risk neutral (see Section 6, discussing risk-spreading). Initially, we will take the social goal to be maximizing total social welfare which is the benefit of the injurers' activity minus total accident costs (defined as cost of care plus expected accident losses). Injurers' behaviour is efficient when they employ the level of care and engage in the activity at the frequency that maximizes social welfare (Shavell, 1987, p. 21).

Consider now what damage rule induces optimal deterrence when injurers are held strictly liable for any harms they cause. Under a strict liability rule, injurers will take the level of care that minimizes the joint social costs of care-taking and accidents if the expected cost to them of risk-taking - for example, their expected liability - equals the cost to society of their risk-taking. This implies that damages should equal the cost to society of the accident, which implies victims shall recover their losses (Brown, 1973; Shavell, 1980). This damage rule also generally will induce injurers to engage in the optimal amount of the activity because the injurers' cost of engaging in another unit of the activity - the resulting increase in his expected liability - will equal the cost to society of his decision - the resulting increase in expected accident costs (Shavell, 1980). Yet this rule will not induce optimal activity levels if each injurer's probability of being in an accident depends on the number of people engaged in the activity. In this case, even under strict liability, injurers will over-engage in the activity because they will not take into account the effect of their actions on other injurers' probabilities of being in an accident (Hindley and Bishop, 1983, pp. 60-61).

When potential victims' care levels and activity levels affect expected accident costs, tort liability rules also must induce victims to take optimal care

and engage in the efficient amount of the activity. Strict liability with full compensation damage awards may undermine this effort, however. When victims are fully compensated for their injuries, a pure strict liability rule will not induce victims to take either efficient care or efficient activity levels because victims do not bear the cost of any injuries they suffer; thus they have no reason to spend resources to avoid the harm (Shavell, 1980). Victims will take due care, however, when strict liability is supplemented with the defense of contributory negligence, because in this situation victims bear the full cost of any failure to take due care. Nevertheless, they still will not engage in the efficient amount of the activity because a victim who has taken due care will be fully compensated for any injuries he suffers (Ibid.).

Under the Pareto criterion victims often must be fully compensated for their losses in order to ensure that the injurers' risk-taking leaves potential victims no worse off than they would be otherwise. If victims possess the initial entitlement to the property in question, then they must be fully compensated in order to ensure that they are not made any worse off (see Section 3 which discusses the entitlement issue).

4. Optimal Deterrence Damages Under Negligence Liability

Under a negligence rule, full *ex post* compensation of purely pecuniary losses is an optimal damage rule, although it is not the minimum optimal rule. Full compensation for property losses will induce injurers to take optimal care under a negligence rule, provided courts correctly set the standard of care (Brown, 1973; Shavell, 1980). However, a lesser award also may suffice. Cooter has shown that negligence liability can induce injurers to take due care using less-than-full-compensation damage awards because an injurer's expected liability increases dramatically from zero to the expected damage award if he reduces his care-taking from due care to less than due care. This dramatic increase provides a strong incentive to take due care (Cooter, 1984). This result does not hold, however, if the application of 'but for' causation effectively eliminates the discontinuity in the injurer's expected liability function. In this case, injurers will not take due care unless damages fully compensate victims (Grady, 1983; Kahan, 1989). In all events, under a perfectly functioning negligence rule, injurers will take due care if damages fully compensated victims forcing injurers to bear the full costs of their risk-taking (Shavell, 1980; Cooter, 1984). Negligence liability will not induce injurers to engage in efficient activity levels, however, because non-negligent injurers are not liable and thus do not bear the social costs of their activity level choices. Their activity levels therefore will be too high (Shavell, 1980).

Negligence liability will induce victims to take efficient care and engage in efficient activity levels, however. Under this regime, injurers will take due care and thus will not be liable for the risks they impose. Victims, therefore, will bear the full cost of their injuries and will have the requisite incentive to take due care and reduce their activities to the optimal level (Shavell, 1980).

Negligence liability thus will optimally deter to the extent it can, when damage awards fully compensate victims for their losses. Yet the question remains whether this regime is Pareto efficient. Whether this regime satisfies the Pareto criterion depends on the initial allocation of entitlements. Negligence liability implicitly grants to the injurer the right to impose reasonable risks on the victim, yet entitles the victim to freedom from harms from unreasonable risks. When this describes the victim's initial endowment, then forcing injurers to fully compensate victims for injuries resulting from unreasonable risks satisfies the requirement for Pareto efficiency that victims be no worse off than they would be in the status quo ante. Negligence liability is not Pareto efficient, however, if the victim's initial endowment is to be free from any risk of harm created by the injurer. In this situation, victims are made worse off by a rule that allows injurers to impose reasonable risks on victims without compensating them and only forces injurers to fully compensate victims for any unreasonable risks they impose (Arlen, 1985; see Calabresi and Melamed, 1972, discussing the intersection of entitlements and liability rules).

5. Comparison with Existing Law

The preceding analysis suggests that in the case of injury to replaceable commodities, damage awards generally should fully compensate victims for their losses. Thus tort law should force injurers to pay for any damage they cause. This implies that the 'thin skull plaintiff rule' - which holds injurers liable for a victim's injuries even if the victim is unusually sensitive - is efficient because it forces the injurer to take into account all expected costs of his care-taking and activity levels. By contrast, the use of the proximate cause doctrine to eliminate liability for foreseeable but excessive losses is not efficient (Shavell, 1987, pp. 128-131).

To induce efficient behavior, however, 'full compensation' should be based on the optimal loss caused by the injurer. After an accident occurs victims often can take steps to mitigate the harm - for example, by seeking medical treatment for an injury. To encourage optimal mitigation, victims' recovery should be limited to optimally mitigated losses plus mitigation costs (Shavell, 1987, pp. 144-146; Wittman, 1981). Recovery also should be reduced - or set off - by those amounts the victim would have spent anyway had the loss not occurred (Shavell, 1987, p. 140).

6. Efficient Risk Spreading

The preceding analysis assumes that injurers and victims are risk neutral - that they care only about the *expected* value of losses and not their magnitude. This assumption may accurately describes many corporations. Thus, injurers in products liability cases may be risk neutral (but see Arlen, 1992b, pp. 419-420, discussing when corporations should be treated as being risk averse). Individuals, however, generally are risk averse: most individuals would prefer the certain loss of \$10 to a 10 percent chance of losing \$100, even though the expected value of these losses is the same. A risk-averse individual facing a potential loss, thus, would be better off if he could purchase actuarially fair insurance that fully compensates him for the loss (see generally Shavell, 1987, Ch. 8).

6.1 Insurance is Available

If both injurers and victims are risk averse and both parties can buy actuarially fair first- and third-party insurance, then people will optimally spread risk by purchasing insurance; tort liability rules need only be concerned with optimal deterrence (Shavell, 1987, pp. 210-212). Indeed, in this situation tort liability probably should not be used as an insurance mechanism: the administrative costs of tort liability far exceed the administrative costs of either first- or third-party insurance (Weiler, 1993b, pp. 926-927). Tort liability should be imposed to optimally deter risk-taking, however. In this situation, full compensation damages are optimal. This conclusion holds even if there is moral hazard in the sale of liability insurance because insurers cannot observe the injurers' precautions (Shavell, 1982; Shavell, 1987, pp. 211-212).

6.2 Insurance is not Available

By contrast, if insurance is not available, then tort rules should not only induce optimal deterrence but also optimal risk-spreading by risk-averse parties. In the case of replaceable losses, the optimal amount of insurance is full compensation (Shavell, 1987, Ch. 8; see also Chapter 5700 on Insurance Regulation). Thus, victims' risk-spreading will be optimal if they are fully compensated for any losses they may suffer. This implies that a full compensation damage rule will ensure that victims optimally spread risks when the injurers' activity is governed by a rule of strict liability (Shavell, 1982; Shavell, 1987, pp. 210-227).

Victims' risk-spreading will not be optimal under a negligence regime, however, because a perfectly functioning negligence regime will induce injurers to take due care, in which case victims will not be compensated for their losses (Shavell, 1982; Shavell, 1987, pp. 210-227). If the regime does not function perfectly, however, and injurers are deemed to be negligent (for example, because of court error or principals' inability to induce their agents to take due

care), then a full compensation damage rule will induce efficient risk-spreading by victims (Shavell, 1982).

If insurance is not available and injurers also are risk averse, then the very damage and liability rules that yield efficient risk-spreading by victims will produce inefficient risk-spreading by injurers, and vice versa. Strict liability forces injurers to bear any injuries they cause; by contrast, under a negligence rule injurers' risk-spreading is efficient because they can avoid all losses by taking due care (Shavell, 1987, pp. 208-209).

Moreover, the presence of risk-averse injurers who cannot purchase insurance also alters optimal damage rules. To induce due care and optimal activity levels under a strict liability rule when injurers are risk averse and uninsured, injurers must be liable for an amount that is less than the victims' losses. This is because the injurer will view both the loss itself and the risk as a cost. Yet, if damage awards do not fully compensate victims, then victims' risk-spreading will not be optimal. A full compensation damage rule will induce injurers to take due care when they are subject to a negligence liability rule, however, because they can avoid all risk by taking due care. As previously explained, however, neither injurers' activity levels nor victims' risk-spreading will be optimal under such a regime (Shavell, 1982; Shavell, 1987, pp. 209-210).

7. Accidents in a Market Setting

When victims and injurers are in a consensual or market relationship and victims are fully informed about any risks imposed on them by injurers, market forces will ensure that injurers take optimal care and engage in the optimal level of the activity. This is because victims will treat the risk of harm as a cost of buying the product (or service), thus giving the potential injurer the incentive to minimize the joint cost of accident losses and his care-taking. Activity levels will be efficient because victims will only buy the commodity if the benefit to them exceeds the total cost, including expected accident costs (Polinsky, 1980; Shavell, 1980; Shavell, 1987, Ch. 3; Spence, 1977). In this situation, therefore, the only function for the tort system, if any, is to induce optimal risk-spreading in those situations where individuals cannot purchase insurance. As explained above, when it is appropriate to use the tort system to provide insurance to victims, then damages should fully compensate victims for their losses (see Epstein, 1985 and Chapter 5140 on Products Liability for a complete discussion of the use of the tort system to provide insurance to victims).

