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CHANGES IN TIME IN LAW OF LIABILITY AND DAMAGES

- 1) Report: Liability Perspectives and Policy

CHANGES IN TIME IN LAW OF LIABILITY
AND DAMAGES

Liability

Perspectives and Policy

ROBERT M. LITIAN
and
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Editors

Liability

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Perspectives and Policy

Robert E. Litan and Clifford Winston
editors

The Brookings Institution
Washington, D.C.

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Foreword

IN RECENT years the United States has witnessed an unprecedented growth in personal injury lawsuits. State and federal courts have been flooded with litigation involving medical malpractice, unsafe products, and environmental hazards. Jury awards and out-of-court settlements for medical expenses, income losses, and the pain and suffering of victims have routinely amounted to hundreds of thousands of dollars. At the same time, premiums for liability insurance have risen steeply, and some companies have refused to cover new clients or withdrawn coverage entirely. These developments have threatened the functioning of the entire civil litigation process and touched off a national debate over what should be done to bring order to our system of dealing with personal accidents and injuries. Some critics have urged fundamental reform of the civil liability system to limit awards. Others have contended that more extensive regulation of the insurance industry would reintroduce stability.

In this book Robert E. Litan, Clifford Winston, and a team of economists and lawyers evaluate the issues underlying this debate and suggest policies to ameliorate the problems of both the courts and the insurance industry. They examine the functions of tort law in providing compensation and deterring harmful behavior, the apparent liberalization of tort doctrines that has contributed to higher damage awards and affected the availability and cost of insurance, and the ways in which changes in the system have affected the provision of medical services, the development of safer products, the maintenance of safety in the workplace, and the protection of the environment. The authors also identify critical gaps in knowledge that need to be filled before any sweeping changes can be advanced. Thus, although they provide specific policy recommendations,

they are cautious about calling for radical changes, such as replacing the tort system with broad administrative compensation programs, unless sound evidence supporting such programs becomes available.

Robert E. Litan and Clifford Winston are senior fellows in the Brookings Economic Studies program. Robert Litan is also counsel to Powell, Goldstein, Frazer and Murphy. Other contributors are John Calfee, assistant professor of management, University of Maryland; Patricia M. Danzon, professor of health care systems, University of Pennsylvania; Scott E. Harrington, associate professor of insurance, University of Pennsylvania; Peter Huber, private consultant, Washington, D.C., and senior fellow, the Manhattan Institute; George L. Priest, professor of law, Yale University; Peter Swire, associate, Powell, Goldstein, Frazer and Murphy; and W. Kip Viscusi, professor of economics, Northwestern University.

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BRUCE K. MACLAURY
President

April 1988
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The U.S. Liability System: Background and Trends

Robert E. Litan, Peter Swire, and Clifford Winston

THE AMERICAN civil litigation system, in recent years, has been placed on trial. Critics charge that the explosive growth in the number of liability lawsuits, coupled with dramatic increases in jury awards and settlements, has caused an insurance crisis—steeply higher premiums for liability insurance and, in some instances, coverage curtailed or withdrawn. For many lines of commercial liability insurance, including products liability and medical malpractice, premiums have skyrocketed in just a few years. For other lines, notably those covering nurse-midwives, municipalities, and day care centers, coverage is simply no longer available in some areas. As a result, the crisis may be dampening productivity growth and pushing up prices for a broad range of goods and services, crippling the international competitiveness of the American economy at a time when it can ill afford it. Only fundamental reform of the nation's civil justice system, critics warn, will make liability insurance more available and affordable.

This outlook is not universally shared. Skeptics acknowledge that property and casualty insurance companies suffered unusually large losses in 1984 and 1985—\$1.9 billion and \$3.8 billion, respectively—but they attribute these setbacks to excessive rate cutting in earlier years and to falling returns from the industry's portfolio investments. These critics also deny that the civil justice system needs fundamental overhaul. The liability insurance industry, they charge, has launched a "tort reform" campaign to cover its own underwriting mistakes and even perhaps its collusive behavior. The only reform required in their view is more intensive regulation of the industry.

The controversy is not a new one. Public concern over the efficiency and fairness of the civil liability system ebbs and flows with the apparently cyclical performance of the property and casualty insurance industry. The

previous insurance "crisis," for example, occurred in the mid-1970s, when liability premiums also escalated and coverage was curtailed. The events prompted Congress and state legislatures to examine possible reforms to the nation's tort laws. But relatively little change at either the federal or state levels resulted.

More has happened during the current crisis. Although Congress has thus far failed to agree on any reforms to the civil justice system, most states have recently modified their liability laws—imposing caps on awards and adjusting tort doctrines so that they do not unduly favor plaintiffs—in an attempt to reduce liability costs. In the meantime, however, many customers have abandoned their insurers and chosen to form insurance syndicates of their own or even to self-insure. This has led to a vicious cycle. Because the customers who drop their insurance tend to be low-cost risks, insurers are left with servicing higher-risk customers. This "adverse selection" process forces premiums up still further and in turn induces still more low-risk customers to seek alternative ways of meeting their liability costs.

Nevertheless, calls for reforming the system of civil justice are less urgent now than they have been in recent months. As in previous insurance cycles, increases in premiums have moderated. In some instances, coverage that was withdrawn has reappeared. In 1986 the property and casualty industry earned 11.6 percent on its equity, a return lower than the manufacturing sector average of 13 percent during the past decade but still considerably better than the disappointing performance of the previous two years.

The issues raised by the most recent crisis, however, will not disappear. If nothing else, the dramatic increases in premiums and curtailments of coverage have called greater attention to the nation's civil justice system—whether it is working satisfactorily, and if not why—than at any point in recent memory. Moreover, interest in these issues will intensify if and when the underwriting cycle reverses course and turns against the industry once again.

It is essential therefore that there be a framework within which to evaluate and develop policies that merit consideration. This book attempts to supply that framework by bringing together analyses of the major issues raised by the recent crisis. It also examines certain underlying causes of the recent dramatic changes in insurance markets, assesses the merits of conflicting opinions, and identifies critical gaps in knowledge that must be filled before fundamental disputes can be resolved and sound public policy developed.

The Changing Function of Tort Law

Injuries pose three different and potentially conflicting challenges for all societies. One is efficiently to *deter* behavior that causes injuries. A second and related objective is to exact *retribution* against those responsible. Most societies use some combination of criminal and civil penalties—jail sentences and fines—to meet these goals. The third challenge is to *compensate* victims for their injuries. Compensation may be supplied by the government or by the private sector (through insurance), and may or may not be linked to specific injuries or types of accidents. *Tort law*—rules allowing accident victims to seek compensation through the judicial system from the parties responsible—can be considered a mechanism for meeting all three of these challenges.

Tort rules will efficiently deter accident-causing behavior if responsibility for the costs of injuries is imposed on those who can avoid or prevent accidents most cheaply. If they are well designed, liability rules encourage “cheapest-cost avoiders” to take efficient precautions, unless it is less expensive simply to pay for the cost of injuries. For example, suppose that the plaintiff in a lawsuit could have avoided a \$10,000 injury only by taking precautionary measures costing \$1,000 but that the defendant manufacturer could have avoided the accident by spending just \$100. Holding the defendant—the cheapest-cost avoider—responsible for the costs of the injury would encourage others similarly situated to take efficient precautions to prevent future such accidents.

Of course, tort law administered in this fashion imposes higher costs on those whose activities entail the risk of injury—say, manufacturers of hazardous substances—which requires them to charge higher prices on their products or services to cover the costs of preventing future accidents. Some producers or organizations might even decide not to offer certain products or services because of the liability risks. But if producers and other participants in the economy are not charged for the costs they impose on others through accidents and injuries, resources will be misallocated toward activities that create or perpetuate risks.

Tort law also provides a means for compensating injured parties or *spreading losses* by making individuals or firms with greater resources, either on their own or through their liability insurance policies, pay for the costs of injuries. Misfortune can strike suddenly and unpredictably. A car accident can paralyze and forever change the life of an injured driver or passenger. A drug once thought to be totally safe can later be discovered to cause cancer among many who use it. All societies must choose how

these and similar losses should be borne, either solely by victims or spread in some way among other parties.

One method for spreading losses is to have government-administered (and taxpayer-financed) programs for compensating injured parties, as is the case in New Zealand and Sweden and to a limited extent in the United States through the disability component of the social security system. Compensation through the tort system is an alternative means. In practice, tort law administers compensation through private third-party insurance, which individuals and firms purchase to cover the costs they might owe to injured victims. Liability insurance spreads losses not only among all policyholders but, in the case of business purchasers, among consumers, in the form of higher prices of products or services, and workers, in the form of lower wages. If premiums are based on experience or risk, liability insurance can also deter activities that create risks.

