

What is Optimal Compensation for Personal Injury and Death?

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I. Introduction

Economists hired by attorneys to estimate economic losses resulting from accidents (or to criticize the loss estimates of other experts) have as one of their major concerns the construction of estimates that fit the rules of the jurisdiction in which the lawsuit has been brought. Variation exists in both the elements of damages that are recoverable and the manner in which such damages may be calculated, as typified by the following questions:¹

Are damages in the case of wrongful death computed as the loss to the estate or the loss to survivors?

Must payments from collateral sources be deducted from lost earnings to arrive at the net loss?

Is it permissible to discount future losses to present worth?

Are taxes to be deducted from lost earnings?

What adjustment is permitted for inflation in estimating the future loss of earnings?

Is it permitted to include the value of lost pleasures of living as an element of damages over and above an award for pain and suffering?

What deduction is allowed for a deceased victim's own consumption in computing economic losses?

The "hat" worn by the economist in this context is one of the practitioner who uses his or her skills to fashion a damage estimate that fits the constraints at hand. The economist's appraisal of economic losses may or may not include an evaluation of the local jurisdiction's rules and constraints.

A separate but related role for the economist is to evaluate and make recommendations about what elements of damages ought to be compensated and how such

damages should be estimated. This paper examines and evaluates the implications of the "insurance principle" for the elements of damages in personal injury and death cases that ought to be compensated.

To put this paper in context, two perspectives on the question of compensation need to be distinguished. The first is the perspective of Anglo-American tort law--that body of law determining liability for accidents. If one asks "What is the purpose of accident liability?" the tort law perspective (i.e., the perspective of most legal scholars, lawyers and judges) would hold that a very important purpose (if not the purpose) is to provide fair compensation for accident victims. Furthermore, fair compensation is usually defined as making the victim "whole" (in so far as this is possible). This is referred to as "corrective justice" (Schuck, 1988, p. 104) or "perfect compensation" (Cooter, 1991, p. 12; Viscusi, 1992, p. 75).

A second perspective is offered by a branch of the relatively new sub-field of law and economics. This branch might be given the label "the economics of accident liability," or "accident economics" for short. The distinguishing feature of accident economics is the use of the economic models to study the effect of accident law on behavior. In the accident economics perspective, the compensation of accident victims is not viewed as an important purpose of accident liability because there exist other means, at least in modern economies with well-developed insurance markets, to achieve victim compensation through public and private accident insurance. In the opinion of those working in this area, if the tort system did not exist, accident victims could and would still be compensated through these other insurance arrangements. The main effect of the tort system lies not in assuring victim compensation but in the incentives it creates for safety. A significant conclusion in this literature is that, among the various systems that could be devised to induce economic agents to choose the socially correct amount of safety precautions, there are accident situations where the system of accident liability is likely to function better for the control of risk than regulation. To quote Shavell (1987), "...liability possesses unique advantages where a regulatory authority will not be expected to have good information about risk or the occurrence of harm, and where the deterrent inherent in liability will not be seriously weakened by injurers' inability to pay for harm or the possibility that they will escape suit. It is likely that these conditions will hold, and continue to make the system of liability for accidents socially valuable, in a large domain." (p. 298).

Using accident economics, this paper explores aspects of the question of "What is optimal compensation for personal injury and wrongful death?" The effect of the liability system on behavior is analyzed in this literature using the assumption that individuals make choices so as to maximize expected utility. Optimal compensation is based on the "insurance principle," defined to be the level of insurance coverage that an informed person with a socially appropriate level of income would chose to purchase to cover the

risk of injury or death. Following the review in Section II of the use of the insurance principle to define optimal compensation, Section III explores some issues and problems that must be confronted for an evaluation of whether and to what extent the insurance principle should be used to set compensation in practice.

II. Optimal Compensation: Theory

The contribution of economics to the question of optimal compensation is grounded in the notion of maximizing social welfare. Allocating resources to maximize social welfare requires that these resources be allocated so as to achieve efficiency or Pareto-optimality. If an allocation of resources is not efficient, then it must be possible to revise the allocation to improve the welfare of at least one person without harming anyone else, proving that the original allocation could not have maximized social welfare (at least not where, as is usually assumed, social welfare is taken to be a function of the utility or welfare levels of the persons making up society).