Victims are not necessarily fully informed about risks, however. If victims do not accurately estimate the risk of loss, then market forces alone may not induce optimal care-taking and activity levels (Spence, 1977; see A. Schwartz, 1988; Shavell, 1987, Ch. 3). Consumers may fail to accurately estimate risks

as a result of either imperfect information or cognitive 'imperfections' that cause people's attitudes towards risk to deviate from that predicted by expected utility theory. For example, evidence suggests that consumers are likely to underestimate hidden product risks; they also tend to underestimate known but large risks, such as the risk of dying of cancer, and risks that are substantially within the individual's control (Viscusi, 1991, pp. 64-65).

When consumers underestimate risks, injurers will take insufficient care and engage in too much of the activity, unless they are liable for the injuries they cause or unless the problem can be corrected with warranties (Polinsky and Rogerson, 1983; Shavell, 1980; Shavell, 1987, pp. 52-53; Spence, 1977; see Schwartz and Wilde, 1985). Producers will not necessarily respond to markets with imperfectly informed consumers by offering full warranties, and the availability of warranties will not necessarily induce optimal product quality (Cooper and Ross, 1985; Grossman, 1981; Polinsky and Rogerson, 1983; Salop, 1977; Schwartz and Wilde, 1985; see Priest, 1981).

Tort liability may be able to induce optimal care-taking and activity levels in those circumstances when market forces alone cannot do so. When consumers underestimate risks, injurers can be induced to take due care and engage in optimal activity levels if they are held strictly liable for consumers losses and subject to a full compensation damage rule. When injurers bear all expected accident costs, they will directly bear the full cost to society of their products. Thus, in their effort to minimize their own costs, they also will select the care levels that minimize social costs. Product prices thus will equal the social cost of producing the goods, provided product markets are competitive. Consumers, therefore, will purchase the optimal amount of the product, leading to optimal activity levels (Shavell, 1987, pp. 67-68; see Polinsky and Rogerson, 1983, modifying this conclusion when producers have market power). (For a more complete discussion of this topic, see Chapter 5140.)

Of course, consumers do not necessarily underestimate all risks. Indeed, evidence suggests consumers overestimate small but known risks that have received substantial publicity, as well as risks that are vivid or dramatic (such as the risk of dying in a plane crash) (Viscusi, 1991, pp. 64-65; see Arlen, 1998). In this situation, market focus may cause injurers to take excessive care and engage in too little of the activity. Tort liability will only exacerbate this problem (Viscusi, 1991, pp. 64-65; see Arlen, 1998; A. Schwartz, 1988).

8. Automobile Accidents and other Bilateral Risks

The preceding analysis assumes that individuals are either injurers and victims but not both - in other words that accidents result from 'unilateral risk' activities. Many common accidents, however, result from 'bilateral risk'

activities - situations where both potential parties to the accident risk being injured should an accident occur. For example, automobile collisions, the largest single source of tort cases, are bilateral risk accidents.

In the bilateral risk context, a full compensation damage award will induce optimal care-taking by both parties to the accident if the activity is governed by a duty-based liability rule: such as negligence (with or without contributory negligence) or strict liability with contributory negligence. Each party will take due care because he is best off taking due care whether or not the other takes due care (Arlen, 1990a, 1990b, 1992a, compare with Diamond, 1974, p. 117, concluding that pure negligence is not efficient).

In fact, duty-based liability rules can induce efficient care-taking employing a less-than-full-compensation damage rule. People will take efficient care provided that damage awards are sufficiently large that each is better off taking due care and getting the resulting reduction in liability than he is not taking due care and paying the additional cost. The damage award that induces efficient care-taking is less than the amount that fully compensates victims for their losses (Arlen, 1990a, 1990b, 1992a).

When people are risk averse, the three duty-based liability rules will not induce optimal risk-spreading, however, even when combined with a full compensation damage award. Under these regimes, each party will take due care. Thus, under negligence (with and without contributory negligence) each party will take due care and thus will bear his own losses. Accordingly, negligence is consistent with efficient risk spreading only if parties can purchase first-party insurance. Under strict liability with contributory negligence each party will take due care and thus will bear the other parties' losses but not his own. Thus this regime is consistent with efficient risk-spreading only if parties can purchase third-party insurance (Arlen, 1990b).

Regardless of the damage rule, however, pure strict liability will not induce efficient care-taking. To see why, assume both people suffer the same injury whenever an accident occurs. In this case, each person's expected damages equals his expected recovery. Thus, pure strict liability is equivalent to a no liability regime: neither is efficient because neither risk-imposer bears the cost to the other person of his risk-taking (Arlen, 1990a, 1990b, 1992a).

9. Factors Affecting Liability

Of course, even in the standard 'unilateral risk' case, determining the optimal damage award may be more complicated than it might at first appear. This part considers several factors that may affect the magnitude of liability, focusing on the traditional model of accidents in which parties to the accident are strangers and are either potential victims or injurers, but not both.

9.1 Litigation Costs

The standard analysis of tort law assumes that there are no litigation costs. Yet litigation costs are substantial. This raises the issue of whether damages should equal the victims' actual losses plus their litigation costs.

(a) *Pareto Criterion* Under the Pareto criterion, damage rules must include the victims' litigation costs because a damage rule that limits compensation to harm suffered without including the victims' litigation costs does not leave the victim no worse off than he would be otherwise, at least in those cases where the victim originally possessed the entitlement the injured property.

(b) *Strict Liability* Under strict liability injurers should compensate victims for their litigation costs in some circumstances but not in others. According to Polinsky and Rubinfeld (1988) optimal deterrence requires that injurers compensate victims for their litigation costs. Injurers must compensate victims for two reasons. First, if victims bear their own litigation costs, some victims with good claims will not find it worthwhile to sue because litigation costs exceed their expected recovery. Thus, injurers will not bear the full expected cost of the harms they impose because not all victims will sue. Second, even if all victims sue, injurers will not bear the full social cost of their actions because, properly defined, the social cost of the injurers' risk-taking is the sum of the victims' losses and the cost of litigation. Thus, under a rule of strict liability with compensatory damages injurers will not take efficient care or engage in efficient activity levels. Litigation costs also will be excessive (Polinsky and Rubinfeld, 1988).

Yet, Polinsky and Rubinfeld argue, deterrence is not the only objective of the tort system. A full analysis reveals that in some circumstances victims should not be compensated for their litigation costs. In addition to inducing due care, an optimal regime must minimize litigation costs. Whether compensatory damages should be adjusted upwards or downwards depends on the effect of changes in damages on the injurers' incentives to take care and the victims' incentives to sue. Specifically, if the injurers' care-taking affects not only the probability of an accident but the magnitude of the harm, it may be optimal to enable the victim to recover some but not all of his litigation costs: enough so that it is worthwhile for the victim to sue when an injurer takes less than optimal care and the victim's harm is large, but not enough so that it is worthwhile for a victim to sue if the injurer takes optimal care, thereby reducing the amount of harm suffered (and thus the amount of recover) (Polinsky and Rubinfeld, 1988). This would induce optimal care-taking and minimize on litigation costs by effectively transforming the strict liability rule into a negligence rule. As with any negligence rule, such a regime would not induce injurers to undertake the optimal amount of the activity.

Victims should recover less than their compensatory damages, Polinsky and Rubinfeld argue, in those situations where injurers' care-taking is not productive, and thus optimal care is to take none at all. In this case, a strict liability regime is optimal if it reduces the victims' recovery to ensure they will not sue (Polinsky and Rubinfeld, 1988). Again, this will not produce optimal activity levels, however.

(c) *Negligence Liability* Under a negligence rule, a damage rule limiting defendants' liability to victims' losses will either result in optimal care or too little care. Thus, when needed, any adjustment to compensatory damages should always be positive (Polinsky and Rubinfeld, 1988). Under a negligence rule, injurers will invariably take due care if victims' litigation costs are not so high as to discourage suit. This results in first-best efficiency because once injurers take due care, victims have no reason to sue. If, however, litigation costs are high enough to discourage many suits, injurers will not take due care. This also will lead to excessive litigation costs if some victims nevertheless find it worthwhile to sue. Increasing damages to ensure that victims sue will induce optimal care-taking and minimize litigation costs, since once injurers take due care victims no longer have a reason to sue (Polinsky and Rubinfeld, 1988, pp. 161-162).

(d) *Fees Imposed on Plaintiffs and Defendants* The previous analysis assumes that the state cannot impose fees on either plaintiffs or defendants. Shavell (1996, 1997) shows that once one allows for such fees, optimal damages imposed on defendants equals the harm to the plaintiff plus the plaintiff's litigation costs plus the state's litigation costs. This ensures that each injurer's total expected costs equals the total cost to society of her risk-taking activities. In order to ensure that plaintiffs have the optimal incentive to sue, the state can impose fees for bringing a suit when plaintiffs would otherwise have excessive incentives to sue or subsidies when plaintiff's incentives are inadequate. Shavell argues that a plaintiff's incentives are excessive if the social benefit of the suit - measured by its deterrence impact, not the plaintiff's injury - are less than the costs of bringing the suit (Shavell, 1997, pp. 575-581, 584-585).

Shavell explains that this system is superior to one in which plaintiffs must pay the state's litigation costs. He notes that in this situation one should not always force plaintiffs to pay the state's costs because often a plaintiff's suit provides an external benefit - deterrence - that exceeds his private benefit. Thus, even when the fee is *not* imposed plaintiff may not have sufficient incentives to sue since he does not reap the full gains from his suit (Shavell, 1996, p. 587, 1997). Similarly, Shavell rejects a simple loser-pays fee shifting arrangement noting that under such a regime victims with good suits will always sue. Yet whether the victim will prevail does not determine whether,

from society's standpoint, the suit should be brought. This, he argues, depends on the deterrence impact of the suit.

Shavell's analysis raises an interesting question about how to measure the deterrence value of a suit. Shavell argues that deterrence value should not be measured *ex post*. Rather liability will not have a deterrence value if, *ex ante*, the injurer does not expect to cause this type of accident (Shavell, 1987, pp. 129-130). Such a suit would have deterrence value, however, if the finding of liability - separate from the occurrence of the accident - would be likely to educate other potential injurers (or victims) about the risk (see Arlen, 1993, p. 1124, n. 110; Rubin, 1993, p. 50).