A third objective of the tort system is to exact retribution against wrongdoers regardless of cost. The idea here, of course, is that justice requires wrongdoers to pay a price for their harmful behavior. Criminal laws are designed to accomplish this by punishing those who intentionally inflict harm on others. Many legal scholars argue that the common-law tort system, which requires negligent parties to compensate those they injure, should also be used to assign culpability. Given its focus on the economic functions of the civil liability system, however, this book concentrates primarily on the objectives of deterrence and spreading loss.

As it turns out, these two objectives can conflict. If individuals may recover only those losses that defendants could more cheaply avoid, then the loss-spreading function of the civil liability system will be limited. In particular, injured parties who could have avoided their accidents more cheaply than potential defendants may receive no compensation at all, even in cases where the defendants may have been able to take practical preventive measures. Conversely, if the system is to be used liberally to spread losses, many individuals and firms will be forced to bear costs they may have no way of preventing. Thus, for example, losses may be easily spread by requiring manufacturers to pay for injuries that scientists may some day link to their products. But if the manufacturers have no way at the time to prevent the injuries, then requiring them to shoulder the cost many years later will do nothing to promote deterrence.

The discussions in this book broadly suggest that, in fact, changes in tort law and the growth of third-party insurance during the past two decades have sharply increased the use of the tort system to spread losses, but at the cost of reducing the system's ability to deter harmful activities

efficiently. It was not always this way: a variety of tort doctrines formerly limited the ability of plaintiffs to recover. From the mid-nineteenth century until very recently, for example, plaintiffs could win a tort action only by proving that their injuries were "proximately caused" by the defendant's negligence or by behavior that a "reasonable man" would not have displayed. And plaintiffs could only recover for purely economic damages or medical costs and lost income; they could not be compensated for pain and suffering or emotional distress. At one time, plaintiffs injured by defective products could recover only from the retailers from whom they purchased the products (in legal terms, those with whom they were "in privity"), not from manufacturers. Even when defendants were negligent, plaintiffs could not recover at all if through their own negligent conduct they contributed to their predicament. And some potential defendants, notably federal, state, and local governments, were immune from suit.

Americans have gradually grown more receptive, however, to using the tort system as a vehicle for compensation. Having enjoyed significant advances in living standards, many Americans could afford to pay more attention to the environmental, health, and safety effects of industrial growth. In the 1960s and 1970s Congress responded by authorizing major programs to regulate exposure to harmful substances in the workplace, in products sold to consumers, and in the general environment.¹ During the same years, judges and juries eased the availability and raised the levels of compensation provided through the tort system. Finally, individuals have increasingly sought compensation from the courts because existing insurance policies or government compensation funds have offered less generous compensation prospects.

The increasing importance of the loss-spreading objective of the tort system has been manifested in three ways. Changes in tort doctrines have made it easier for plaintiffs to recover in any given litigation. Successful plaintiffs in certain classes of tort cases have enjoyed larger damage awards and settlements. And the combination of both trends appears to have induced many more individuals to file lawsuits.

Liberalization of Tort Doctrines

Tort law in the United States is largely based not on statutes but on common law, a body of legal principles developed case by case by judges, primarily those in state courts. It is difficult therefore to generalize about

1. See Robert E. Litan and William D. Nordhaus, *Reforming Federal Regulation* (Yale University Press, 1983), pp. 34-58.

the status of tort law in all jurisdictions. Nevertheless, certain important changes in doctrines have occurred in the past several decades, all of which have expanded the system's function in spreading losses:

—Whether by applying the negligence test in a flexible fashion or by imposing liability on parties whose behavior is causally related to accidents but who are not necessarily negligent (so-called strict liability), the courts have increased manufacturers' liability for defective products. Early in the twentieth century courts began to weaken the privity doctrine by allowing plaintiffs and then members of their families to recover directly from manufacturers for injuries caused by defective products. More recently, certain courts have held that a product can be defective even if it conforms to prevailing regulatory standards and if the manufacturer had no knowledge at the time of design or production that it would entail the risks later attributed to it in litigation.

—The negligence standard itself has been extended through litigation to impose liability on a wide class of service providers not previously accustomed to being sued. Day care centers, ski lift, ice rink, and amusement park operators, taverns and restaurants, and not-for-profit organizations have all been taken to court for failures to warn of certain dangers and for the careless conduct of their employees. The exposure of these defendants to liability claims has been widened by the doctrine of joint and several liability, which allows prevailing plaintiffs to recover up to the full amount of a total damage award from any single defendant if the other defendants are unable to pay, and by the collateral source rule, which prohibits juries from reducing damages by subtracting insurance monies or other compensation plaintiffs receive from other sources.

—The concept of contributory negligence has been relaxed in many states so that negligent plaintiffs are no longer totally barred from recovery. Instead, they find their damages reduced by the proportion by which their negligence contributed to their injury. In addition, beginning with the Federal Tort Claims Act of 1946, which waived the federal government's sovereign immunity, courts have made state and local governments liable for tort suits.

—Courts have relaxed the standards plaintiffs must satisfy in proving, under either the negligence or strict liability doctrine, that defendants have caused their injuries. This trend has been manifested primarily in product liability and so-called toxic tort cases, which have frequently required courts to decide whether plaintiffs' injuries have been caused by their exposure, often over long periods of their lives, to substances recently discovered to be associated with the development of cancer or other seri-

ous diseases. Courts have adopted a range of rules to determine causation in such cases. Some have placed liability on the first or last source to which plaintiffs can establish they were exposed; others have made *all* manufacturers of the substance jointly and severally liable. In one noted case involving the exposure of Vietnam veterans to the chemical Agent Orange, a federal court actively encouraged a \$180 million settlement even though no hard scientific evidence had been uncovered that linked the chemical to the medical infirmities claimed by the plaintiffs.

—Finally, courts in certain jurisdictions have liberally interpreted statutes of limitation, which bar plaintiffs from recovering if they wait too long after suffering injury (typically more than three or four years) to file suit. In many toxic tort, product liability, and medical malpractice cases, it is difficult to determine when injury actually occurs. It could occur with the first exposure to a substance or operation, or it could develop decades later when the symptoms of disease become observable. Although jurisdictions differ widely on this issue, the trend has been for courts not to invoke the statute of limitations to bar suits involving long-latent injuries.

Higher Damage Awards and Settlements

The tort system allows for compensation to injured parties through lawsuits and, far more importantly, through claims resolution by liability insurance companies. Indeed, of the millions of insurance claims filed each year, typically only 2 percent are resolved through litigation. Of cases brought to court, less than 5 percent are tried to verdict; the rest are settled.²

In addition, the amounts actually received by successful plaintiffs are often much smaller than those originally awarded by juries. Trial judges and appellate courts may, for instance, override jury verdicts; or in some cases the defendant may not have sufficient resources (even with insurance) to satisfy the judgment. One recent study of 198 tort verdicts in 1984 and 1985 that resulted in awards of \$1 million or more found that the successful plaintiffs received the original jury award in only 51 cases; the final distributions to plaintiffs in the other cases were, on average, 30 percent less than the amount originally awarded.³

In short, jury awards represent only the tip of the tort system and

2. William E. Bailey, "The High Cost of Insurance: Who's to Blame?" *The Brief*, vol. 16 (Winter 1987), pp. 15-18.

3. Ivy E. Broder, "Characteristics of Million Dollar Awards: Jury Verdicts and Final Disbursements," *Justice System Journal*, vol. 11 (Winter 1986), p. 353.

Table 1-1. Average Jury Awards in Cook County, Illinois, and San Francisco, Selected Periods, 1960-84
Constant 1984 dollars unless otherwise specified

Type of Case	1960-64	1975-79	1980-84	Average annual percentage increase 1960-64 to 1975-79 ^a	Average annual percentage increase 1975-79 to 1980-84 ^a	Average annual percentage increase 1960-64 to 1980-84 ^a
<i>Medical malpractice</i>						
Cook County	52,000	324,000	1,179,000	13.0	29.5	16.9
San Francisco	125,000	644,000	1,162,000	11.5	12.5	11.8
<i>Product liability</i>						
Cook County	265,000	597,000	828,000	5.6	6.8	5.9
San Francisco	99,000	308,000	1,105,000	7.9	29.1	12.8
<i>All personal injury</i>						
Cook County	59,000	130,000	187,000	5.4	7.5	5.9
San Francisco	66,000	133,000	302,000	4.8	17.8	7.9
Real GNP	...	...	...	3.6	2.3	3.2
Real price of medical services	...	...	...	1.9	1.1	1.7

Sources: Mark A. Peterson, *Civil Juries in the 1980's: Trends in Jury Trials and Verdicts in California and Cook County, Illinois* (Rand Corporation, Institute for Civil Justice, 1987), pp. 22, 35, 51; and *Economic Report of the President, January 1987*.

a. Compiled from midpoints of each five-year period.

may not even accurately reflect the actual levels of compensation received by plaintiffs. Nevertheless, verdicts set benchmarks for nonlitigated claims and tort settlements. As jury awards increase, claimants and litigants have greater incentives to hold out for larger settlements in return for not proceeding with litigation. Accordingly, no analysis of the tort system can be complete without examining trends in jury verdicts.