What guidance does the criterion of economic efficiency provide in deciding how much compensation the victim of an accident (or that victim's survivors if the victim is killed) should receive? As we shall see, the criterion of efficiency provides general guidance about both the amount that injurers should have to pay and about the compensation that victims should receive; moreover, in accident cases involving death or serious injury, economic efficiency may require that what injurers pay exceed what victims receive.

To describe where the efficiency criterion leads, I follow Shavell (1987) and consider a model in which accidents may cause both pecuniary and non-pecuniary losses. To define these losses clearly, suppose there are three kinds of goods: (i) a composite, or all-purpose, good, which can be thought of as wealth; (ii) a produced good, such as bicycles, washing machines, and the like, that can be produced with c units of wealth; and (iii) an irreparable good, such as art produced by family members, family snapshots, and, important for our purposes, health and one's physical and emotional well-being.² Suppose further that the utility of a person equals:

$$(1) \quad U = W + z + n$$

where W is the number of units of wealth that the individual holds, z is the utility of the produced good (of which it is assumed for simplicity that he demands only one unit, and from which he derives z units of utility, with $z > c$ for the first unit, and $z = 0$ for additional units), and n is the utility of the irreparable good, n . Like the produced good, assume that the first unit of the irreparable good generates n units of utility, but that further units yield no utility.

Assume that accidents may cause victims to lose any of the three kinds of goods and that injurers' care-taking activities involve expending the single good, wealth. Assume further that social welfare depends on the welfare of victims and injurers and that, for simplicity, it is the sum of their utilities.

If an accident causes the loss of a unit of wealth, social welfare is reduced by 1; if a unit of the produced good is lost, social welfare is reduced by the production cost, c . Note that this loss is less than the utility provided by a unit of the produced good, z . Because the lost unit of the produced good can be replaced by giving up c units of wealth, which causes a loss of c units of utility, the loss if a unit of the produced good is lost is c , not z . By assumption, it is socially worthwhile to replace the unit of the produced good because that replacement generates more utility (namely, z) than it costs. If a unit of the irreplaceable good is lost, the loss of social welfare is n .

An accident causing a loss of wealth or a loss of the produced good is said to cause a pecuniary loss, whereas an accident that causes a loss of the non-re producable good is said to cause a non-pecuniary loss. Obviously, many accidents cause both kinds of losses, and this is especially likely for the personal injury and death cases in which the forensic economist is likely to become involved.

I turn now to a discussion of two questions that the accident economics approach endeavors to answer in the context of economic models: "For what losses should injurers be liable?" and "For what losses should victims be compensated?"

For What Losses Should Injurers Be Liable? One of the fundamental results of the application of the efficiency concept to the study of accidents is that for social welfare to be maximized, the level of care-taking by all parties must be such that the sum of accident costs and accident-prevention costs is minimized. (See, for example, Shavell (1987), Chap. 2, or Calabresi) Parties will be led under (a) the rule of strict liability or (b) the negligence rule with a properly set due care standard, to act so as to minimize the sum of accident and accident- prevention costs if the liability (i.e., what injurers are required to pay) is equal to the total loss caused. The total loss is the sum of pecuniary and non-pecuniary losses. Failure to hold injurers liable for the total loss may result in too few resources being devoted to safety precaution and care-taking.

As an example, suppose that a typical accident causes the loss of 5 units of wealth, one unit of the produced good with a market price of 10 and a loss of a unit of the irreparable good that the victim values at 20 units of wealth. The accident therefore causes a total loss of 35 units of wealth = 35 units of utility. If the injurer only has to pay damages for the loss of wealth of 5 and the loss of the produced good of 10, the liability of

15 falls short of the total loss of 35. If damage payments are the only source of deterrence, precaution-taking will be chosen so as to equate incremental care-taking costs with incremental care-taking benefits, where these benefits come in the form of reductions in the damage claims injurers expect to pay, based on accident losses of 15 rather than 35. Some safety measures that would be adopted where the expected liability is 35 will be too costly to adopt when the expected liability is only 15.