9.2 Uncertainty and Court Error

Optimal damage awards also are affected by whether the legal process is plagued by error.

(a) *Court Error in Determining Negligence* The possibility of court error in determining whether the injurer is liable under a negligence rule also may affect the optimal damage rule. Specifically, if courts are likely to err in determining whether the injurer took due care, negligence liability rule with full compensation damages will not necessarily induce injurers to take due care. Even when courts are likely to err in either direction - to find a non-negligent injurer liable and a negligent injurer not liable - under plausible conditions, care-taking will be excessive if damage awards fully compensate victims for their losses. When courts err, the cost to the injurer in deciding to take due care rather than excessive care is significant - the resulting increased likelihood of being found negligent. This will exceed the additional cost to her of taking excessive care, under plausible assumptions. In contrast, the possibility of error in her favor will not induce her to take less than due care. Doing so only saves her the additional cost of taking due care but subjects her to a significant risk of being found liable when she otherwise would not have been. Thus, even when courts are as likely to err in the injurer's favor and against her, the cost of an error going against the injurer will exceed the benefit of an erroneous finding in her favor. Thus injurers will respond to uncertainty by taking excessive care - provided that there is a positive probability of the court underestimating injurers' care levels and the distribution of errors is not too dispersed (Calfee and Craswell, 1984; Craswell and Calfee, 1986; Shavell, 1987, pp. 79-83, 93-97; compare Diamond, 1974).

This problem can be addressed in a couple of ways. The state can retain negligence liability but implement a less-than-full compensation damage awards (Calfee and Craswell, 1984) or it can switch to a strict liability regime (if courts can correctly determine damage awards) (Cooter, 1984).

(b) *Role of Causation Rules* Uncertainty in the determination of negligence will not induce excessive care-taking if on average courts get the due care standard right and causation rules function perfectly, thus eliminating the discontinuity in the injurer's expected liability. Causation rules may eliminate this discontinuity because a negligent injurer is liable only if his negligence caused the harm. Thus, if courts err in determining due care but not in assessing causation, an injurer falsely judged to be negligent still will not be liable because the court will recognize that it is not more likely than not that the accident would not have occurred but for the injurer's negligence (Grady, 1983; Kahan, 1989, pp. 437-439).

Should causation rules eliminate the 'discontinuity' produced by negligence liability, then the risk of court error in determining whether an injurer is negligent generally will result in injurers taking less than due care - not excessive care - because uncertainty over care-taking may lead courts to hold, incorrectly, that negligent injurers took due care, whereas correct application of causation rules will ensure that non-negligent injurers incorrectly found to be negligent will escape liability (Kahan, 1989, pp. 437-439). In this situation, inducing efficient care may require super-compensatory damage awards.

(c) *Error in Determining Plaintiffs' Losses* Courts also may err in assessing plaintiffs' losses. Cooter has argued that when courts are subject to this type of error the solution is to employ a negligence liability rule. He argues that injurers' risk-taking is less sensitive to errors in determining the damage award under a negligence regime than under strict liability because under a negligence rule the injurer's expected liability increases dramatically if she fails to take due care. Cooter argues that this implies that negligence is the superior rule when courts cannot accurately determine damages (Cooter, 1984).

Shavell argues that possible court error in the calculation of losses does not necessarily imply that strict liability will be inefficient. Strict liability will provide correct incentives if courts' estimates of losses are correct on average (Shavell, 1987, pp. 131-132).

Moreover, even when courts err on average, Kaplow and Shavell (1996) argue that negligence is not superior to strict liability. Kaplow and Shavell show that, in order to determine due care, courts must be able to calculate victims' losses. Thus, if courts cannot accurately determine damage awards under a strict liability rule, they also will be unable to determine due care under a negligence rule, and injurers' care-taking under a negligence regime will not be optimal. It has been suggested that due care might nevertheless be easier to determine because courts can rely on custom and other sources of information on due care. Yet in order to determine whether the custom is efficient courts still will need to be able to estimate harm (Kaplow and Shavell, 1996; compare with Arlen and Kraakman, 1997, discussing strict versus duty-based vicarious liability rules).

Thus, any difficulty the court faces in assessing damages should afflict negligence liability as well as strict liability (Kaplow and Shavell, 1996). The choice between the regimes, therefore, will likely depend on relative administrative costs. Kaplow and Shavell argue that since determining due care requires more information than determining damages, the risk of error and administrative costs are higher under a negligence regime and thus strict liability is superior. Nevertheless, negligence may produce lower administrative costs because fewer suits will be brought (see generally Shavell, 1987, pp. 264-265).

9.3 Injurers' Ability to Escape Liability for Losses

Other imperfections also can affect optimal damage awards. For example, if injurers are not necessarily liable for their wrongs - for example, because torts go undetected - full compensation damage awards will not optimally deter wrongdoing.

Empirical evidence suggests that injurers are not liable for many of the torts they cause. For example, empirical evidence suggests that a tiny portion (less than 6 percent) of victims of medical negligence will obtain compensation (Danzon, 1985, pp. 22-25; Weiler et al. 1993a, pp. 74-75). Indeed, even the probability of detecting the source of a substantial oil spill is only 60 percent (Cohen, 1987).

When wrongdoers may escape liability, optimal deterrence of a risk-neutral tortfeasor appears to require a damage award equal to the victim's loss divided by the injurer's probability of detection (specifically, the injurer's probability of being formally liable) (h/p) because this rule ensures that an injurer's expected liability equals the social cost of the harm (Becker, 1968; Cooter, 1989b; Landes and Posner, 1981; Polinsky and Shavell, 1998; see Arlen, 1994). This could be implemented using a regime of compensatory damages coupled with punitive damages or compensatory tort liability coupled with government-imposed civil or criminal penalties.

This damage rule is not necessarily optimal, however. As previously explained, under a negligence regime expected damages need not equal victims' losses if the injurer's expected liability function increases substantially (and discontinuously) if he takes less than due care. Moreover, even under strict liability reasons exist why the damage multiplier should not necessarily equal one over the probability of detection (see, for example, Becker, 1968, p. 178; Craswell, 1996; Karpoff and Lott, 1993; Kaplow, 1992). (See Chapter 3700 on Punitive Damages for a more detailed discussion of this issue.) Finally, this rule must be modified for corporate defendants held liable for torts (or crimes) committed by their agents (Arlen, 1994; Arlen and Kraakman, 1997; see Part C for a discussion on vicarious liability).

9.4 Intentional Torts

Optimal compensation for intentional torts also may exceed the victim's actual losses even if injurers are invariably found liable. Intentional torts generally are those which require the injurer to expend resources in order to commit. It would appear that holding injurers fully and strictly liable for such torts would optimally deter them. But, as Landes and Posner initially observed, this assumes that there are 'optimal' intentional torts. Many intentional torts involve low transactions costs; thus, market transactions are possible. All else equal, market transactions are preferable to the involuntary taking of another's property, particularly once one considers victims' costs of avoiding non-market takings. To force such transactions into the market, expected damages should exceed the injurer's gain from the transaction. This may exceed the victims' losses (Landes and Posner, 1987, pp. 160-163; see Haddock, McChesney and Spiegel, 1990; see also the following articles on benefit-based damages: Epstein, 1994; Levmore, 1994; Polinsky and Shavell, 1994; Wittman, 1984, 1985).

9.5 Supercompensatory Damage Awards and Decoupling

Although super compensatory damage awards are necessary to solve some problems, they may create others. For example, excess compensation may reduce victims' incentives to take care, unless a victim's right to recovery is governed by contributory negligence. Excess compensation also may preclude victims from optimally spreading losses, because the marginal utility of wealth of victims who receive excess compensation will be less than their pre-accident marginal utility of wealth (Polinsky and Che, 1991; see Arlen, 1990b).

Excess compensation creates problems less often than might at first appear, however. As Rubinfeld observes, whether victim compensation is excessive depends on a victim's compensation net of attorney's fees and litigation costs, not the gross compensation paid. Litigation costs and attorneys' fees are sufficiently high that defendants' liability can exceed victims' losses by a considerable amount without victims being over-compensated (Rubinfeld, 1984, pp. 553-555).

Nevertheless, when injurers may escape liability, the optimal deterrence award *net* of other costs often will exceed victims' losses. This creates two potential problems. First, if victims can influence the probability or magnitude of the accident, super-compensatory awards may cause victims to engage in very excessive activity levels (victims will take due care, however, provided they are subject to a contributory negligence defense). In addition, victims' risk-spreading will not be optimal because the optimal amount of insurance is full compensation, not excessive compensation. One potential solution to the problem of excessive victim compensation is to decouple injurers' liability from victims' compensation, with victims being fully compensated for their losses (including litigation costs) and any liability in excess of full compensation

being paid to the state (Polinsky and Che, 1991; see Danzon, 1984; Spence, 1977). This possibility is discussed later in this entry.

B. Damages for Death and Serious Physical Injury

Economic analysis of damages for death and serious permanent physical injury differs substantially from the standard analysis of property damage because these injuries include harm to irreplaceable commodities. A commodity is irreplaceable if its owner does not perceive any equivalent commodities available on the market (Cook and Graham, 1977, pp. 144-146). Loss of this commodity results in a 'nonpecuniary loss'. Health is generally considered an irreplaceable commodity.

Under current law, victims are not compensated for their total losses arising from an accident that results in death or serious permanent injury. Rather, victims are compensated for the pecuniary losses associated with the injury plus an award for the 'pain and suffering' occasioned by the loss. In some cases, victims also may receive punitive damages.

This section first examines evidence on the actual operation of the tort system: how much are victims compensated and how much do defendants pay? It then addresses the issue of what are optimal awards for death and physical injury.

10. Actual Awards for Death and Physical Injury

In a 1991 study, Hensler et al. concluded that liability payments total \$15.7 billion annually. Three-quarters of this amount went to victims of automobile accidents, even though this group constituted only 59 percent of the pool of victims who received compensation. Compensation net of legal fees and property damage totaled \$12.9 billion (Hensler et al., 1991, pp. 100-101).