Unfortunately, there are no comprehensive nationwide data on jury awards. The only reliable data that do exist for a relatively long period are those collected by the Rand Corporation's Institute for Civil Justice, which has assembled civil jury verdicts over a twenty-five year period in two large metropolitan areas: Cook County, Illinois, and San Francisco.⁴ These data do not reflect appellate court revisions, although they are adjusted for inflation. Key statistics from the institute's data base are shown in table 1-1, which presents average jury awards in the two jurisdictions for selected five-year periods. Over the entire twenty-five

4. Mark A. Peterson, *Civil Juries in the 1980's: Trends in Jury Trials and Verdicts in California and Cook County, Illinois* (Santa Monica, Calif: Rand Corp., Institute for Civil Justice, 1987).

years, average awards in tort cases brought in Cook County and San Francisco increased sharply, considerably faster than the growth in real GNP and real prices of medical services. The average annual rate of increase in awards for all lawsuit categories was more rapid in the recent period closely associated with the insurance crisis.

The data shown in table 1-1 reflect two other important trends. First, awards in medical malpractice and product liability cases were significantly higher and increased at a faster pace than those for personal injury cases generally. This pattern is consistent with the recent survey of jury verdicts in ten states between 1981 and 1985 conducted by Stephen Daniels and Joanne Martin, which also found award levels in malpractice and product liability cases to be higher than for other categories of tort cases.⁵

Second, much of the increase in medical malpractice and product liability awards in Cook County and San Francisco, especially in recent years, has been caused by an explosive growth in jury awards of \$1 million or more. In Cook County, for example, there were only two verdicts of \$1 million or more (in 1984 dollars) from 1960 to 1964, and these accounted for only 4 percent of personal injury awards. By 1980-84, sixty-seven verdicts of \$1 million or more had been handed down, accounting for 8.1 percent of awards. In San Francisco from 1980 to 1984 only 3.8 percent of all personal injury cases produced verdicts of \$1 million or more, but these accounted for almost half of the total amounts awarded. The increase in large awards is confirmed in other studies as well.⁶

Some have argued that although the relatively small number of large dollar verdicts apparently has been very instrumental in driving up the average tort award, *median* awards have increased less dramatically.⁷

5. Stephen Daniels and Joanne Martin, "Jury Verdicts and the 'Crisis' in Civil Justice," *Justice System Journal*, vol. 11 (Winter 1986), p. 339. However, the study also found that malpractice and product liability cases generally make up less than 10 percent of total tort litigations and are more difficult for plaintiffs to win (p. 333).

6. One recent survey of product liability claims greater than \$100,000 that were closed in 1985 revealed a sharp increase in the proportion of claims that have yielded payments of at least \$1 million: from none in 1975 to 6 percent in 1979 to 13 percent in 1985. See Lawrence W. Soular, *A Study of Large Product Liability Claims Closed in 1985* (Schaumburg, Ill., and New York: Alliance of American Insurers, and American Insurance Association, 1986), p. 3.

7. By definition, half of all awards are above and half are below the median. With a relatively small number of large dollar awards, the median will typically fall below the average, which gives greater weight to the large dollar figures.

The data from the Institute for Civil Justice presented in table 1-1 do, in fact, show

However, this observation ignores two problems that liability insurers face when deciding whether to offer coverage and how to set premiums: insurers can only remain profitable if they set their premiums to cover total expected claim costs, and large dollar claims increase uncertainty about the range of possible losses.

The greater frequency of large dollar awards can be partly explained by increases in noneconomic damages—those for pain and suffering—as well as increases in punitive awards in certain cases. George Priest finds that noneconomic damages generally account for 30 to 40 percent of all tort damage awards and for even higher proportions of very large awards.⁸ Patricia Danzon documents a similar trend for jury awards in medical malpractice cases in chapter 4 of this volume. Meanwhile, the Cook County and San Francisco data reveal dramatic increases in the dollar value of punitive awards: from averages of \$7,000 and \$166,000 in constant 1984 dollars between 1960 and 1964 to averages of \$729,000 and \$381,000 between 1980 and 1984.⁹

To be sure, it is difficult to infer a nationwide pattern from data on jury awards on just two, albeit large, metropolitan areas. Nevertheless, the trends in these two areas are consistent with the pattern of underwriting losses recently experienced nationwide by liability insurers.

The Litigation Revolution

As with jury verdicts, there are no comprehensive data for tort lawsuits filed in federal and state courts in the United States. The information that is available, however, suggests that the number of certain types of tort cases has risen sharply. This is to be expected, given the expansive functions for spreading loss that have been assigned the tort system by judges and juries.

It is clear, for example, that the volume of medical malpractice and

that median jury awards increased in both Cook County and San Francisco at a slower pace than average awards. The median inflation-adjusted medical malpractice and product liability awards in Cook County, for example, increased over the 1960–84 period by 245 percent and 82 percent, respectively; the corresponding increases for the average awards were 2,167 percent and 212 percent. Similarly, in San Francisco, median awards in the two types of cases advanced by 144 percent and 641 percent over the twenty-five-year period; the average awards ballooned by 830 and 1,016 percent.

8. George L. Priest, "The Current Insurance Crisis and Modern Tort Law," *Yale Law Journal*, vol. 96 (June 1987), pp. 1521–90.

9. Mark Peterson, Syam Sarma, and Michael Shanley, *Punitive Damages: Empirical Findings* (Rand Corp., Institute for Civil Justice, 1987), p. 15.

products liability cases filed in federal court have increased sharply. Between 1976 and 1985, filings in these categories roughly trebled, to more than 1,800 malpractice cases and 13,500 products liability lawsuits. A significant part of the increase in products liability claims has been the result of a sharp rise in the number of suits involving toxic torts (notably asbestos) and medical products.

Limited evidence suggests that tort filings in state courts have mirrored the trends at the federal level.¹⁰ State court data for medical malpractice, for example, show a jump of 123 percent in cases filed between 1979 and 1983, to a nationwide total of more than 23,500. A similar trend—an increase of 141 percent—occurred during this period in claims filed against officials of municipal and county governments.¹¹

Compensation through Tort Law: Blessing or Curse?

Even if more expansive liability doctrines and awards were not efficiently deterring accidents and injuries, they conceivably could be justified as means for filling gaps in existing compensation programs and devices. For example, even though medical insurance is available through medicare to all American citizens aged sixty-five and older and to more than 80 percent of younger Americans through private insurance or medicaid, more than 30 million people still remain uninsured for medical expenses at any given time, and perhaps more than 20 million are

10. Of the approximately 866,000 tort suits terminated in the United States in 1985, 827,000 were in state courts and only 39,000 in federal courts. James S. Kakalik and Nicholas M. Pace, *Costs and Compensation Paid in Tort Litigation* (Rand Corp., Institute for Civil Justice, 1986), p. 15.

11. *Report of the Tort Policy Working Group on the Causes, Extent and Policy Implications of the Current Crisis in Insurance Availability and Affordability* (Government Printing Office, 1986). The data cited in a recent report by the National Center for State Courts prove nothing to the contrary, in contrast to what some observers have claimed. See National Center for State Courts, *State Court Caseload Statistics: Annual Report, 1984* (Williamsburg, Va.: NCSC, 1986). According to this study, which surveyed court filings in thirteen states, the total number of all types of tort filings increased by only 9 percent between 1978 and 1984, or roughly the same rate as the general population (8 percent). But as the Tort Policy Working Group has pointed out, the National Center data do not include cases at all levels of state courts (California municipal court statistics, which show, for instance, much larger rates of increase, are excluded). In addition, the center's figures conceal the fact that suits involving automobile accidents, the cause of over half of all tort actions, have declined in recent years because of fewer accidents and the adoption of no-fault insurance in many states. See Tort Policy Working Group, *An Update on the Liability Crisis* (GPO, 1987), pp. 42-46.

uninsured throughout a given calendar year.¹² In addition, many of those with insurance have limited coverage, especially for the catastrophic medical expenses often associated with major tort litigations.¹³

Gaps also exist in programs designed to compensate for income losses, although it is likely that the coverage provided by public and private disability insurance programs has increased over time.¹⁴ Workers' compensation statutes now in effect at the state level cover both medical and income losses due to disability, but only for occupationally related injuries. Furthermore, as Kip Viscusi shows in chapter 6, workers' compensation programs have infrequently covered losses caused by disease. The social security system provides disability benefits for medical or mental impairments from any cause, but only for those disabled longer than one year or if the condition can be expected to result in death. Moreover, although the average benefit of \$30,000 (present discounted value) is substantial, it is far less than the compensation available for pain and suffering in many tort actions.¹⁵ Finally, many employers provide disability insurance for their employees, but coverage is typically limited to only 50 to 60 percent of current earnings.