In most situations, it is more difficult for the courts to determine the monetary value to place on non-pecuniary losses, as compared to pecuniary losses of wealth or producible goods. Pecuniary losses equal the loss of wealth itself or the cost of replacing producible goods, which, in competitive markets, equals the price of the good. The court does not have to concern itself with measuring the utility the consumer received from a destroyed unit of the producible good, only the cost of replacing it. Hence, the pecuniary losses caused by accidents are relatively easy to measure. Such accidents do not pose severe problems in having liability set at a level that calls forth the appropriate level of care-taking. Non-pecuniary losses are much more difficult to measure and may not be worth trying to measure if such losses are small because taking them into account would impose additional costs of measurement that exceed the value of the damages being measured.

As an example of an accident causing primarily a pecuniary loss, suppose a UPS truck pulls into a driveway and hits a child's bicycle. This accident causes a purely pecuniary loss and the injurer should be faced with a loss equal to a monetary payment that is large enough either to repair the bicycle or to purchase an identical replacement (if the bicycle is "totaled," meaning that its cost of repair exceeds the price of a new bike.) An action exists that will restore the victim to the original level of welfare. Requiring that the injurer pay this level of compensation also serves to provide the appropriate incentive for precautions to be taken in the future.³

Accidents that cause significant non-pecuniary losses pose problems of measurement because there are no direct markets for the losses and, therefore, some indirect means must be used to place a dollar value on what has been lost. For the most serious non-pecuniary losses involving death or serious personal injury, there is a lively controversy and large literature about whether and how such damages can be estimated using indirect market measures and hypothetical questions to place a dollar value on such losses. (A useful collection of papers is provided in Ward.) From the point of view of optimal deterrence, estimates derived from willingness-to-pay for risk reduction provide the best conceptual way so far available to arrive at these values. However, here is also where the gap between what ought to be paid by injurers and what ought to be received in compensation appear to diverge the most.

To illustrate this point, suppose a child is killed in an accident involving defective play equipment. If the jurisdiction in question limits liability to the pecuniary losses of the parents from the death of the child, the average liability will normally be very low. This is because it is unusual in our modern western culture for children to provide significant financial support to their parents, yet it is common for parents to devote significant resources to rearing children. Hence, the death of a child is likely to generate a financial gain to the parents. The small liability so calculated may provide the manufacturer of the play equipment with inadequate incentive to devote resources to safety. I say "may" rather than "will" because there could exist other mechanisms, such as regulations that require the manufacturer to recall all units of the defective play equipment, which expose the firm to other potential costs that serve to induce precaution over and above that which is induced by the prospect of being held liable for damages for the death of a child in a specific lawsuit. In addition, the manufacturer may not be able to affect the relative probability of a fatal vs. a non-fatal accident. When a non-fatal accident severely injures a child, most jurisdictions would allow an award for the present value of child's lifetime earnings and fringe benefits, as well as the future cost of medical and personal care. The sum of these components of loss can run into the millions of dollars. Still, if the difficulty in calculating the additional non-pecuniary losses leads these losses to be ignored or minimized, there may be inadequate incentives for safety. If risk-reducing activities by the manufacturer reduce the chances of fatal and non-fatal accidents in fixed proportions, the expected value of such activities to the firm is clearly lower than true social losses if the firm is not held liable for the non-pecuniary losses associated with a child's death. And if there are opportunities for producing reductions in the risk of fatal and non-fatal accidents in variable proportions, then manufacturing firms will devote relatively too many resources to reducing the risk of non-fatal accidents and too few to reducing the risk of fatal accidents.⁴

For What Losses Should Victims Be Compensated? To determine optimal compensation, accident economics draws on the literature describing individual choice under uncertainty and, in particular, the use of that theory of choice to explain the purchase of insurance. (See, for example, Ehrlich and Becker, 1972; Shavell, Chaps. 8-10) The most widely-used theory of choice under uncertainty holds that individuals make choices so as to maximize expected utility. If a person is averse to risk, then that person will be made better off if offered the opportunity to insure a risk at fair odds. Optimal compensation from the viewpoint of this theory is now examined. Consider the following set of possible levels of compensation of an individual who has been the victim of an accident involving both pecuniary and non-pecuniary losses:

(a) the amount required to compensate for all pecuniary losses (lost wages, fringe benefits, medical expenses, repairing or replacing damaged property, and lost household services for an injury case; these items less the decedent's personal consumption in a death case.)