This study found that the average compensation paid to victims was \$11,173. The average net compensation for personal economic cost - net of damages for pain and suffering, property damage and attorneys' fees - was \$5,432. The average liability payment for automobile accidents was \$14,444. In both situations, the distribution of payments was highly skewed, with most victims receiving substantially less than the average. The median payment for all cases was only \$2,500; the median for automobile accidents was \$4,000 (Hensler et al. 1991, pp. 102-103).

Evidence suggests that victims of nonfatal accidents generally are not compensated for all the losses they suffer. Hensler et al. found that nonfatal accidents impose direct and work-loss costs of \$175.9 billion annually. Victims

generally bear 38 percent of the monetary loss directly; they only recover 62 percent from other sources (including the tort system and insurance). The study found that the recovery rate for direct costs is 75 percent, but for work loss is only 34 percent. Tort liability payments, net of attorneys' fees, comprise only 7 percent of the total compensation victims receive (Hensler et al. 1991, pp. 102-107). Similarly, Viscusi's study of product liability claims paid in 1977 found that the average bodily injury loss, \$27,446 (1990 dollars) exceeded the average bodily injury payment of \$19,990 (1990 dollars) (Viscusi, 1991, p. 102). Other studies also conclude that seriously injured victims are likely to be under-compensated (Galanter, 1996, pp. 1117-1119).

This finding that seriously injured victims are under-compensated holds even though most victims receive awards for pain and suffering. Viscusi found that 62.5 percent of the cases with positive awards for bodily injury included awards for pain and suffering. There was considerable variation in the amount paid, however. The mean value of pain and suffering awards over all cases where such damages were awarded is \$200,000 (1990 dollars) in cases involving brain damage and paraplegia. However, in 14 of the 18 injury categories for which pain and suffering was awarded, mean awards are below \$60,000. On average, pain and suffering awards constitute two-thirds of the total compensation awarded in those cases where pain and suffering damages are awarded (Viscusi, 1991, pp. 103-107).

Leebron (1989) analyzed cases involving pain and suffering before death and found that the mean award was \$83,700 and the median award was \$28,500 (in 1987 dollars). In general, pain and suffering awards averaged about 23 percent of the total award and almost 76 percent of the wrongful death amount. Leebron also found considerable variation in the awards, however, not only in absolute terms but in the per minute payment for suffering. Differences in the manner of death explains some, but not all, of this variation.

The previous discussion of whether damages under-compensate victims compares victims' compensation with actual *ex post* losses suffered. It also is instructive to compare compensation to the value the individuals place on their life and health, as determined by the amount that workers require to compensate them for additional risk of death or injury. Examining workers' preferences, Viscusi concluded that their behavior yields an *ex ante* compensation demand value of life of \$6.4 million. There is considerable variation, however. Workers in high-risk jobs appear to place an implicit value on their lives of \$1 million or less, whereas workers in very low-risk jobs may value their lives at \$10 million or more (Viscusi, 1991, p. 108). Valuations of nonfatal injuries yield estimates of \$12,000 (1984 dollars) to \$50,000 (1987 dollars) per injury. Approximately half of this amount is for noneconomic loss (Viscusi, 1991, pp. 109-110).

11. What is Optimal Full Compensation for Death or Injury?

The preceding discussion suggests that actual damage awards, therefore, do not fully compensate victims of serious injuries for their losses. This raises the issues: what is full compensation for death or permanent injury and should the tort system try to fully compensate victims of these injuries?

The answer to the first question depends on what efficiency criterion is employed. Under the Pareto criterion, tort liability must ensure that the injurers' risk-taking leaves no one worse off than he would be otherwise. This criterion would seem to require that victims be fully compensated for their losses. But whether, and to what extent, victims must be compensated depends on the initial allocation of entitlements.

This part discusses the damage rule that satisfies the Pareto criterion's requirement that no one be made worse off than otherwise. The next part examines the tort regimes that minimize the joint costs of accidents and accident prevention.

11.1 Injurers are Entitled to Impose Risks at Will

Society may grant to potential injurers an entitlement to impose certain risks on others. In this case, the Pareto optimal solution to the accident problem is determined - as in Shavell (1987, pp. 247-254) - by maximizing the utility of the potential victim subject to the constraint that injurer be made no worse off than otherwise. Tort damage awards thus need not compensate victims for their losses because, in essence, they have nothing to lose (see Shavell, 1987, pp. 247-254).

11.2 Victims Possess Initial Entitlement to Their Health

Alternatively, victims may possess the right to be completely free from certain types of risks. In this context, the Pareto-optimal solution to the accident problem is determined by maximizing the utility of the injurer subject to the constraint that the victim be no worse off than if the injurer does not engage in the risky activity. This would seem to imply that tort damage awards must fully compensate the victim for his losses by awarding his sufficient compensation to return the victim to his pre-accident (healthy) level of utility. But this is not necessarily the case.

(a) Ex Ante Compensation and Complete Insurance Markets The standard accident of economic models of tort law assumes that accidents occur as the result of injurers imposing risks on victims, without either party imposing any risk of harm on the injurer. In this situation, fully compensating the victim apparently requires that the award leave the injured victim no worse off than when he was healthy (see, for example, Arlen, 1985; Friedman, 1982). A

problem arises, however, because many serious permanent injuries dramatically effect the victim's marginal utility of wealth. For example, a victim of a fatal accident may not derive *any* utility from wealth paid to her after the accident. Thus full *ex post* compensation for such injuries would seem to be impossible (alternatively, it is sometimes said that *ex post* full compensation award is infinite, see, for example, Buchanan and Faith, 1979, pp. 245-246; Friedman, 1982; Mishan, 1971, p. 693). Yet, as David Friedman observes, the reason injurers cannot fully compensate victims for such injuries is not that life has infinite value, but rather that money paid to a dead person has no value (Friedman, 1982). The full compensation amount would be finite - and perhaps quite small - if it were determined *ex ante*: if those who impose risk compensated all potential victims *ex ante*, before any one is injured. Because the money would be paid to healthy people who value it, only a finite amount of compensation would be required (Friedman, 1982, p. 83; see Graham and Peirce, 1984).

Implementing a system of *ex ante* damage awards probably is unworkable, however, because it would require courts to calculate, in advance, the risks imposed by an enormous variety of activities and to oversee constant cash payments to millions of people (Friedman, 1982, p. 83). Yet, Friedman argues, it may be possible to implement a system which awards damages only *ex post* based on the *ex ante* value of life. Friedman notes that victims could be fully compensated for their losses with substantially smaller awards than at present if mechanisms exist that enable potential victims to obtain the benefit of the compensation while healthy - when the money is valuable. If victims could benefit from the compensation while healthy, then the proper measure of full compensation is the amount paid to the victim once injured that fully compensates her for her loss *given* that she will get the benefit of some (or all) of this money while healthy (Friedman, 1982, pp. 83-85, 89-90; compare with Fraser, 1984a). This solution would be possible if insurance markets were complete, in that victims could sell insurance on themselves (Friedman, 1982). Alternatively, the state could allow a market in unmatured tort claims, where healthy victims could sell their potential claims to others (Cooter, 1989a; see Shukaitis, 1987, discussing the merits of a market in matured tort claims).

Currently, however, victims cannot sell unmatured tort claims and there are reasons to doubt the feasibility of either such a market or of 'reverse insurance' (Arlen, 1990b, p. 61, n. 90). Yet even so tort damage awards need not necessarily fully compensate victims *ex post* in order to ensure that potential victims are no worse off than otherwise.

(b) Bilateral Risk Accidents First, most accidents result from bilateral risk - not unilateral risk - activities. Bilateral risk activities are those where both parties to the accident risk being injured should an accident occur. Car crashes are an example of a bilateral risk accident.

In many cases, each potential victim of a bilateral risk accident risks injury only if he also is engaging in a risky activity. Each person thus can avoid being subject to the risk in question - thereby ensuring his initial level of utility - by refraining from imposing risk on others. In turn, each assumes a risk of injury to himself in return for the ability to impose risk on others. In this situation, tort liability rules are Pareto efficient if they maximize the utility to individuals of engaging in the risky activity by minimizing the joints costs of accidents and accident prevention. There is no additional requirement that injured victims be compensated for their losses. The system compensates each person *ex ante* for any risk imposed on him by allowing him to engage in a risky activity, imposing risks on others which they would otherwise be entitled to be free from. Moreover, individuals would not want damage awards to be higher than that necessary to achieve optimal deterrence and risk spreading because this would require each person to expend greater resources while healthy in return for the right to receive additional compensation if injured, which necessarily is worth less to the person if risk spreading is optimal (Arlen, 1990b, pp. 63-65).

This analysis may extend, with some modifications, to the tort system generally, if we view it as a general set of rules that allow us to impose certain risks on others in return for the right of others to impose risk (perhaps different risks) on us. In this situation, the measure of compensation afforded by the tort system to each potential victim should include the benefit to him of imposing risks on others under this rule. People thus might generally prefer damage awards which do not fully compensate victims *ex post* if in return for not receiving full compensation if injured (when the money may have less value) each party has to pay less to injure others (thus reducing their expected liability which they often must pay while healthy, when the money is more valuable). In this case, properly defined, a 'full compensation' damage rule - which ensures that no one is worse off than in the status quo ante where no risks are imposed - would set *ex post* recovery at less than the amount that returns an injured victim to his pre-accident utility (See Arlen, 1990b, 1985, p. 1136).

(c) Products Liability

Damage awards also need not fully compensate victims *ex post* in product liability cases if fully informed customers can avoid product-related injuries by not buying the product. Customers will purchase the product only if its purchase - including the resulting risk - leaves them no worse off than they would be otherwise. Thus, regardless of the damage award, customers are never made worse off (Shavell, 1980). This analysis assumes, however, that customers are fully informed. If customers underestimate the risk in question, then they will not be as well off as they would be otherwise unless tort damages fully compensate them for any harm they suffer (see Section 14).

11.3 Injurers are Entitled to Impose Reasonable Risks

Victims may only be entitled to be free from unreasonable risks of harm imposed by injurers (Graham and Peirce, 1984). In this situation, under a system of *ex ante* damage awards, victims will be as well off as they would be otherwise if they are compensated only for the cost to them of any risks imposed on them over the 'reasonable' level - for example, the level that results if the injurer takes optimal care. If, by contrast, compensation is only paid *ex post*, then to be as well off as they would be otherwise, victims must be paid the full *ex post* compensation demand value of the risk imposed.