The merits of each of the purported justifications of recent trends in tort law, however, raise significant questions. While they have broadened the availability of compensation, more liberal liability doctrines and larger damage awards and settlements may have overdeterred, forcing socially worthwhile products, services, and activities to be curtailed, withdrawn from the market, or eliminated. Patricia Danzon discusses in chapter 4 the increasing reluctance of doctors, especially obstetricians, to offer medical services because of liability risks. Peter Huber in chapter 5 notes that all but two insurance carriers have withdrawn liability coverage for operators of hazardous waste facilities, forcing many to

12. Margaret B. Sulvetta and Katherine Swartz, *The Uninsured and Uncompensated Care* (Washington, D.C.: George Washington University National Health Policy Forum, June 1986), p. 3.

13. One leading study has found that at least a quarter of the nonelderly population—perhaps more than 50 million people—is inadequately protected against exposure to large medical bills. See Pamela J. Farley, "Who Are the Underinsured?" *Milbank Memorial Fund Quarterly/Health and Society*, vol. 63 (Summer 1985), p. 479.

14. Lawrence Summers and Chris Carroll, "Why Is U.S. National Saving So Low?" *Brookings Papers on Economic Activity*, 2:1987, pp. 607–35.

15. For average benefits see Jerry L. Mashaw, *Bureaucratic Justice: Managing Social Security Disability Claims* (Yale University Press, 1983), p. 18. Disability benefits under social security are also not well linked to previous earnings of the victim, nor are they provided to those who are only partially disabled.

shut down. Similarly, liability concerns reportedly have caused drug companies to reduce research and development of new vaccines.¹⁶

Meanwhile, there is little evidence that expanded tort liability has efficiently filled in the gaps left by the existing public and private network of compensation plans. In fact, as George Priest has persuasively argued, the trend toward compensation of noneconomic injury through the tort system may be *undermining* the compensation objective by inducing private insurers to withdraw coverage and to raise premiums at the expense of low-income consumers.¹⁷ As noted earlier, the pain and suffering component of jury verdicts appears to account for much of the increase in personal injury awards, especially those in product liability and medical malpractice cases. But perhaps even more important, given the subjective nature of decisions to award these kinds of damages, is the uncertainty about the probable amount of the awards, which makes it increasingly difficult for liability insurers to write coverage profitably. Insurers have raised premiums for commercial lines to compensate for the increased risk, but as rates climb, lower-risk customers are finding it cheaper to self-insure. Liability insurers are therefore increasingly plagued with the problem of adverse selection—insuring only the poorest risks—which drives up premiums even further, and in extreme cases compels insurers to withdraw altogether from providing coverage.¹⁸

Finally, delivering compensation through the tort system is very expensive. According to the Institute for Civil Justice, the United States spent between \$29 billion and \$36 billion on tort litigation in 1985. Of this amount, only \$14 billion to \$16 billion, or less than half the total, was paid to plaintiffs as damage awards; the rest went to lawyers and court administrators.¹⁹ Researchers at New York University, using a variety of methodologies, have arrived at similar estimates for administrative costs.²⁰

Precisely because these transactions costs are so high, interest has grown in supplementing or replacing the tort system with alternative means of compensation. Most suggestions would place some sort of cap

16. Institute of Medicine, *Vaccine Supply and Innovation* (Washington, D.C.: National Academy Press, 1985).

17. See Priest, "Current Insurance Crisis and Modern Tort Law," pp. 1585-86.

18. *Ibid.*, pp. 1563-90.

19. Kakalik and Pace, *Costs and Compensation Paid in Tort Litigation*, pp. ix-x.

20. Andrew Schotter and Janusz Ordover, "The Cost of the Tort System," unpublished paper (New York University, Starr Center for Applied Economics, March 1986).

on total compensation—especially for pain and suffering—in return for automatic eligibility. More ambitious proposals envision separate funds, financed by taxes on employees or employers or both, to pay compensation awarded to victims of medical malpractice or exposure to toxic substances.

But the discussions in this book conclude that the limited experience with alternative compensation programs in the United States has not been encouraging. The federal black lung program, for example, was established in 1969 to provide temporary compensation for an estimated 100,000 retired miners with pneumoconiosis, a disease caused by long exposure to coal dust. But just as some courts have liberalized the tort standard of causation, Congress broadened eligibility criteria under the black lung program in both 1972 and 1978. Accordingly, 542,000 miners, spouses, and dependents had received benefits under the program by the end of 1981.²¹ Because of this experience, future proposals to establish compensation programs are unlikely to be given serious consideration by Congress or state legislatures unless they are accompanied by convincing demonstrations that their costs can be contained.

Outline of the Book and Key Conclusions

The balance of this book addresses the issues raised above in greater detail and depth. In the next chapter, John Calfee and Clifford Winston set forth a methodological framework for evaluating the debate over the current liability system. They explain formally why the objectives of efficient deterrence and compensation may conflict and therefore why no liability rule or policy can achieve both goals.

Scott Harrington follows in chapter 3 with a detailed examination of the performance and behavior of the property and casualty insurance industry. Concentrating on the first half of the 1980s, he finds that increases in premiums and cutbacks in coverage reflect a sharp rise in losses.

Chapters 4 through 7 document the trends toward liberalized liability and rising damage awards in the specific areas of tort law in which the insurance crisis has been most pronounced: medical malpractice (Patricia Danzon), environmental liability (Peter Huber), occupational liabil-

21. John S. Lopatto, "The Federal Black Lung Program: A 1983 Primer," *West Virginia Law Review*, vol. 85, no. 4 (1983), pp. 677-78.

ity (Kip Viscusi), and products liability (George Priest). These chapters demonstrate how, in moving toward broader compensation, the tort system has affected the medical system, the environment, the workplace, and the development of products.

In the concluding chapter, Robert Litan and Clifford Winston summarize the policy recommendations made in each of the previous chapters. First, given Harrington's findings that property and casualty insurance markets have simply reflected underlying trends in the civil liability system, they find that calls for stiffer regulation of the insurance industry would accomplish very little and by inducing insurers to withdraw coverage would likely be counterproductive. Second, tort law would more efficiently deter undesirable behavior if judges encouraged juries, in deciding which parties should bear the loss of accidents, to balance the costs and benefits of the behavior of both plaintiffs and defendants. Third, much of the uncertainty about the size of damage awards could be removed if schedules were established for pain and suffering that base recoveries on the age of the injured party and the severity of the injury. Finally, given the limited data available, we simply know too little about the total costs and benefits of the current liability system to be confident that any radical change—in particular, replacing the tort system with a government-administered compensation program—would produce benefits to society that would outweigh the costs.

Economic Aspects of Liability Rules and Liability Insurance

John E. Calfee and Clifford Winston

THE U.S. liability system may be seen as an attempt to use one mechanism, a payment for damages, to perform two functions: providing an incentive to prevent injury and compensating for injury (insurance). Using this mechanism for both tasks may succeed if all information on risks to be insured against is available to producers and buyers. But a primary reason for having liability rules is to offset a lack of information about risk. Information can be imperfect in many ways. Consumers may misperceive risks. Insurers cannot prevent moral hazard, the tendency for those who are insured to become careless because they know they are insured. Insurers are also subject to adverse selection, the tendency at given rates for high-risk individuals or groups to buy more coverage than low-risk individuals or groups, thus exposing insurers to much higher payouts per policy. Finally, courts cannot know appropriate levels of precaution and producers often do not know what constitutes appropriate standards of due care. In these situations the means for achieving the two goals of compensation and prevention tend to diverge: what works well for achieving one goal will work poorly for achieving the other. We argue that no liability rule or policy can optimally handle both compensation for and deterrence of injury under the conditions encountered in most economic environments.

A Simple Model of Liability

An easy way to see the commonality of many of the problems discussed in this book is to work with a model of liability and insurance. The model simplifies various complex issues that arise in actual liability disputes, but

still reveals the major difficulties in applying liability rules and provides a framework for understanding the primary issues discussed in the chapters that follow. The model and its results are summarized in a nontechnical manner in the text and stated mathematically in the appendix.

In the section that follows we apply our model to various standards of liability. We seek to determine the conditions under which each of these rules meets the objectives of both deterrence and compensation for each of the types of losses that injuries may produce. For convenience our discussion focuses on injuries resulting from defective products. However, the results are easily generalized to injuries resulting from services such as medical care and to such other activities as handling hazardous materials.