(b) the amount required to make the person whole, or restore the person to the original level of well-being, if possible; compensation is made for all pecuniary losses in definition (a), and there is additional compensation for any pain and suffering, emotional distress, and for the loss of life's pleasures.

(c) the insurance coverage that a rational, well-informed individual with a socially acceptable level of income would have bought.

In a highly simplified model, Shavell (1978) has explored the relationships between (a), (b) and (c). He shows that the optimal amount of insurance coverage chosen by the individual may be less than what would be needed to make the individual whole and perhaps even less than the purely pecuniary losses. The relationship between (a), (b) and (c) depends on the type of accident (i.e., mild, severe, or fatal, and if non-fatal, the exact type and duration of the injuries), and on the relationship between the person's utility function in the no-accident state of the world as compared with the person's utility function conditional on having the accident.⁵ If the utility of wealth when the accident does not occur, $U(y)$, exceeds the contemplated utility of wealth if the accident occurs, $V(y)$, and if, in addition, the marginal utility of wealth, $U'(y)$ exceeds $V'(y)$, for all levels of y , then the optimal amount of insurance chosen (which is the amount of insurance needed to equate the marginal utility of wealth in both states of the world) will be insufficient to cover all pecuniary losses, much less pain and suffering. If $U'(y) = V'(y)$ for all y , then coverage will equal pecuniary losses but there will be nothing for pain and suffering. Finally, if $U'(y) < V'(y)$ for all y , then the individual will obtain more coverage than necessary to compensate for purely pecuniary losses and some compensation (perhaps even enough to more than make the individual whole) will occur for pain and suffering. Shavell speculates that it is plausible that $U'(y) = V'(y)$ for an accident that does not result in permanent disability. For moderate permanent disabilities, he regards $U'(y) < V'(y)$ as a possibility. In cases of severe disability (the person is a "vegetable") or death, he regards $U'(y) > V'(y)$ as likely, implying less than complete insurance coverage even for pecuniary losses.

The relationship among (a) compensation for pecuniary losses, and (b) compensation sufficient to make the individual whole, and (c) optimal insurance coverage, can be presented as follows: Let p be the probability of an accident, the severity of which could vary from a non-permanent, mild injury, to a fatal accident. Let the pecuniary loss caused by the accident be given by z . Further, let $U(y)$ be the utility of wealth function if there is no accident and $V(y)$ be the utility of wealth if there is an accident. Further assume that the individual is a von Neumann-Morgenstern expected utility maximizer who is risk averse, meaning that U and V are concave functions. Let c^* be the optimal amount of insurance coverage that the individual chooses to buy paying a premium of pc^* (assuming actuarially fair insurance). Finally, assume that the accident is a source of disutility so that

$U(y) > V(y)$, for all y . That is, assume that for any level of income, the individual has a higher utility level in the no-accident state in comparison to the state of the world where the accident has occurred. The expected utility that is to be maximized is given by:

$$(1) \quad (1-p)U(y - pc) + pV(y - pc - z + c)$$

To maximize expected utility, it is necessary that marginal utilities be equated in both states of the world:

$$(2) \quad U'(y - pc^*) = V'(y - pc^* - z + c^*)$$

To allow comparisons with the case where the person is "made whole," define c^{**} as the amount of coverage - if such a c^{**} exists - that will equate total utility in the two states of the world:

$$(3) \quad U(y - pc^{**}) = V(y - pc^{**} - z + c^{**})$$

Given this structure for the problem, a number of conclusions can be drawn. First, the amount of insurance needed to compensate purely pecuniary losses, z , is less than what is needed to make the person whole, c^{**} . This is due to the assumption that $U(y) > V(y)$, for all y . If $z = c^{**}$, (3) reduces to the statement that $U(y - pc^{**}) = V(y - pc^{**})$, which contradicts $U(y) > V(y)$, for all y . Hence, z must be less than c^{**} . The positive difference, $c^{**} - z$, compensates for "pain and suffering."