12. Inducing Efficient Deterrence and Risk-spreading

To minimize the joint costs of accidents and their prevention, tort rules must optimally deter injurers' risk-taking (and, where relevant, victims' risk-taking) and be consistent with optimal risk-spreading by risk-averse victims and injurers. The present analysis examines what tort liability and damage rules governing serious permanent injuries induce injurers to undertake efficient care and activity levels, while being consistent with efficient risk-spreading by victims. The question of what rules will also induce victims to undertake optimal care and activity levels is addressed earlier in this chapter and in Chapter 3100. The issue of how to induce injurers to efficiently spread risk is addressed both in Chapter 5700 and in Chapter 3800.

12.1 The Potential Conflict between Deterrence and Risk-spreading

When accidents result in death or serious physical injury, it may be difficult to induce both optimal deterrence and optimal risk-spreading. Optimal deterrence requires that injurers bear the full social cost of their risk-taking activities, including nonpecuniary losses. Yet were the tort system to award damages to victims that fully compensated them, *ex post*, for death or serious permanent injury, the award would preclude victims from engaging in optimal risk-spreading, because, assuming that health is a normal good, full *ex post* compensation for death or serious permanent injury exceeds the amount that induces efficient risk-spreading.

Victims efficiently spread the risk of loss when they derive that same marginal benefit from a unit of wealth whether healthy or injured. If health is a normal good, then the optimal amount of insurance is *less than* the amount needed to fully compensate the victim for his full loss. In other words, a potential victim's marginal utility of wealth will be the same, whether healthy or injured, if he is paid an amount if injured which fails to return him to his preaccident level of utility (Arrow, 1974; Cook and Graham, 1977; Spence, 1977). To take an extreme example, a person with no heirs would prefer to

have more wealth when alive than when dead, because money has no value to him once he is dead. Thus, he will not purchase life insurance. And, absent deterrence concerns, he would prefer to receive even a small amount of money while healthy to receiving millions of dollars after his death. Thus, any compensation paid to him after he dies would produce greater social utility if given to someone who is healthy.

Similarly, in the case of serious permanent injuries, if health is a normal good then individuals would not fully insure against the risk of a serious permanent physical injury (Arrow, 1974; Cook and Graham, 1977; Spence, 1977). Thus, damage awards which fully compensate a victim for serious physical injuries - in the sense of returning him to his preaccident level of utility - overcompensate victims in that they exceed the efficient amount of insurance coverage (Cook and Graham, 1977; Spence, 1977).

12.2 Does the Conflict Exist?

The preceding analysis suggests there is an apparent conflict between deterrence and risk-spreading. In order to be efficient, a tort regime must take this conflict into account.

Yet in order to address this conflict, we must understand exactly when it arises, and when it does not. For example, the conflict between deterrence and risk-spreading may be overstated in the case of negligence liability. Indeed, under a perfectly functioning negligence rule, there is no conflict between deterrence and risk-spreading, provided victims can purchase first-party insurance. Under a perfectly functioning negligence rule with optimal (deterrence-based) damage rules, injurers will take due care and thus will not be liable. Thus, tort liability will deter without compensating, and damage awards will not distort victims' ability to spread risks using first-party insurance (Arlen, 1990b; Calfee and Rubin, 1992, p. 403). Of course, negligence liability does not eliminate the conflict between deterrence and risk-spreading if injurers are found negligent, for example because courts err or because principals are unable to induce agents to take due care.

In addition, even the activity is governed by a strict liability regime (or if injurers risk liability under a negligence regime) employing deterrence-based damage awards will not necessarily interfere with victims' ability to optimally spread risks. Although it is true that in order to induce optimal deterrence injurers must bear the full cost of any harms they cause, this does not imply that injurers' liability must equal the amount that leaves the victim as well off after the serious injury as before - that is, equal to the full *ex post* compensation demand value of the injury. From society's standpoint, the cost of an injurer's risk-taking activities is better measured by the cost of the risk he imposed on all potential victims than by the *ex post* compensation value of the actual injuries suffered by any victims. In other words, the deterrence award should

be based on the *ex ante* compensation demand value of the injury: on the amount individuals would require to accept the *risk* the injurer imposed, divided by the expected number of accidents (Arlen, 1990b, 1993; Viscusi, 1991, p. 108).

While this amount may be large, in the case of very serious injuries it generally will be less than the amount needed to compensate injured victims *ex post*. *Ex ante* compensation is based what amount must be awarded to healthy individuals to compensate them for bearing a risk of a harm that may never materialize. People often accept relatively less when compensated *ex ante*, because they are receiving the money when they are healthy and can enjoy it more; indeed, individuals often are willing to accept relatively small sums of compensation for relatively small risks of quite serious injuries. The sum of all the compensation required generally is much less than the *ex post* compensation demand value of the injury. By contrast, the *ex post* value is based on the amount needed to compensate a seriously injured person for his loss. If the injury eliminates, or dramatically reduces, any utility to the victim of money, then this amount might be astronomical. Indeed, in the case of death, no such amount may exist - or, the amount may be infinite (Mishan, 1971) - even though a healthy person might require a relatively small amount *ex ante* to induce him to accept a risk of such loss (Arlen, 1993, pp. 1097-1098; Danzon, 1984; Viscusi, 1991, pp. 89-91; see Geistfeld, 1995, pp. 804-810).

Thus, in order to optimally deter injurers it is not necessary that the award fully compensates victims for their actual losses. The award must simply equal the cost to society of the risk imposed. Should this amount equal - or, if there is first-party insurance, should it be less than - the victim's optimal insurance coverage, then even under a strict liability rule, setting damage awards equal to the amount necessary to optimally deter injurers will not preclude victims from engaging in efficient risk spreading.

Moreover, even if the *ex ante* deterrence award exceeds the optimal amount of insurance, holding injurers liable for this amount will not necessary result in victims being over-compensated. While injurers' behavior is based on the gross award paid - including injurers' litigation costs and any part of the award that goes to victims' litigation costs - victims' compensation depends on the *net* award. A victim's compensation is excessive only if the *net* award - net of attorneys' fees and litigation costs - exceeds the efficient amount of insurance. Thus, even if an injurers' liability equals the full deterrence award, the net award to the victim may be less than or equal to the optimal amount of insurance (Geistfeld, 1995, pp. 800-802; Rubinfeld, 1984, pp. 553-555).

Evidence suggests that if damage awards were set equal to optimal deterrence levels, litigation costs would substantially reduce the risk of excess compensation. For example, currently pain and suffering awards appear to roughly equal the standard lawyers' contingency fee (Viscusi, 1991, p. 114). Thus, the victim's net award may be roughly equal to pecuniary losses.

Provided victims can purchase first-party insurance against nonpecuniary losses, this net award will be consistent with optimal risk-spreading by victims. Similarly, Geistfeld argues that on net victims will not be over-compensated if victims are not compensated for all tortuously caused injuries; any over-insurance for some injuries may offset under-insurance for others (Geistfeld, 1995, p. 800).

Yet while for some injuries the net deterrence award may be less than or equal to the optimal amount of insurance, for many it still will exceed the optimal insurance award. Scholars have estimated the *ex ante* value of life to be approximately \$3-6 million (Viscusi, 1991, p. 108; see Danzon, 1984, p. 527, placing the value at approximately \$1.4 million (1980 dollars), citing Arthur, 1981; see generally, Kornhauser, 1990). Even net of litigation costs, this *ex ante* deterrence damage award likely exceeds the efficient amount of insurance - particularly if, as some have suggested, individuals would only insure against pecuniary losses (Danzon, 1984, pp. 522-524; Priest, 1987, p. 1547; A. Schwartz, 1988, pp. 364-367; Leebron, 1989, p. 274; see also Viscusi, 1991, p. 110; Viscusi and Evans, 1990).

12.3 Measure of Optimal Insurance

The magnitude of the gap between the optimal deterrence award and the optimal insurance award depends critically on what is the optimal amount of compensation to pay to victims. A number of scholars have argued that individuals only insure against pecuniary losses, even when faced with a risk of a serious nonpecuniary loss, such as is occasioned by death or serious permanent physical injury (Danzon, 1984, pp. 522-524; Priest, 1987, p. 1547; A. Schwartz, 1988, pp. 364-367; Leebron, 1989, p. 274).

Yet whether optimal insurance for such injuries is indeed limited to purely pecuniary losses remains an open question. As a theoretical matter, optimal insurance can exceed pecuniary losses: optimal insurance for injuries that increase the victims' marginal utility of wealth exceeds the victims' pecuniary losses. Individuals will insure against nonpecuniary losses if the injury increases the marginal utility of wealth: implying that the individual derives more utility out of a dollar spent if injured than he did if healthy. This might occur if an injured person would be using the wealth to enable him to get essentials, like mobility, whereas when healthy he would only be using the money to purchase luxuries. Individuals will not insure against nonpecuniary losses (and will not even insure against all their pecuniary losses), however, if the injury decreases the marginal utility of wealth, as occurs with wrongful death (Calfee and Rubin, 1992; Cooter, 1989a, pp. 388-391; Viscusi, 1991, p. 90).

Empirical evidence suggests that serious on-the-job injuries may reduce the victim's marginal utility of wealth (see Viscusi and Evans, 1990). In this case, the net optimal deterrence award will exceed the optimal amount of compensation because the former generally exceeds the victim's pecuniary

losses. Yet there is some evidence to suggest that some injuries do increase the marginal utility of wealth - or at least that individuals anticipate that it will. For example, people currently insure against nonpecuniary losses - purchasing, for example, uninsured motorist coverage. This suggests that such insurance may be optimal in some circumstances (Arlen, 1990b, pp. 73-74, n. 149; Croley and Hanson, 1995; Geistfeld, 1995, pp. 795-796).

However, even when optimal insurance includes some nonpecuniary losses, individuals do not fully insure against nonpecuniary losses, and optimal insurance often (indeed generally) will be less than the net optimal deterrence value of the injury. Thus, even when optimal insurance includes insurance for nonpecuniary losses, the optimal insurance damage award nevertheless generally will be lower than the (net) optimal damage award, thus presenting a conflict between risk-spreading and deterrence.