The analysis considers three types of losses individuals may suffer when an injury occurs: *monetary losses*, which deprive the victim of money or income; *pure nonmonetary losses*, such as pain and suffering not explicitly valued in the marketplace; and *changes in the marginal utility of income or money*, which may occur if an injury renders some activities impossible—driving a car, for example—or, at its most serious, restricts individual mobility completely.¹

Nonmonetary or noneconomic losses roughly correspond to those described by the term "pain and suffering." If no nonmonetary damages are involved and injured parties can reasonably be assumed risk-neutral toward monetary losses (that is, indifferent as to whether a payout is certain or only expected from a gamble), there is no need to consider marginal utility of income or money at all, and the analysis can proceed in terms of dollar losses and gains.² Many analyses of the economic effects of liability rules work this way.³ But some of the most troublesome aspects of prod-

1. For a theoretical exposition of the distinction between monetary and nonmonetary commodities (also called nonpecuniary or irreplaceable commodities) see Philip J. Cook and Daniel A. Graham, "The Demand for Insurance and Protection: The Case of Irreplaceable Commodities," *Quarterly Journal of Economics*, vol. 91 (February 1977), pp. 143-56.

2. William M. Landes and Richard A. Posner, "A Positive Economic Analysis of Products Liability," *Journal of Legal Studies*, vol. 14 (December 1985), p. 536, argue that liability rules can reasonably be analyzed while assuming risk-neutrality. The term risk-aversion usually refers to a willingness to pay a premium for insurance against monetary losses. Michael Spence, "Consumer Misperceptions, Product Failure and Producer Liability," *Review of Economic Studies*, vol. 44 (October 1977), pp. 561-72, uses the term to cover situations in which there are nonmonetary losses, regardless of whether consumers would wish to insure against such losses.

3. See, for instance, John Prather Brown, "Toward an Economic Theory of Liability," *Journal of Legal Studies*, vol. 2 (June 1973), pp. 323-49; Steven Shavell, "Strict Liability versus Negligence," *Journal of Legal Studies*, vol. 9 (January 1980), pp. 1-25; William M. Landes and Richard A. Posner, "The Positive Economic Theory of Tort Law," *Georgia*

ucts liability and the liability insurance crisis stem from treatment of nonmonetary losses. As the discussion will show, the presence of nonmonetary losses tends to place a wedge between the two basic goals of compensation and deterrence and strongly affects the relations between such alternative bases for standards as the doctrines of strict liability and negligence.⁴

In essence, the model developed and used in this chapter determines conditions that characterize optimal levels of safety (deterrence or prevention) and compensation for injury, thus enabling one to assess whether these conditions are satisfied by particular liability standards. Optimal levels of deterrence and compensation maximize social welfare, which is dependent on consumers' expected utility from goods and services and producers' competitive profit. The concept of social welfare could be expanded to include the necessity for social justice and compensation for the costs of litigation (transactions costs), but doing so would not change the basic problems.

We emphasize, however, that the model contains a number of simplifying assumptions. We usually assume that prevention efforts affect only the occurrence of injury, not its extent and nature, and that only producers of products, not those who are at risk of injury, are able to affect the probability of loss. For the time being we assume insurance is available at cost, by which we mean that insurance paying a given amount in case of injury is available for an actuarially fair premium. We usually assume there are no administrative costs for compensating victims and no problems of adverse selection and moral hazard in the insurance market. But we point out where these assumptions are likely to fail and the resulting implications. We do not model the problem of scope of liability, an issue that arises when many factors combine to cause injury, but do note where the model can be extended to treat this problem. We also ignore the possibility that potential injurers and victims can write contracts to bypass the liability system. Finally, an important aspect of the liability system not modeled is the informational requirements of the legal system. Again, where it is relevant, we note the implications of the model for informa-

Law Review, vol. 15 (Summer 1981), pp. 851-924; and Landes and Posner, "Positive Economic Analysis of Products Liability."

4. This is discussed in the context of workmen's compensation by Samuel A. Rea, *Disability Insurance and Public Policy* (University of Toronto Press, 1981); and Rea, "Nonpecuniary Loss and Breach of Contract," *Journal of Legal Studies*, vol. 11 (January 1982), pp. 35-53.

tional and other demands on the liability system. If these issues were considered in the model, the difficulties of achieving both appropriate deterrence and compensation would be exacerbated.

Liability Rules

Liability standards provide guidance for courts to evaluate the legality of the behavior of litigants when defendants are claimed to have inflicted some type of damage on plaintiffs. The standards that have been applied in the United States are first-party liability, strict liability, and negligence.

First-Party Liability

A first-party liability rule makes injured parties responsible for their losses unless producers voluntarily provide compensation. The efficiency of first-party liability depends greatly on the extent to which consumers are aware of the risks inherent in using a given product, that is, on the information available to them.

MONETARY LOSSES. Suppose there are no nonmonetary losses and that consumers know both the probability that products fail when properly used and the monetary losses such failures will cause. Economic theory suggests that producers operating in a competitive market will take actions to prevent injuries and will provide compensation at levels that maximize consumers' expected utility, that is, consumers' preferred trade-off between compensation, price, and risk, subject to normal profits.⁵ Alternatively, if producers do not offer compensation, buyers will purchase insurance from third parties that will yield a level of compensation equal to that which producers should have provided.

As shown mathematically in the appendix, appropriate compensation will be achieved when consumers use insurance, either voluntarily supplied with the product or sold separately by third parties, to transfer income between situations in which a loss occurs and those in which no loss occurs in order to equalize the rates at which income provides satisfaction in each situation.⁶ This condition is met when consumers are fully insured

5. More precisely, producers will maximize consumer utility subject to a profit constraint or other constraints that may involve nonmonetary factors. See Patricia M. Danzon, "Tort Reform and the Role of Government in Private Insurance Markets," *Journal of Legal Studies*, vol. 13 (August 1984), pp. 517-49; and the appendix to this chapter.

6. If the price of insurance includes a premium to cover insurers' costs, as all insurance

against monetary losses. Producers in a fully competitive market of informed consumers will also adjust the level of product safety or precaution to maximize consumer utility. As demonstrated in the appendix, this occurs when the marginal cost of prevention is equated with the marginal benefit of prevention.⁷

In short, when consumers know the probability of loss, first-party liability should efficiently handle both prevention of and compensation for injury.

Several conditions may disturb this efficiency, however. Producers' compensation plans could suffer from adverse selection—too many high-risk consumers—and, if potential victims can affect the probability or magnitude of loss, compensation plans could encounter moral hazard—too much consumer carelessness in using the product. The result in either instance could be that inadequate compensation would be provided for injuries caused by the product. These problems may be mitigated if consumers can buy insurance instead of using the liability system for insurance. In principle, insurers are likely to have greater ability and experience in providing compensation, and thus exhibit greater efficiency in satisfying consumers. Nevertheless, first-party insurance will produce efficient incentives for purchasers to take proper precautions only if the premiums charged are explicitly linked to purchases of the risky products. Yet in practice, first-party insurance policies such as medical insurance typically cover numerous products and events at the same time; the insurance covers its purchasers, not specific products or activities. Imperfections of this sort keep market prices from providing consumers an incentive to shop for safer products. How, after all, can a consumer distinguish potential differences in levels of risk for two products that perform the same function if insurance costs for using them are the same?

When consumers are unaware of the risks, the market will behave imperfectly in several ways, and first-party liability clearly is not an efficient rule. Producers have no incentive to offer compensation or incur prevention costs for risks that consumers do not perceive. Thus for most risky products the price will be too low and the product itself will be

does, consumers will purchase less than the amount of insurance necessary to equalize marginal satisfaction from income between situations of injury and no injury; see Danzon, "Tort Reform," appendix A. If consumers are not risk-averse—that is, if the utility of wealth is simply proportional to wealth so that the marginal utility of wealth is a constant—then consumers will have no reason to purchase insurance even if it is priced at an actuarially fair level.

7. See Brown, "Toward an Economic Theory of Liability."

consumed in larger than optimal quantities. But if the product actually reduces risk from its "natural" state (obstetrical services, for example, reduce risks for both mother and infant), the absence of liability does not necessarily lead to overconsumption of the product. Appropriate levels of consumption depend on the perceived reduction in risk.⁸

Consumers may be aware that a risk exists, but their perceptions of its magnitude or duration may be inaccurate. In such a situation their marginal utility of income before and after an injury will not be equal even after the purchase of insurance (see the appendix). In particular, if consumers underestimate risk, producers will provide insufficient compensation. The effect of underestimating risk on prevention depends on how perceptions change in response to reductions in risk from product improvement. On the whole, consumers' underestimation of risk probably leads producers to underinvest in risk reduction (see the appendix).

Again, the effect of imperfect consumer information on price and consumption depends partly on whether the product does itself reduce risks. Risky products are likely to have a price that is too low and therefore will be overconsumed. If the risky product itself reduces risk (again, as in the case of obstetrical services), price and consumption depend on the perceived reduction in risk, and the product might not be overconsumed.

NONMONETARY LOSSES. Nonmonetary losses occur when an injury affects a victim's utility for wealth in such a way that the same level of income does not produce the same level of satisfaction as before the loss. The effects of the availability of consumer information on the efficiency of first-party liability are qualitatively the same for nonmonetary losses as they are when only monetary losses are involved.