Second, of critical importance is the relationship between the marginal utility of income in the two states of the world, $U'(y)$ and $V'(y)$. Accidents that involve only modest pecuniary and non-pecuniary losses (e.g., a bruised and cut arm that totally heals in one month) are unlikely to cause much of a change in the utility of money, meaning that $U'(y) = V'(y)$. Some accidents may cause a person to value money more. Being crippled may result in an enhanced need for money, even after being compensated for medical expenses and lost earnings. If $U'(y) > V'(y)$, for all y , which seems very plausible for accidents causing severe permanent or death, (2) combined with diminishing marginal utility (concavity) imply that optimal coverage, c^* , must be less than the pecuniary loss, z . Hence, the relationship $c^* < z < c^{**}$ holds, and even pecuniary losses will not be fully insured, much less pain and suffering. If, alternatively, $U'(y) = V'(y)$, for all y , then by (2) and concavity, $c^* = z$. Pecuniary losses are fully insured, but the insurance coverage falls short of compensating for pain and suffering. Finally, if $U'(y) < V'(y)$, c^* will exceed z , meaning there will be some coverage of pain and suffering. In fact, c^* could conceivably exceed c^{**} , with utility being higher with the accident and compensation than if the accident did not happen, but this would seem to be unusual.

Is there evidence about how $U'(y)$ and $V'(y)$ compare for different types of accidents? Using survey data on worker responses to questions about extra wages needed to compensate for the added job risks of working with hazardous chemicals, Viscusi and Evans (1990) find that $U'(y) > V'(y)$, meaning that utility is higher in the no-accident state, and that the ratio of $V'(y)$ to $U'(y)$, evaluated where wealth is identical, is 0.78 using one estimating technique and 0.93 using another. Using the 0.78 estimate of $V'(y)/U'(y)$, the implication is that with full insurance of the financial losses of a serious work injury (full insurance equates wealth in both states of the world), an extra dollar in the accident state of the world has a value 22 percent less than it does in the no-accident state of the world. Hence, Viscusi and Evans find that optimal insurance coverage for serious work-related injuries would cover less than the pecuniary losses. In the notation of the previous theoretical discussion, c^* is less than z .

The results by Viscusi and Evans pertain to serious work-related injuries. If chemical workers are no different from the average person in society, it would seem plausible that for fatal accidents, $U'(y)$ is greater than $V'(y)$ to an extent even larger than is true for serious work-related injuries. A person might buy life insurance to cover pecuniary losses that would be sustained by dependent survivors, but not to compensate for pain and suffering prior to death or for the loss of enjoyment of life itself. The intuition for this result is that such additional insurance coverage would reduce the consumer's expected utility by shifting money to the state of the world where it is least needed (where the consumer is dead) from a state of the world where it is needed more (where the consumer is alive and able to enjoy money). Hence, we might expect that if $V'(y)/U'(y) = 0.78$ for serious injuries, this ratio would be even lower (e.g., 0.40) for the death of a wage earner, and even lower still (e.g., 0.10) for the death of a retiree or a child.

Care must be taken, however, regarding the precise content of what is covered by the term "pecuniary loss." A pecuniary loss could mean anything that money would be helpful with, including household help, personal care, an experimental new drug, or other medical approaches, or it might include only "standard medical care" and loss of wages and fringe benefits. This distinction is made because advances in technology that generate new and expensive medical treatment and computed-assisted devices to help an injured person with daily life could mean that $U'(y) < V'(y)$ is true for an increasing array of injuries. Who would want to be stuck in a situation with a severe disability that could be greatly helped by expensive new technology but not have the money to buy it? The advance of knowledge may mean that an ever-widening array of injuries fall in the category for which $U'(y) < V'(y)$.

Divergence Between Optimal Victim Compensation and Injurer Liability. What then do these theoretical and empirical results imply about the size of optimal compensation? The most general conclusion is that awards that are optimal from the standpoint of

deterrence are not optimal from the standpoint of compensation. The socially ideal solution to the accident problem would have victims receive in compensation an amount equal to the losses they would purchase with actuarially fair insurance. This amount of compensation would not include non-pecuniary losses since risk-averse individuals with $U'(y) \geq V'(y)$ would not choose to insure such losses. However, for injurers to take appropriate precautions for safety, they have to face the prospect of paying the full value of losses. Denote the optimal amount that a victim should receive, based on the insurance principle, as R , and denote the amount that the injurer should pay as P . Since $P > R$, it is not possible for an optimal solution to be achieved, since an award of P implies over insurance and an award of R gives insufficient incentives for safety precautions.