12.4 Eliminating the Conflict Between Risk-Spreading and Deterrence

Thus, in the standard model of accidents - where accidents occur between 'injurers' and 'victims' who are strangers to each other - if injurers must pay victims an award based on the deterrence value of the risk, victims' risk-spreading generally will be suboptimal.

(a) *Decoupling* The state may be able to eliminate this conflict between deterrence and risk-spreading by decoupling the injurer's liability from the victim's recovery. In other words, the state can require the injurer to pay the victim an amount that ensures that the victim's net recovery equals the insurance value of the harm, and then, where necessary, impose a deterrence surcharge on the injurer payable to the state to ensure that the injurer's total liability equals the *ex ante* cost of the risk he imposed (Danzon, 1984; Shavell, 1987, pp. 233-235; Spence, 1977).

It has been suggested that this solution may not be feasible because a majority of cases settle out of court, enabling the injurer to avoid paying the fine to the state (Geistfeld, 1995, pp. 799-800; Rubinfeld, 1984, pp. 553-557). Yet Polinsky and Che argue that decoupling may enhance efficiency even if cases settle (Polinsky and Che, 1991, pp. 566-567). Kahan and Tuckman (1995) argue, however, that Polinsky and Che's result does not necessarily hold, and that the requisite levies may be ineffective if agency problems affect the plaintiff-lawyer relationship. Yet Shavell shows that settlements will not undermine the state's ability to collect fines if the state refuses to enforce any settlements that are not registered with the court, with the injurer being required to pay a levy when he registers. This would ensure that injurers are not tempted to settle secretly because plaintiffs on the receiving end of secret settlements could turn around and sue the injurer. The only way for the injurer to get the benefit of settling would be to register and pay the fine (Shavell, 1996; 1997).

(b) *Bilateral Risks* Even without decoupling, most standard torts resulting in serious permanent injury or death may not produce a conflict between deterrence and risk-spreading. Most tortuous injuries result from bilateral risk accidents - those in which both potential parties to the accident risk being injured. Indeed, most tort cases are automobile accidents - which are single activity accidents where both parties to the accident are engaged in the same activity and impose risks on each other. In this situation, the tort system operates more effectively as a mechanism for deterring risk-taking than for compensating victims, and tort damage awards may not interfere with victims ability to engage in optimal risk-spreading through the purchase of first-party insurance.

Consider the most extreme type of bilateral risk accident: single activity accidents where both parties will be injured should an accident occur and will suffer identical losses. In this situation, neither party will receive any net compensation under any of the standard liability rules. Under negligence liability, each party will take due care and will not be liable. Under strict liability with contributory negligence, each will take due care and will be liable to the other, but because the accidents are symmetrical, damages paid will equal damages received with the result that on net neither receives or pays any compensation. Tort liability thus does not result in victims receiving net compensation and thus does not interfere with each parties' ability to employ first-party insurance to optimally spread the risk of loss. Rather it serves a purely deterrent function: it will induce due care if the state employs a duty-based liability rule - that is, negligence liability or strict liability with contributory negligence - because each party takes due care in order to avoid net liability for the other's losses (Arlen, 1990b; see Diamond, 1974, discussing deterrence but not insurance).

The state also can induce optimal care-taking and promote optimal risk-spreading when parties to bilateral risk accidents do not suffer the identical losses. Under any negligence-based liability rule (for example, pure negligence, negligence with contributory negligence, and strict liability with contributory negligence) each injurer will take optimal care if damages are set such that the injurer is better off taking due care than bearing net liability for the accident (Arlen, 1992a; see Arlen 1990b; compare with Diamond, 1974). If damages are based on 'deterrence values' - that is, on the amount necessary to induce efficient care-taking - then under either negligence liability rule recovery also will be consistent with efficient risk-spreading by victims, provided victims can purchase first-party insurance. Under both negligence and negligence with contributory negligence, each risk-taker will take due care and thus neither will be liable. Thus, tort damages only affect potential injurers' care levels and do not affect the parties' ability to spread the risk of loss efficiently. Each will do so by purchasing first-party insurance (Arlen, 1992a).

Under strict liability with contributory negligence, each will take due care and thus will be liable. Because each is liable for the other's losses, the defendant who suffered the larger injury will receive an award greater than his liability; the other party will not receive any net compensation. Thus, the party who faces net liability invariably can spread his risk of loss, provided that he can purchase insurance, because there is no risk of his being over-compensated. The party who will receive net compensation should an injury occur also may be able to optimally spread the risk of loss, if he can purchase insurance and if his net recovery (net of fees, costs, *and* the liability to the other) is less than the amount needed to induce optimal risk-spreading. Alternatively, the state can guarantee that risk-spreading is efficient by arbitrarily ruling that both parties to a bilateral risk accident will pay the same damages, with the amount of the award equaling that minimum award necessary to make each party take due care. In this case, even under strict liability with contributory negligence, neither receives any net compensation when each takes due care, and damage awards do not interfere with victims' ability to spread risks optimally by purchasing first-party insurance (Arlen, 1992a). For a more detailed discussion of efficient insurance, see Chapter 5700.

(c) *Products Liability* Products liability cases also may not involve a conflict between deterrence and risk-spreading. If consumers are perfectly informed about product risks, the market will induce producers to take optimal care and produce the optimal amount of the product. Thus, damage awards need only induce optimal risk-spreading by victims. Awards thus should be based on 'insurance' values, not deterrence values (A. Schwartz, 1988; Priest, 1987; see Shavell, 1980).

Many argue, however, that tort liability must promote optimal deterrence if consumers underestimate the risk of harm (see Section 14). Thus, injurers' liability should equal the optimal deterrence award, which may exceed optimal compensation to victims (for example, Danzon, 1984; Geistfeld, 1995, pp. 798-799; A. Schwartz, 1988; Spence, 1977). Yet, as previously discussed, a victim often will be over-compensated - from an insurance standpoint - if his recovery equals the injurers' liability. As before, it may be possible to solve this problem by decoupling the victims' recovery from the injurers' liability (Polinsky and Che, 1991; Spence, 1977). (See the discussion above.)

Of course, this raises the issue of whether consumers do indeed underestimate the risks of being injured by a product. Schwartz (1988, pp. 378-384) disputes the claim that consumers generally underestimate product risks sufficiently to produce inefficient equilibria. However, Viscusi and others have shown that consumers do underestimate some risks (Viscusi, 1991, pp. 134-139; see generally Sunstein, 1997, p. 1183, discussing self-serving biases). Yet, Viscusi also has shown that consumers overestimate other product risks,

such as risks that are called to their attention (for example, by product warnings) and risks of certain low-probability events (like cancer) (Viscusi, 1991, pp. 134-139). When consumers overestimate risks, products liability may lead to over-deterrence.

Moreover, some scholars argue that even if victims are imperfectly informed, damages in some products liability cases need not equal the 'deterrence' value of the injury. Calfee and Rubin claim that imperfect information does not necessarily justify products liability for products, like vaccines, which overall serve to reduce the risk of harm. If consumers underestimate both the risk of harm from the product (for example, the risk of side effects) and the background risk the product reduces (the risk of disease), the consumer demand for the product may be suboptimal. In this situation, employing deterrence-based damage awards may reduce efficiency by deterring consumers from purchasing a product they should purchase (Calfee and Rubin, 1992; but see Geistfeld, 1995, p. 798, n. 99). Similarly, Knoll argues that stiff penalties for products liability may have the perverse result of encouraging firms to keep dangerous products on the market (Knoll, 1996b; see Arlen, 1994, examining the impact of strict liability on a firm's willingness to monitor to determine it has done something which is likely to lead to liability).

Finally, the government may be able to better solve imperfect information problems by giving consumers information on risk rather than by imposing tort liability. This depends in part on the consumers' ability to rationally interpret information about their own risk of being injured (see, for example, Sunstein, 1997).

13. Deterrence Awards: Willingness to Pay vs. Willingness to Accept

The optimal deterrence damage award for a particular injury is not the same in every case. First, a population's *ex ante* evaluation of the cost of a particular risk will depend not only on the magnitude of the risk but also on the background risk affecting the population, assuming, as is likely, that preferences are nonlinear in risk (Arlen, 1985, pp. 1132-1134; Kornhauser, 1990, p. 215; see Linnerooth, 1979, pp. 57-58). In addition, it will depend whether the optimal award is properly based on potential victims' willingness to pay to avoid the risk or the amount they must be compensated to accept the risk.

Willingness to pay and willingness to accept produce very different estimates of the deterrence value of life (Hoffman and Spitzer, 1993; Geistfeld, 1995, pp. 822-825; Knetch, 1984; Kornhauser, 1990). The willingness to accept (or compensation demand) measure is most appropriate for accidents between strangers governed by a strict liability rule because strict liability implicitly grants the victim the entitlement to his health (Arlen, 1985).

Under social welfare maximization or Kaldor-Hicks efficiency, the determination of due care and damages under a negligence rule also should be based on the willingness to accept risk if the presumption is that people possess the right to their health and reasonable risks are those which create benefits which equal or exceed the amount victims would require to compensate them for those risks (Arlen, 1985).

Willingness to pay may be the appropriate measure of damages for accidents resulting from bilateral risks (Geistfeld, 1995, pp. 826-828). Willingness-to-pay also may be the proper measure of damages in products liability cases because potential victims are in fact paying for safety through higher product prices. Yet Geistfeld argues against using this measure on the grounds that it would be unfair: rich and poor consumers would pay the same product prices and yet the rich would be entitled to more compensation because they would have a higher willingness to pay (Geistfeld, 1995, pp. 805-806, n. 123). This problem disappears, however, if injurers' liability is based on *ex ante* deterrence value of the risk - that is, on the aggregate willingness-to-pay of all consumers who purchase the product divided by the expected number of accidents. In this case, all victims would receive the same amount. Where this award conflicts with risk-spreading goals, the state could decouple victims' recovery from injurers' liability by forcing injurers to pay a fine to the state (see the discussion above).

When implementing any damage rule, however, it is important to recognize that actual damages awarded by courts may also be affected by how the issue is 'framed'. Specifically, both cognitive decision theory and experimental evidence suggests that juries' and judges' determination of the value of life is likely to depend on whether the judge or jury views tort damages as a gain to an injured victim or as making up a loss to a previously healthy person: whether they are told to consider the amount needed to make the victim whole or the amount she would have to be paid to subject herself to the injury in the first place (McCaffery, Kahneman and Spitzer, 1995).