Again, consider the situation in which consumers are fully informed of the risks entailed in using a product. The possibility of nonmonetary losses makes it difficult to know the appropriate level of insurance or precaution. This difficulty is not a market imperfection, however, because the parties involved have an incentive to determine appropriate precautions without external rules. Consumers will attempt to purchase what is for them optimal insurance, and producers will compete to meet consumers' demands for the optimal level of prevention.

Nevertheless, the potential for nonmonetary losses poses special problems even when consumers and producers know the risks. One problem is the asymmetry of information: consumers may have reasonably certain

8. See John E. Calfee and Paul H. Rubin, "Liability for Reducing Risk," paper presented at the 1987 annual meeting of the Western Economic Association.

knowledge about the magnitude of their nonmonetary losses if they are injured, but producers may be far less certain and thus make inappropriate investments in prevention.⁹ To the extent that nonmonetary losses are insured, the problems of adverse selection and moral hazard are more difficult to assess. When losses are primarily nonmonetary and the marginal utility of wealth is unaffected, little insurance is desired, as when pain and suffering follow necessary surgery. But if the nonmonetary loss increases the marginal utility of wealth, as when the loss requires major expenses just to achieve a normal life, a large amount of insurance may be sought. Then the informational requirements could be particularly difficult for insurers to meet, simply because of the tenuous nature of the loss and the possibility that consumers will overinsure.

Now suppose consumers are not aware of product failure rates. The implications for the desirability of first-party liability are complex but qualitatively similar to those for monetary losses. Again, producers will not incur prevention costs and will not pay compensation, and consumers will underinsure. Product prices will be too low because all the costs of using products will not be reflected in their prices, and most products will be consumed in larger than optimal quantities. Again, however, this result is not necessarily true for products that reduce risks.¹⁰ If consumers are aware that a risk exists, but their perceptions are inaccurate, the effect on the level of prevention undertaken by producers again depends on the marginal relation between actual and perceived risk (see the appendix).

SOLUTIONS TO THE INFORMATION PROBLEM. The problems posed by imperfect consumer information could in principle be solved by having the government provide all relevant information.¹¹ But this would require that vast quantities of highly dispersed information be centralized, maintained, and distributed in a timely fashion. An alternative would be to require producers to provide risk information, perhaps through warnings on product labels and in product advertising. This would not eliminate the need for governmental collection of information, however, because the nature

9. Problems also arise when a heterogeneous body of consumers is considered. See Jerry Green, "On the Optimal Structure of Liability Laws," *Bell Journal of Economics*, vol. 7 (Autumn 1976), pp. 553-74.

10. With products that reduce risks, consumers will underinsure. But the degree of underinsurance could be less than when consumers forego use of the product, assuming that they do not accurately assess the risk they face if they do not use the product. See Calfee and Rubin, "Liability for Reducing Risk."

11. See W. Kip Viscusi, Wesley A. Magat, and Joel Huber, "Informational Regulation of Consumer Health Risks: An Empirical Evaluation of Hazard Warnings," *Rand Journal of Economics*, vol. 17 (Autumn 1986), pp. 351-65.

and amount of risk information provided by producers would have to be monitored.¹² Hence the main justification for imposing a liability rule on the market is that consumers lack information and find it costly to negotiate for its provision.

Strict Liability

The second rule of the liability system, strict liability, is the opposite of first-party liability in that it requires the producer to compensate a victim for all losses caused by the producer's conduct, regardless of the steps the producer has taken to prevent accidents. When injuries cause only monetary losses, strict liability is theoretically the optimal rule, although its efficiency may be compromised by market imperfections such as moral hazard and adverse selection. When injuries cause non-monetary losses, however, strict liability will usually have the effect of requiring consumers to pay for more than their desired level of insurance. This can substantially increase the price of a product and have adverse effects on consumer choices among products.

MONETARY LOSSES. If a consumer's potential losses are exclusively monetary, a strict liability standard in effect requires producers to sell insurance against failure when they sell their products. Analytically, the situation is identical to first-party liability except that compensation is provided by the producer rather than by a third party (see the appendix). The producers absorb all costs and therefore will minimize expected losses from consumer injuries by taking optimal measures to prevent accidents and by purchasing appropriate insurance.¹³ If the classic insurance problems of moral hazard and adverse selection do not arise, product prices will correctly reflect risk and the quantity purchased will be appropriate.

Beneath the superficial similarities between first-party liability and strict liability for monetary losses, however, there are significant differences. Informational requirements are more narrowly focused under strict liability. Only the producer (and the liability insurer, if any) must know the level of risk; consumers may remain uninformed. But the amounts and kinds of information needed by producers can be significant. This can be seen by looking at the insurance aspect of liability. Under strict liability, insurance classes are necessarily based on specific

12. If information provided by producers is not monitored except when injuries occur, the effect is much like that induced by a liability standard.

13. Brown, "Toward an Economic Theory of Liability."

products or activities rather than on specific types of consumers. For example, all users of home swimming pools, careful and careless alike, would form a single insurance class under a rule that made swimming pool manufacturers and installers strictly liable for all injuries suffered by pool users. This could frustrate insurers' attempts to take account of adverse selection and moral hazard, which are likely to arise if consumers can affect the size or probability of loss.¹⁴ This involuntary formation of insurance classes could also have adverse effects when consumers have diverse tastes and incomes. In particular, strict liability generally requires poorer consumers to subsidize insurance for the well-off because they pay the same amount for the product but wealthier people will collect larger damage payments.¹⁵

Finally, and perhaps most importantly, the efficiency of strict liability in preventing and compensating injury critically depends on whether the scope of liability can be limited when there are multiple possible causes of injury, as there could be in cases involving long-term illnesses such as cancer. The key issue is whether liability efficiently encourages the incentive to reduce the probability of loss. If the injurer could not efficiently have taken precautions to reduce risk, it makes little sense to argue that he should nonetheless be held liable because he "caused" the loss.¹⁶

NONMONETARY LOSSES. Now suppose injury involves a nonmonetary loss for which the product's producer must also provide compensation. An immediate problem is the size of the payment. Nonmonetary damages by definition have no obvious monetary equivalent, and thus it is

14. See Richard A. Epstein, "The Legal and Insurance Dynamics of Mass Tort Litigation," *Journal of Legal Studies*, vol. 13 (August 1984), pp. 475-506; Epstein, "Products Liability as an Insurance Market," *Journal of Legal Studies*, vol. 14 (December 1985), pp. 645-69; and George L. Priest, "The Current Insurance Crisis and Modern Tort Law," *Yale Law Journal*, vol. 96 (June 1987), pp. 1521-90.

15. Priest, "Current Insurance Crisis," pp. 1559-60.

16. See Steven Shavell, "An Analysis of Causation and the Scope of Liability in the Law of Torts," *Journal of Legal Studies*, vol. 9 (June 1980), pp. 463-516; Shavell, "Uncertainty over Causation and the Determination of Civil Liability," *Journal of Law and Economics*, vol. 28 (October 1985), pp. 587-609; William M. Landes and Richard A. Posner, "Causation in Tort Law: An Economic Approach," *Journal of Legal Studies*, vol. 12 (January 1983), pp. 109-34; and Robert Cooter, "Prices and Sanctions," *Columbia Law Review*, vol. 84 (October 1984), pp. 1523-60. On proposals to limit liability in accordance with the probability of causation, see Naomi Sheiner, "Comment: DES and a Proposed Theory of Enterprise Liability," *Fordham Law Review*, vol. 46 (April 1978), pp. 963-1007; and David Rosenberg, "The Causal Connection in Mass Exposure Cases: A 'Public Law' Vision of the Tort System," *Harvard Law Review*, vol. 97 (February 1984), p. 851.

not clear how the courts can measure them. Surprisingly, this problem has largely been ignored in the relevant literature. A reasonable approach would be that courts would assess damages equal to the sum of two factors: the greatest amount the victim would have paid to avoid the injury (given that compensation will be paid for monetary loss) plus desired compensation, which is the amount of insurance the consumer would willingly have purchased to compensate for an injury that occurs despite precautions. Requiring the producer to pay this amount would make certain that he is treating potential consumer losses as if they were his own and thus would provide the appropriate incentive for preventing them (see the appendix).¹⁷

Such an approach entails two problems, however. The first relates to insurance. Compensation to be paid in event of injury is essentially an insurance policy that applies only if the injury occurs. Under a strict liability rule, a premium for this insurance will be reflected in the product price, which also includes costs of production and injury prevention. But the insurance a producer provides under a rule of strict liability will exceed the desired level by the amount that a typical consumer would be willing to pay for prevention, an amount that could be quite large. Although the extra insurance will be worth something, it will be worth less to many consumers than the premium producers pay and pass on to all consumers.