A good example of this dilemma arises in death cases. It is virtually certain that in the case of the death of a young child, pecuniary losses, calculated as a loss to survivors, will be small and far below the total of pecuniary and non-pecuniary losses. Moreover, it is well known that little life insurance is bought for children, since this would shift money from a state of the world where the child lives and needs support and education to a state of the world where the child is dead and family needs are smaller. Awards that optimally compensate parents, in line with the insurance they would purchase on the life of the child, would provide too little incentive for safety.

One solution to this problem is to allow fines to be imposed on injurers in the amount F , such that $R + F = P$. In that way, injurers would take proper care and, at the same time, victims would not be overcompensated. From a system in which victims were paid P , it should be possible to institute fines on injurers and win the consent of such a change from all potential victims, who could be induced to favor the change by a reduction in taxes (or the payment of rebates) made possible by the collection of fines. The tax reduction or rebate would be analogous to a reduction in an insurance premium when insurance coverage is reduced to a more modest level. That potential victims could be induced to switch from the prospect of being paid P to the prospect of receiving only R plus a tax reduction or rebate via fines of size $P - R$ is only possible because an award of P represents too much insurance, in light of the insurance principle.⁶

An alternative solution suggested by Rubin (1993) for situations in which parties involved have a pre-existing relationship (product liability, worker, or mal-practice) would be to allow potential victims and injurers to enter into contracts regarding damages that specify the types of losses (e.g., pecuniary but not non-pecuniary) that could be claimed and any other particulars to which the parties can mutually agree. Rubin (1993) predicts that in such contracts consumers ex ante would not want payments for nonpecuniary damages should an accident occur. Rather, they would prefer to negotiate away the right to be paid such damages in exchange for lower prices for products. However, consumers would presumably only wish to make such a deal if they also felt that there were other

incentives for safety that would cause product suppliers to face the full cost of accidents and make decisions about safety accordingly. Rubin's position is that the current system in which non-pecuniary damages can be awarded provides excessive incentives for safety (at least in the area of product liability); hence, reducing damage awards corrects not only the forced purchase of excess insurance by consumers but also the currently-excessive incentives for firms to engage in safety precautions.

III. Issues

The foregoing summary of some of the major theoretical conclusions from the literature on accident economics raises a number of issues:

1. Is expected utility theory (and the associated conclusions about the types of losses individuals will and will not want to insure) correct? Is there evidence that confirms or disconfirms the theoretical predictions that flow from the insurance principle?
2. If compensation should be based on the insurance principle, what must be known to put the proffered guidance into practice?
3. If compensation payments are to be limited in the way that the insurance principle suggests, what assurance is there that injurers will have the incentive to undertake the appropriate level of safety precautions?

1. The Validity of Expected Utility Theory and the Theory of Insurance. The foregoing discussion of insurance suggests that consumers would typically not want insurance to compensate for certain kinds of losses: pain and suffering, emotional distress (to the extent this can be distinguished from pain and suffering), loss of life's pleasures through death or severe disability, death of a child, and earnings capacity (as opposed to expected earnings). Indeed consumers may even choose not to fully insure pecuniary losses. Rubin (1993) notes but cites no data to support that most consumers insure their homes against fire (a largely pecuniary loss, though there are clearly nonpecuniary losses involved in the burning of one's home, even if no persons or pets are injured or killed). However, most fire insurance (i.e., homeowners insurance) is required by mortgage holders as a condition for obtaining a mortgage. It would be interesting to see how many would have this insurance if it were not required when a home is first purchased. In addition, many carry life insurance, but the level of coverage in force in 1991 ranged from a low of \$67,000 per household in West Virginia to a high of \$267,000 in Washington, D.C., with a United States average of \$102,700. (1992 Life Insurance Fact Book, p. 23) These amounts include ordinary, group, industrial and credit life insurance policies. Median household income in 1991 was \$30,126. (Money Income, P-60, No. 180, Table A) Even if the household income is split evenly between two earners (yielding earnings of