14. Efficiency of Existing Tort Law

The present review of the literature on efficient tort damage rules for death and injury reveals that the existing rules governing recovery for wrongful death and physical injury are not efficient.

Under current law, recovery from wrongful death and physical injury is based on the victim's lost wages and medical expenses plus an award for 'pain and suffering'. Current measures of pain and suffering generally are designed to measure just that - the pain of death or injury - and generally are not an attempt to measure the lost quality of life. Moreover, and more important, pain and suffering is victim-specific, and thus is not tied to the total cost of the risk

the injurer imposed on the entire population. Thus existing damage awards do not equal either the *ex post* value of the victim's loss or the *ex ante* cost of the risk the injurer imposed (the efficient *ex ante* damage award). Thus, the injurers' total liability for wrongful death and serious physical injury is not based on the social cost of the harms they cause. Accordingly, the tort system is unlikely to be providing the correct incentives for injurers to take due care and limit their activity levels (Arlen, 1985, 1993).

Indeed, actual damage awards for wrongful death or serious permanent injury rarely exceed the efficient *ex ante* deterrence award of approximately \$3-6 million (Viscusi, 1991, p. 108). This suggests that the tort system may not induce individuals to reduce the risks they impose to efficient levels. But, from the standpoint of inducing optimal risk-spreading, the compensation victims actually receive may be higher than is efficient - although this is unclear given that much of the award will go to attorneys fees and other costs.

Finally, in the unilateral risk context, damage awards do not satisfy the requirement for Pareto efficiency that injurers' risk-taking leave victims no worse off than they would be otherwise if victims are initially entitled to be free from risks imposed by others.

C. Special Topics

15. Damages for Corporate Defendants

The standard analysis of optimal damages assumes that liability falls on the actual injurer. In other words, the standard analysis assumes that the defendant is the actual injurer, and that both people are natural persons. Yet often the defendant is a corporation which is being held liable for wrongdoing of its managers or other employees. Indeed, most of the famous tort cases involve corporate defendants - for example, *U.S. v. Carroll Towing Co.*, 159 F.2d 169 (2d Cir. 1947); *The T.J. Hooper*, 53F.2d 107 (S.D.N.Y. 1931); *Palsgraf v. Long Island R.R.*, 162 N.E. 99 (N.Y. 1928). Analysis of corporate liability for torts of managers or other employees reveals that the standard analysis of individual injurers does not necessarily apply to corporate liability. Holding firms liable for their employees' torts induces employees to take optimal care and firms to engage in optimal activity levels if firms either can directly control employees' care levels or can use wages to force employees to bear the full social cost of wrongdoing. This regime does not induce optimal care, however, if firms cannot directly control employees' care levels and employees cannot pay the optimal damage award (Kornhauser, 1982; Shavell, 1987, pp. 170-175; Sykes, 1984).

In this situation, optimal deterrence requires that corporate tort liability induce firms to optimally deter their employees' wrongdoing. To do this,

however, one must do more than simply force firms to pay for any harms caused.

When employees are insolvent and firms cannot directly control their employees' care-taking, to optimally deter wrongdoing it may be necessary to induce firms to implement measures which increase employees' expected liability by increasing the probability that they will be liable for their torts. These measures - hereinafter called policing measures - include monitoring employees, conducting self-evaluative audits of the firm's compliance with the law, investigating suspected wrongdoing, and reporting wrongdoing. In addition, to optimally deter wrongdoing firms may need to undertake preventive measures - such as screening employees - and also adjust activity levels to reflect the full social cost of wrongdoing (Arlen and Kraakman, 1997).

The current civil corporate liability regime is best described as being a regime of traditional strict vicarious liability, under which firms are liable for every harm caused by their employees' in the course of their employees' employment and subject to a fixed damage award equal to the harm caused, with no mitigation if the firm took steps to avoid the harm (Arlen, 1994). This regime is not in and of itself efficient. First, if the probability of detection is less than one, the firm will not undertake optimal prevention measures or activity levels unless the firm's liability equals the social cost of the harm divided by the probability of detection (h/p) - an amount which may be many times higher than actual harm (Arlen and Kraakman, 1997; see Kornhauser, 1982; Polinsky and Shavell, 1993, 1998; Sykes, 1984).

Second, in order to induce optimal policing measures - specifically measures that affect the probability that the *firm* will be found liable - traditional strict liability generally should be replaced with a partial duty-based regime ('composite regime'). Under this regime firms would be subject to a legal duty to monitor, audit, investigate and report optimally. In order to induce optimal prevention measures and activity levels, the firm would be subject to a sanction of h/p^* - where p^* is the optimal probability of detection - if it satisfied its policing duties but would be subject to a much higher sanction of h/p^o if it did not - where p^o is the probability of detection if the firm does not undertake any policing (Arlen and Kraakman, 1997). Strict liability will not induce firms to undertake optimal policing, unless the sanction is h/p , where p depends on the actual probability of detection (Arlen, 1994; Arlen and Kraakman, 1997). Full analysis of corporate tort liability also would require examination of the impact of criminal laws and also market-based sanctions.

The present analysis reveals that one cannot simply apply the findings of the standard economic models of torts to cases involving corporate defendants. This suggests that we need to develop a better understanding of why corporations commit torts and how firms respond to liability, and that we should be circumspect about basing policing decisions governing corporate liability on economic models of how individuals behave. This topic is discussed in more

detail in Chapter 3400 on Vicarious and Corporate Liability.

16. Economic and Nonpecuniary Losses

Even where full compensation is efficient, concern for efficiency suggests that victims should not necessarily be compensated for their economic losses. Economic loss usually refers to foregone profits or earnings. Scholars argue that victims should not necessarily be compensated for economic losses because only some economic losses are social costs. For example, assume that a firm loses business to a competitor selling the same product at a lower price as a result of the tortious activity of the latter. In this case, from the perspective of 'static' efficiency, the 'victim's' lost profits are not a measure of social loss but are actually a measure of social gain. Similarly, when an accident halts a firm's production of a good, the firm's lost profits on foregone sales are not social costs if other firms produce perfect substitutes at the same cost (Shavell, 1987, pp. 135-140).

Nevertheless, in other cases economic losses may also be social losses. For example, an accident that interferes with production will cause social losses if alternative goods are manufactured at higher cost. This cost difference is the measure of the social loss and is a proper component of damages. This amount will be less than economic losses, however, if the price of the good does not change. Social costs may exceed economic losses if no alternative sale is made, because the social costs equal the lost consumer surplus which necessarily equals or exceeds the producer's economic loss (Bishop, 1982; Shavell, 1987, pp. 135-140). (For additional discussions of tort liability for economic losses see Goldberg, 1994; Landes and Posner, 1987, pp. 251-255; Rabin, 1985; Rizzo, 1982; G. Schwartz, 1986, 1996.)

In contrast to economic losses, which often should not be included in damage awards, nonpecuniary losses generally should be included. Nonpecuniary loss generally refers to the loss of an 'irreplaceable' commodity - a commodity which cannot be purchased on the market. Irreplaceable goods include the sentimental value a person attaches to a family photo or other personal possessions. Health is another irreplaceable good (see discussion above). Nonpecuniary losses are social costs: the cost is the reduction in the victims' utility. In order to ensure that injurers take into account the full social cost of their actions, injurers must be liable for both pecuniary and nonpecuniary losses (Bishop and Sutton, 1986; Shavell, 1987, pp. 133-135). The one exception to this is where nonpecuniary loss is small enough that the benefit of holding injurers liable for this nonpecuniary loss is less than the administrative cost of estimating them (Shavell, 1987, pp. 133-135). This condition is satisfied only if the benefit of including such losses measured by

the effect of including them on all injurers who impose risks to such commodities (whether injury results or not) exceeds the administrative cost of calculating them in the (relatively fewer) cases where the commodity is actually injured. Additional issues concerning recovery for nonpecuniary losses are discussed above.

17. Role of Defendants' Wealth

The standard analysis generally assumes that potential injurers are identical. The question arises, however, what if potential injurers have different wealth? Should this affect the damage award?

Under the Pareto efficiency criterion, defendants' wealth should be irrelevant to the determination of damages (see Shavell, 1987, pp. 215-227; Miceli and Segerson, 1995). This result also holds under the total social utility maximization criterion if each individual has the identical marginal utility of wealth for all levels of wealth - that is, if individuals are identical and are risk neutral (Arlen, 1992b; Abraham and Jeffries, 1989).

When social welfare is measured by maximizing total social utility, then employing a simple model in which individuals are risk averse but are otherwise identical it can be shown that total social utility is maximized if wealthier people spend more on care; which can be achieved by forcing them to pay higher damages. The reason is that in this situation defendants have declining marginal utility of wealth. Thus, the wealthier the defendant the less impact an expenditure of a dollar has on his welfare. Thus, optimal due care for wealthier individuals exceeds optimal due care for poorer defendants, because, all else equal, the marginal cost of care for a wealthier defendant is lower. It is possible to induce greater care-taking by wealthier defendants by having damages vary with defendants' wealth (Arlen, 1992b).

This conclusion results from the fact that under the social welfare maximization criterion transfers of wealth can increase social welfare - as defined as maximizing total social utility. The fact that when the total social utility criterion is employed it is possible to increase 'social welfare' through purely distributional changes is a reason that many economists prefer other measures such as the Pareto criterion or Kaldor-Hicks criterion (Arlen, 1990b).

Moreover, Miceli and Segerson question the conclusion that having defendants' damages vary with wealth maximizes total social utility. They agree that the efficient standard of care and damage awards vary with defendants' wealth when a negligence liability rule is employed and tort liability rules are the only instrument employed to increase social utility (Miceli and Segerson, 1995, pp. 202, 204-205). However, they conclude that under strict liability care levels and damage awards should be independent of defendants' wealth (Miceli and Segerson, 1995, pp. 204-205).