The second, and related, problem is that this overinsurance will make product prices too high. Prices will have three components: costs of production (including costs of prevention), a premium for desired insurance, and a premium for the undesired insurance payout for nonmonetary losses that is set equal to the amount consumers would have paid toward prevention. Optimal amounts of the products will not be purchased. Moreover, faced with the possibility of paying out this extra insurance, producers will further increase prevention activities, and necessarily their attendant costs, which will increase prices still further beyond the efficient level.

A number of analyses have nevertheless argued that strict liability could retain the producer's incentive to prevent injuries without requiring buyers to pay prices that include the unwanted insurance premium.¹⁸

17. Spence, "Consumer Misperceptions," p. 566.

18. *Ibid.* Spence points out that if consumer perceptions of risk are taken into account, the optimal fine may be less than the amount consumers would be willing to pay toward prevention, because awareness of risk provides some incentive for them to prevent accidents.

They propose that damages actually paid to victims consist only of the desired insurance payout, while the amount consumers have in effect paid toward prevention be paid as a fine to the state, with the fine used to subsidize the product price. Although some nonliability enforcement systems resemble this approach, the courts have not operated in this way for ordinary tort cases.¹⁹ Currently, courts appear to award damages that include both the insurance payout and a penalty levied against the producer to compensate for pain and suffering.

There is no reason to think this two-part proposal will produce an appropriate price, either. If the undesired insurance premium is not included in the price of the product, the price will not reflect the risk of using the product. In this sense the price will be too low. There is no known solution to this problem. For products that reduce risk, however, the lower price brought about by the two-part arrangement is not necessarily bad, because this price may accurately reflect the fact that using the product is less risky than not using it.²⁰

Negligence

A third liability rule, the negligence standard, requires producers who fail to achieve a prescribed level of prevention to compensate victims for all losses. Because it requires additional information to assess the required level of prevention and does not yield a price that reflects risk, the negligence standard is theoretically inferior to strict liability when injuries cause only monetary losses. But when injuries also cause non-monetary damages, the negligence standard tends to avoid the involuntary overinsurance associated with strict liability.

MONETARY LOSSES. Under a negligence standard, courts determine whether the performance of the product or service at issue violates a standard of due care. If a defendant fails to take due care, he must compensate the victim for losses; otherwise, losses are borne by the victim. If the due care standard is set at the optimal level, producers have an incentive to take optimal safety precautions because they know that if they fail to do so they must absorb potential losses by victims. Thus producers that take optimal precautions but do nothing further will not be negligent and will pay no compensation.²¹ This result must

19. An example of such a nonliability system would be one with regulations that use fines to support a government agency providing subsidized services to the industry.

20. Calfee and Rubin, "Liability for Reducing Risk."

21. Brown, "Toward an Economic Theory of Liability."

be modified, however, when there is uncertainty about the level of prevention required. Risk-neutral producers who are uncertain about what constitutes due care in a given situation are likely to spend more on prevention than consumers would wish to pay.²²

If consumers are aware of the risks, they will secure desired levels of compensation by purchasing insurance from third parties. As a result the product price, if perceived as including the insurance premium, represents full social costs and leads to correct levels of output. As noted earlier, however, consumers normally purchase products separately from insurance. This reduces the ability of insurance to promote efficiency.

If consumers are unaware of the risks they run in using a product, producers will undertake optimal injury-prevention measures anyway because they will still be required to meet the due care standard. But uninformed consumers will underinsure and thus overconsume the product because the perceived price will not include a reserve for risk.²³ (Consumers' lack of information, it will be recalled, does not affect economic efficiency under a strict liability standard for monetary damages.) At the same time, however, a negligence rule is more effective than a strict liability rule in delineating the scope of liability. Enforcing a negligence rule requires courts to assess the optimal precaution level in terms of the effect of prevention on the probability of failure, and such an inquiry necessarily asks whether the producer was in a position to reduce the probability of failure. In contrast, a strict liability rule focuses on the consequences of the injury and pays little attention to the marginal costs and benefits of prevention efforts by the manufacturer.

A negligence rule also has specific implications for the informational requirements of courts and insurers. Courts must assess the appropriate degree of precaution, which requires information on consumer losses and the costs of prevention. But this information is required by courts only when injury occurs and is litigated. With a well-functioning negligence rule, most producers are not negligent and are not involved in litigation.²⁴ Informational problems such as adverse selection may arise

22. Richard Craswell and John E. Calfee, "Deterrence and Uncertain Legal Standards," *Journal of Law, Economics, and Organization*, vol. 2 (Fall 1986), pp. 279-303; and Steven Shavell, *Economic Analysis of Accident Law* (Harvard University Press, 1987), ch. 4.

23. Shavell, "Strict Liability versus Negligence," p. 4.

24. This suggests that comparing the costs of operating a liability system based on negligence with compensation actually paid to victims provides a misleading estimate of the efficiency of the tort system. Most benefits of the system are unobserved precautions taken by producers and unobserved third-party insurance payments to consumers.

in connection with insurance but are dealt with primarily by insurance companies rather than by non-negligent producers, who do not provide compensation.

Finally, if potential victims can affect the probability of loss, the negligence standard can become prey to careless consumers unless the due care standard takes account of appropriate precautions by consumers. Traditionally, most courts have taken account of precautions through the contributory negligence rule, which bars plaintiffs from recovering any compensation if they have not exercised due care in using a product. More recently, a number of courts have turned to a comparative negligence standard, which requires them to consider the behavior of both plaintiff and defendant and to award damages on the basis of how well the plaintiff observed due care standards in comparison with how well the defendant observed them.²⁵

NONMONETARY LOSSES. A negligence standard tends to avoid consumers' overinsurance for nonmonetary losses, the most severe problem of strict liability.²⁶ If due care is set at the optimal level and the penalty for violations includes both compensation for monetary losses and a pain and suffering award equal to what consumers would have paid to prevent the injury, producers will have an incentive to take optimal precautions and, having met the due care standard, will not be found negligent. Because compensation is not actually paid, consumers are not forced to purchase more than the desired level of insurance.

But as with monetary losses, the extent to which the negligence rule promotes efficiency in the context of nonmonetary losses may change if producers are uncertain about what constitutes due care. Indeed, uncertainty could make the negligence rule highly inefficient because potentially large damage awards for pain and suffering caused by negligence can easily lead to expensive overcompliance with the standards on the part of producers. This potential for overcompliance could explain why the law sometimes uses a gross negligence standard, under which producers are liable only if their safety precautions fall far short of the

25. On contributory negligence, see Brown, "Toward an Economic Theory of Liability"; and George B. Assaf, "The Shape of Reaction Functions and the Efficiency of Liability Rules: A Correction," *Journal of Legal Studies*, vol. 13 (January 1984), pp. 101-11. David Haddock and Christopher Curran, "An Economic Theory of Comparative Negligence," *Journal of Legal Studies*, vol. 14 (January 1985), pp. 49-72, provide a recent analysis that includes a discussion of comparative negligence. None of these analyses take nonmonetary damages into account.

26. As noted earlier, strict liability for nonmonetary losses also encourages overinvestment in precautions.

Table 2-1. *Effects of Liability Rules under Simple Market Conditions*

<i>Liability standard</i>	<i>Perfect consumer information</i>	<i>Imperfect consumer information</i>
<i>First-party liability</i>		
Monetary losses	Optimal prevention Fully self-insure Appropriate price	Nonoptimal prevention Too little compensation Price too low
Nonmonetary losses	Optimal prevention Optimal self-insurance Appropriate price	Nonoptimal prevention Too little compensation Price too low
<i>Strict liability</i>		
Monetary losses	Optimal prevention Full compensation Appropriate price	Optimal prevention Full compensation Appropriate price
Nonmonetary losses	Too much prevention Involuntary overinsurance Price too high	Too much prevention Involuntary overinsurance Price does not reflect risk
<i>Negligence</i>		
Monetary losses	Optimal prevention Fully self-insure Appropriate price	Optimal prevention Too little insurance Price too low
Nonmonetary losses	Optimal prevention Optimal self-insurance Appropriate price	Optimal prevention Too little insurance Price does not reflect risk

optimal level. If there is producer uncertainty about due care, replacing a negligence standard with a gross negligence standard may increase social welfare.²⁷

Consumers aware of risk can presumably obtain a desired level of protection through third-party insurance. If consumers are unaware of risk, market failures parallel those already described: consumers do not purchase levels of insurance they would otherwise want and, because the perceived price of a product does not include a risk reserve, the product will be produced in larger than optimal quantities. Again, products that reduce risk may be an exception because they are not necessarily overconsumed even if sold at a price that does not reflect risk.

Summary

This theoretical discussion has omitted much that would make the analysis more realistic. The analysis assumes, among other things, that

27. On uncertainty and the standard of gross negligence, see Craswell and Calfee, "Deterrence and Uncertain Legal Standards," pp. 284-85.

most informational problems are solved, that liability rules are well established in advance and are not rewritten by the courts or legislatures, and that juries look dispassionately at costs and benefits. But even in this intellectually streamlined world where problems should be far more manageable than in actual practice, fundamental problems arise. Rules of negligence and strict liability are both likely to operate imperfectly and may not even improve upon first-party liability. Table 2-1 summarizes the basic findings from our analysis.