\$15,063 each), the average amount of insurance is too low to replace even the pecuniary losses arising from the death of the average wage earner. And this holds a fortiori for "earnings potential," which is usually taken to be an amount that exceeds expected earnings. Hence, the theory is not contradicted by the life insurance coverage in force. The national debate over health insurance has revealed that most people (i.e., all but the now-famous 37,000,000) carry health insurance. Data are not available (to the best of my knowledge) showing the amount of life insurance carried on children, nor are there any data to establish that few carry insurance against pain and suffering. The lack of such data may serve to confirm that pain and suffering insurance is not sold. However, the problem may exist not on the demand side of the market but on the supply side: perhaps insurance companies do not offer such insurance because of moral hazard: if there is no independent way to test how much pain, suffering and psychological distress a person is experiencing except by asking, then firms will be reluctant to sell such insurance because of excessive claims. Or, put differently, the very high premiums that moral hazard would cause to be charged for such insurance would choke off demand. Overall, there appears to be a broad correspondence between the facts about the kind of insurance people buy and the predictions of the theory. However, this correspondence may only be superficial and not stand up to close scrutiny.

A survey of expected utility theory by Schoemaker and a recent book by Thaler (1992) provide some pertinent thoughts about the validity of expected utility theory generally. Schoemaker concludes his 1982 survey of the literature on the expected utility model as follows: "The research reviewed in this article suggests that at the individual level EU [expected utility] maximization is more the exception than the rule, at least for the type of decision tasks examined" (p. 552). Hypothetical experiments find violations of the axioms of EU theory. In addition, studies of real-world data on choices regarding the purchase of flood and earth quake insurance do not appear to be consistent with the theory. Kunreuther et al. (1978) found that a majority of eligible homeowners in flood plains were uninsured in spite of Federal subsidies of up to 90 percent of premium costs. Based on interviews with a sample of homeowners in flood plains and in earthquake areas, over half were not well-informed about the availability of insurance against these hazards; of those who were informed, a substantial fraction (30 percent for earthquake insurance and 40 percent for flood insurance), acted contrary to the prediction of EU maximization. There were controls for expected relief from government agencies. There seems to be an inability of people to process information on low-probability, high loss events. In view of his review of the evidence regarding the EU model as a description of how people behave, or as a normative model of how they ought to behave, Schoemaker remarks that "...an extreme but tenable attitude is to view the EU model as an interesting theoretical construction which is useless for real-world decision-making." (p. 556)

Thaler, in examining the phenomena of "preference reversals," notes that

psychologists have found that "...different methods of eliciting preferences give rise to different preference orderings." (p. 80) Experimental evidence on the phenomena of preference reversals suggests two conclusions: "First, people do not possess a set of pre-defined preferences for every contingency. Rather, preferences are constructed in the process of making a choice or judgment. Second, the context or procedures involved in making a choice or judgment influence the preferences that are implied by the elicited responses." (p. 90)

These empirical findings and criticisms of expected utility theory suggest skepticism is warranted about theory's explanations of insurance-purchasing behavior. The failure of consumers to purchase subsidized flood and earthquake insurance gives one pause about wholeheartedly believing the explanation provided by EU theory for why other types of insurance are bought or not bought.

Putting the Proffered Guidance into Practice. The insurance principle provides certain qualitative conclusions about the kinds of losses individuals who maximize expected utility will want to insure, and whether the amount of insurance will provide full or only partial coverage for certain losses (e.g., as when it is found that a person chooses a level of insurance that will not even cover all the pecuniary losses, much less pain and suffering). The kind of information yielded by the theory is sufficient to conclude that, under certain conditions, people will not insure non-pecuniary losses. The information provided is not sufficient to indicate what dollar level of coverage the person would have chosen. Hence, the theory provides no more than qualitative guidance about what losses should and should not be compensated. And where the theory predicts that even pecuniary losses will not be completely covered (i.e., where $U'(y) > V'(y)$), there is no guidance about what fraction of the purely pecuniary losses (e.g., wages, fringe benefits, medical costs) that it would be optimal for the person to buy.⁷ More over, this optimal choice would depend on the amount of employer-provided coverage and other variables. Also of pertinence would be the question of whether collateral source and subrogation rules apply. Hence, this general theory provides no real guidance in a specific personal injury or death case about the amount of insurance that the victim would have found optimal, and therefore the amount that the victim should receive in compensation. In addition, if people do not follow the EU model in making choices, then it is not clear how much guidance the theory ought to be allowed to provide in setting compensation amounts. Perhaps it could be argued that even if people do not follow the EU model, they ought to! But this puts someone else in charge of deciding how much insurance the person should have bought, given their circumstances, and we are clearly in "never-never" land. Hence, the most the insurance principle does is provide guidance about the kinds of losses that a person would choose or not choose to insure, and therefore a loss that should and should not be compensated. Without further quantitative information, one would presume that if a loss, like wages, should be compensated, it should be compensated at 100 percent.