Furthermore, there are additional reasons to question whether wealth differences should affect damages, Arlen argues that we should not necessarily base damages on defendants' wealth - even where static analysis might suggest that basing damages on defendants' wealth would maximize total social utility - because basing damages on defendants' wealth would have negative effects on willingness to accumulate wealth. In addition, it would entail substantial administrative costs (Arlen, 1992b, pp. 427-429; see Polinsky and Shavell, 1998, pp. 910-913). Moreover, it is far from clear that society should design tort rules to maximize total social utility, instead of rules that are Pareto or Kaldor-Hicks efficient (see Arlen, 1985, 1990b).

Finally, this analysis only examines one method of achieving redistribution. Other instruments, such as the tax system, might be superior for affecting the redistribution of wealth potentially required for social utility maximization (Kaplow and Shavell, 1994). Indeed, Kaplow and Shavell argue that income taxes are superior to liability rules for redistributing wealth because while both instruments distort people's choice between labor and leisure, redistribution through legal rules imposes an additional cost: it distorts the behavior the legal rule was meant to regulate. They, therefore, conclude that legal rules should focus on efficiency alone (Shavell, 1981; Kaplow and Shavell, 1994).

Recently, Sanchirico (1997) has challenged this conclusion that legal rules need only focus on efficiency because equity concerns are better addressed through the tax system. He argues that even if income taxes are optimal, tort rules may need to take considerations other than efficiency into account if people with different wealth levels respond in different ways to the tort system - for example, if the wealthy are more cautious. In addition, equity considerations may be relevant if wealth differences are explained primarily by income differences and high income individuals tend to be more accident prone. Moreover, complete analysis of the issue of whether taxes or legal rules should be used to serve equity concerns would require analysis of the political economy of legislatures versus judges - of which institution is more likely to adopt an optimal, or second-best efficient, regime (Sanchirico, 1997).

Christine Jolls (1998) argues that the case for using legal rules to achieve redistribution is strengthened once one takes into account well-known features of human behavior that depart from the rational choice model. She argues that if - as experimental research suggests - people are overly-optimistic about uncertain events, exhibit risk-seeking behavior towards losses, and engage in mental accounting, then redistribution through tort liability may distort work incentives less than an income tax. This conclusion undermines a central argument *against* using tort liability to achieve redistributive goals. More research is needed to determine whether behavioral economic analysis argues *in favor* of using tort liability to achieve redistribution, however.

18. Sharing Losses Among Multiple Tortfeasors

Many torts involve multiple tortfeasors. Under current law, generally joint tortfeasors are jointly and severally liable for a plaintiff's losses. This rule holds each defendant potentially liable for the full amount of the plaintiff's losses. Apportionment rules, by contrast, apportion tort liability between defendants in relation to their responsibility for the harm. This raises the issue of how to apportion damages among multiple tortfeasors. This issue is discussed at length in the chapter on Joint Tortfeasors (3200) and thus will only be considered briefly in this chapter.

The standard legal regime holds multiple defendants jointly and severally liable for any losses they cause. This implies that each defendant is potentially liable for the full amount of the victim's losses. Alternative regimes apportion this liability between the defendants.

Under a negligence liability regime, joint and several liability will induce potential injurers to take due care if they are fully solvent (Kornhauser and Revesz, 1989; Landes and Posner, 1980; Landes and Posner, 1987, pp. 190-227; see Shavell, 1987, pp. 164-167). By contrast, if each injurer is only liable for the amount of damage attributable to his own negligence - for example, in a pollution case each is not liable for damage caused by the other person's dumping - then injurers will fail to take due care (Kornhauser and Revesz, 1998, p. 372; 1989).

Kornhauser and Revesz argue that the result is different under strict liability, however. They conclude that neither joint liability nor non-joint liability will cause injurers to take due care (Kornhauser and Revesz, 1989, 1998). By contrast, Shavell concluded that under strict liability an apportionment rule will result in injurers taking due care if they act in concert, but not if they act independently (Shavell, 1987, pp. 164-167, 177-179). For a discussion of apportionment rules when injurers are insolvent see Kornhauser and Revesz (1990). For a discussion of the effect of joint and several liability on settlement see Kornhauser and Revesz (1994a; 1994b).

19. Calculation of and Timing of Damage Awards

19.1 Accuracy in the Assessment of Damages

Litigants often devote substantial effort to establishing the level of harm. The question is, are the costs of increased accuracy socially optimal? Kaplow and Shavell (1996) argue that if injurers know the harms they will cause, accurate damage awards will lead potential injurers to internalize the true cost of the risks they impose, leading to optimal care-taking and activity levels. But if injurers do not know the harms they will cause, then simply knowing that damages are accurate will not induce injurers to engage in optimal behavior.

In this situation, expenditures on accuracy are wasteful, if all we are concerned about is optimally deterring injurers' behavior. Injurers can be optimally deterred by basing damages on the average harm caused. Yet this conclusion does not hold if courts' efforts to assess harms correctly causes injurers to learn more about the expected harms they may cause. At present, however, both parties are likely to have excessive incentives to provide information to courts about harm because litigants have *ex post* incentives to provide information about harm if actual harm is differs from estimated harm, even if this information has no social value (Kaplow and Shavell, 1996).

19.2 Individualized versus Scheduled Awards

Danzon (1984) argues that in products liability cases, the current system of individualized awards should be replaced by a system of scheduled awards, under which a victim's recovery for a particular injury is pre-determined, based on the average cost of such an injury. Rubinfeld (1984) suggests that scheduled awards will not necessarily reduce administrative costs and that the variance associated with individual awards may produce some benefits.

Arlen (1990b, 1993) and Viscusi (1991) also argue for scheduled awards and against basing awards on victims' actual losses. They argue that optimal damages for physical injury should be based on the *ex ante* cost to society of the risk the injurers imposed, and not on the actual victim's *ex post* losses. This proposal differs from Danzon's in that damage awards would depend on the magnitude and nature of the risk imposed - not just on the harm. Thus an injurer's liability for a given loss - for example, wrongful death - would not be a fixed amount but rather would depend on the magnitude of the risk imposed and the nature of the risk (say fire versus being crushed). It might well be, however, that the victim's recovery could be decoupled from the injurer's liability, so that victims who suffer a particular type of harm - say loss of an arm - would receive the same amount. Those who would prefer to receive more could purchase insurance.

19.3 Lump-Sum versus Periodic Damages

Compensatory damages often must cover not only past losses but also future losses, for example future lost wages associated with a serious permanent physical injury. The question arises whether this system of lump-sum awards should be replaced by a system under which awards are made periodically, contingent on the actual amount of the future loss.

Those who support periodic contingent awards argue that contingent awards reduces the calculation problems associated with the uncertain nature of future losses. Rea (1981) argues, however, that the case for lump-sum awards is stronger than it might seem because periodic awards can add substantially to accident costs. First, Rea notes that *ex ante* victims will never be made better

off by switching to periodic awards because a victim who would prefer periodic awards can always transfer a lump-sum award into a periodic award by purchasing insurance. Second, he notes that defendants may be risk averse. A risk-averse defendant will prefer a certain lump-sum payment to uncertain contingent payments with the same expected value. The defendant thus subject to a contingent award will likely purchase insurance. Rea suggests that a system under which the victim obtains a lump-sum award and purchases insurance is preferable to one under which the defendant is subject to a periodic award and purchases insurance (Rea, 1981; see also Schuck, 1990).

19.4 Prejudgment Interest

Because it often takes many years from the time of an injury for a successful plaintiff to receive an enforceable judgment, courts award prejudgment interest. A proper award of prejudgment interest is necessary both to ensure that the plaintiff is fully compensated and that the defendant pays the full cost of the injury. The question is, what is the appropriate rate of prejudgment interest?

Michael Knoll argues that economic and finance theory implies that when the parties have ready access to the capital markets (as publicly traded corporations do) prejudgment interest should be awarded at the defendant's cost of unsecured borrowing. A defendant who is assessed a judgment has in effect borrowed the judgment amount from the plaintiff. As with other loans, the plaintiff is compensated if he receives interest at the defendant's borrowing rate. Because judgment creditors are treated along with other unsecured creditors in bankruptcy, awarding prejudgment interest at the defendant's cost of unsecured borrowing will both compensate the plaintiff and prevent the defendant from being unjustly enriched (Knoll, 1996a). For other articles discussing this topic see Fisher and Romaine (1990), Patell, Weil and Wolfson (1982).

20. Conclusion

Economic analysis has greatly enriched our understanding of damage rules. It reveals that damages serve a complex and multi-faceted role: deterring risk-takers, helping victims spread risks, and compensating them for their losses. Economic analysis reveals how to design tort liability and damage rules to serve these goals. This analysis can guide legislators and courts as they design tort liability and damage rules.

Existing research suggests that at present damage awards for serious personal injury and death generally are not sufficiently large to induce potential injurers to take due care and engage in optimal activity levels. Yet economic analysis also suggests that victims of physical injuries may be receiving too much compensation. This suggests that states should consider decoupling

defendants' liability from victims' compensation.

Economic analysis also suggests that the fact that tort liability for certain accidents is too low does not imply that all damages awards should be increased. Although defendants' liability is too low in some circumstances, existing research suggests that it may be too high in others. A defendant's full costs of risk creation include litigation costs, any market penalties the defendant bears as a result of either the harm or being held liable, and any additional government-imposed sanctions, such as civil penalties imposed by an administrative agency or criminal penalties. These costs must be included in any assessment of whether tort damage rules are adequate. Moreover, more empirical evidence is needed on the questions of what is the optimal *ex ante* deterrence award for different risks, and what are potential victims' preferences for spreading the risk of various losses.

Economic analysis of tort damages also would benefit from additional analysis on why accidents happen in the first place - particularly, why are people negligent? Simple economic models predict that if damages and liability rules are set correctly, no one will be negligent. Yet there is considerable anecdotal evidence - and some empirical evidence - that people are indeed negligent (see Weiler, 1993a, pp. 72-73 showing that doctors are negligent in a substantial portion of cases). The question is why? Is it that damages are too low? Is it that optimal care is set incorrectly? Or are there other forces at work - perhaps informational or institutional problems - that result in the tort system not creating adequate incentives for people to take due care. Economists have explored some of the possible reasons: such as the risk of court error; the possibility injurers will not be liable for their torts; and the fact that many tort defendants are business organizations, not individuals. These and other possible explanations warrant additional analysis.

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