Will Injurers Have the Correct Incentive to Take Care? A number of criticisms of the system of tort liability and proposals for tort reform rely on the insurance principle as providing an important reason for not compensating non-pecuniary losses. Examples are Calfee and Rubin (1992, 1993), Frech, and Ireland and Rodgers (1993). Even if the conclusions of the EU model of insurance are regarded as reliable, there remains the question of whether safety incentives are sufficient when damages paid by injurers are reduced below the level of losses suffered by victims. To avoid underprovision of safety, the injurer must face the prospect of paying the full cost of the losses caused, whether through a fine that makes an injurer's payment exceed the victim's compensation, or through some other avenue through which the uncompensated losses of victims are taken into account. In the case where there are prior relationships between the injurer and victim (product liability, work injury, medical or other mal-practice), there may be varying degrees of regulation and market effects that serve as incentives for safety, over and above those provided by the prospect of a having to pay a jury award or out-of-court settlement. Calfee and Rubin (1993) and Rubin (1993) strongly emphasize that jury awards are not the only source of deterrence. They mention the wage premia that are paid for working in more hazardous jobs (from which many of the estimates of the hedonic value of life are derived), and the reputational effects of a product recall on the value of a firm's stock. While these effects certainly enhance safety concerns of firms, more research is needed to determine whether these effects, added to those caused by lawsuits seeking pecuniary damages, would bring about the correct amount of safety precautions by firms.

While the current system of tort damages does provide for pain and suffering awards, such awards may frequently be a disguised method by which the jury can help the plaintiff cover his or her legal fees, which may approximate a third or more of an award. Hence, the current system may provide for compensation that is very near to that which the insurance principle would recommend, with pain and suffering awards being a means of forcing the injurers to pay a winning plaintiff's legal bills. But this is a matter that surely requires additional research.

FOOTNOTES

1. A good review of the interstate variation in damage elements and calculation requirements is found in Brookshire and Smith, 1990, Chapter 12.
2. Because of advances in medical knowledge and technology, what is irreparable at one point in time may be replaceable at another point in time. As an example, transplant surgery makes certain organs replaceable today that were not replaceable in the past.
3. If a perfect substitute for the damaged bike does not exist, then it would have features of

an irreparable good, and the true loss may be the cost of repair even though repair costs more than replacement. In particular, if r is the repair cost, c is the replacement cost of a bike that is an imperfect substitute for the one damaged, u is the utility of the damaged bike and s is the utility of the next best substitute, repair is desirable if $r < u - s + c$. (Shavell, p. 157) Repair is more likely to be optimal the more imperfect the substitute good, which enlarges the size of $u - s$; if $u = s$, goods are perfect substitutes and repair is optimal if it is less expensive than the cost of replacement, c .

4. Sloan, et al., 1993, p. 191, indicates that in medical mal-practice suits involving birth-related injuries, the next most severely injured survivors received compensation averaging \$1.7 million, whereas the most severely injured survivors received an average compensation of \$1.4 million. The most severely injured received somewhat less because these children had a reduced life expectancy. An average of \$127,000 was received by parents making claims as a result of having a child die in the hospital.

5. Early papers that explored the effect of having utility functions be different in different states of the world include Arrow, Cook and Graham, Spence and Zeckhauser.

6. Attorneys fees typically take a third of an award for personal injury or death, meaning that the plaintiff gets two-thirds of the total award. Thus attorneys fees themselves create a wedge between what the injurer pays and what the plaintiff receives. However, this wedge is a kind of transaction cost that, like middleman fees, is hopefully driven down to the competitive level by competition among attorneys.

7. However, the evidence collected by Viscusi and Evans could be used to provide a more specific range of values.

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