Liability Theory and Liability Issues

The theory of liability rules is useful for illuminating aspects of liability law that are of major concern, including injuries attributable to malpractice, hazardous substances, occupational accidents, and unsafe products. In particular, the following discussion analyzes the potential inefficiencies associated with the current liability system and identifies the issues that require resolution before alternative policies can be confidently advanced. These issues are given further attention in the remainder of this book.

Professional Malpractice

As Patricia Danzon shows in chapter 4, liability claims of malpractice by physicians and other professionals have increased substantially in recent years. Although negligence is the predominant standard, strict liability has also been applied in particular situations. Available evidence suggests that neither rule has been especially effective in providing appropriate compensation and deterrence because the key problems that arise in malpractice are ones these rules are not well equipped to handle.

In situations that could lead to malpractice, consumers are frequently unaware of risks and producers are uncertain about appropriate levels of care. Imperfect information poses problems for negligence rules that can result in too many precautions taken or too many services—tests, consultations, operations—provided or both. Moreover, a large proportion of the claims that arise from alleged malpractice involve nonmonetary damages, which, as the theoretical discussion indicated, present problems for strict liability that also result in too much precaution and

excessive involuntary insurance. These responses in turn raise the costs and price of professional care and could ultimately cause physicians to withdraw useful services.²⁸

Given the problems with both rules, how do we determine which is better or whether an alternative is needed? Danzon's chapter identifies the difficulties in evaluating the benefits of the current malpractice system and in identifying superior alternatives. The chapter makes a point particularly important for the discussion here: the goals of compensation and deterrence should be separated, with modifications in the system made to satisfy each goal independently.

Optimal deterrence and compensation in connection with nonmonetary damages require accurate estimates of potential victims' willingness to pay to prevent injury. These estimates are difficult to obtain in practice, and current rules have generated levels of compensation that are probably nowhere near the theoretical ideal. Thus reforms in setting damages must be made directly. Danzon suggests that awards for pain and suffering be scheduled according to the severity of the injury and the age of the victim. A rule of liability based on fault could then be used to reduce uncertainty about risk and encourage an efficient level of care.

Toxic Torts

In chapter 5 Peter Huber documents the significant expansion in recent years of liability suits that involve hazardous materials, so-called toxic torts. This expansion raises several issues. What is the appropriate scope of liability? What effect did the defendant's actions have on the probability of loss? What are appropriate monetary and nonmonetary damage payments?

The courts have been inclined to apply a rule of strict liability in dealing with environmental hazards caused by producers. Theory indicates, however, that this rule does not effectively delineate the scope of liability, which leads to excessive precaution or the abandonment of risky activities (even those that reduce risk) because of the unavailability of insurance at a price that producers and ultimately consumers are willing to pay.

A negligence rule has an advantage over strict liability because prac-

28. These distortions could have particularly deleterious effects in the market for risky products that reduce risk. See Calfee and Rubin, "Liability for Reducing Risk."

tical application of a negligence standard tends to pin down the scope of liability. If courts must assess the effects of producers' investments in preventive measures on the likelihood of creating an environmental hazard, then the courts will also determine whether the producers were in a position to reduce the likelihood of a hazard. Thus a standard of negligence probably comes closer than one of strict liability to providing optimal deterrence. In addition, a negligence standard avoids involuntary overinsurance for nonmonetary losses.

Neither, however, is likely to provide optimal compensation in the circumstances in which toxic tort suits typically arise. As Huber's chapter emphasizes, there are serious ambiguities involved in linking exposure to a hazard, especially exposure long in the past, with a plaintiff's current disease or injury. Obviously, optimal compensation requires that this issue be resolved. Liability rules in and of themselves cannot effectively contribute to this resolution.

Occupational Accidents

Liability in the workplace, discussed by Kip Viscusi in chapter 6, provides an interesting comparison with other areas of liability. After controlling for wage adjustments, the employers' cost of workers' compensation has remained fairly stable during the past several years, suggesting that current rules may do an adequate job of providing compensation and deterrence.

Compensation for job-related accidents is determined by a payment schedule set in advance. This is a form of strict liability that operates largely outside the civil liability system. Because workers' compensation programs reimburse victims only for monetary damages and because they require considerably less information than negligence-based adjudications, it is theoretically plausible that such programs could provide optimal compensation. Indeed, Viscusi shows that the workers' compensation system has provided accident benefits at close to the optimal level in recent years. As is the case with compensation for injury from environmental hazards, however, compensation for health hazards in the workplace remains controversial because cause and effect is difficult to establish.

In addition, the workers' compensation system does not provide incentives for employers and workers to take optimal precautions against accidents because the system has never been truly based on data that reflect incidence of injuries by job category or type of employer. As a result, some combination of market forces (workers' underlying preference

for degrees of risk), direct government regulation, and the residual deterrent effects of workers' compensation is needed to ensure adequate levels of safety.

Products Liability

The recent surge in products liability suits, documented by George Priest in chapter 7, can be attributed mostly to the broadening of the scope of liability and the shift from a negligence standard to one of strict liability. These changes have led not only to spectacular compensation awards but possibly also to serious inefficiencies in products markets.

Products liability law should be designed so that, at minimum cost to society, the law effectively deters the introduction of unsafe products into the marketplace, moderates the risk associated with the use of marketable products, and provides optimal compensation to consumers who are injured by such products. Theory, however, predicts that a standard of strict liability will lead to excessive compensation, especially for nonmonetary damages, and excessive involuntary insurance, in turn distorting market prices according to the likelihood of injury from product use. If the expected liability cost is too high, products may simply be withdrawn or never introduced.

As Priest notes, economic distortions created by current policy can be reduced by applying a negligence standard based on cost-benefit principles.²⁹ Such an action would place some reasonable bounds on the scope of liability standards and curb excessive awards for nonmonetary damages, but at the cost of increasing the informational requirements of litigation.³⁰ If strict liability for products is favored, however, it should probably resemble the workplace liability system by limiting scope and establishing damage schedules, while using means other than torts to encourage optimal safety.

Insurance Industry Performance

This overview of liability theory can also shed light on the insurance industry's financial performance. The recent slump in earnings and increase in premiums can be partly attributed to the cyclical nature of the

29. Priest points out that the negligence standard that applied before 1965 did not correspond to the cost-benefit approach associated with the negligence standard in theory.

30. When nonmonetary damages are involved, however, even strict liability imposes formidable information requirements on the courts.

industry's investment returns, but liability rules also affect industry performance. The adoption of strict liability standards and the enlarged scope of liability in many areas have led to higher premiums. As Scott Harrington warns in chapter 3, if changes are unanticipated, the industry suffers losses before premiums can be adjusted. In such an environment the problems of adverse selection and moral hazard can lead to the elimination of coverage.

Given the insurance industry's strong cyclical pattern of earnings, a stable liability system is necessary for adequate performance. The recent trends in the liability system identified in the introductory chapter have not provided this stability.

Final Comments

Our theoretical analysis has identified the strengths and weaknesses of various liability standards under well-specified conditions. We can see why applications of these rules, and variants of them, in practice have created inefficiencies. The institutional complexities of liability issues, the critical departures from theoretical conditions that are needed for analytical tractability, and the absence of essential empirical information unfortunately make it impossible to provide definitive recommendations on how to achieve optimal compensation and deterrence in specific areas of liability. Analysis with an eye toward this goal must be based on knowledge of specific institutions and experiences. The remaining chapters of this volume take up this task.

Appendix: Mathematical Derivations

This appendix derives in a formal manner the main results presented in the preceding discussion. The mathematical notation is as follows.³¹ Let r = the level of prevention, safety, caution, or so forth taken by the producer; $p(r)$ = the probability of product failure ($p' < 0$, $p'' > 0$); $c(r)$ = the cost of r ($c' > 0$, $c'' > 0$); L = the monetary loss if the product fails;³² M = the payment to victim if the product fails; $V_i(w) =$

31. See Danzon, "Tort Reform." Many of the results outlined below were first reached in Spence, "Consumer Misperceptions," pp. 561-72. We cite other sources as appropriate.

32. Recall that we are assuming the magnitude of loss does not depend on r , the level of safety or prevention.

the utility of wealth when there is no product failure; $V(\omega)$ = the utility of wealth when there is a product failure; ω_0 = the initial wealth of consumers; and s = production cost of the product, exclusive of $c(r)$.³³

First-Party Liability

MONETARY LOSSES. When all losses are monetary, subscripts are not needed to distinguish the utility of income before and after the injury, so that $V_n(\omega) = V(\omega) = V(\omega)$. Suppose consumers know the failure probability, p . Then competitive market outcomes will be the theoretical optimum. Producers operating in a competitive market will set prevention level, r , and compensation, M , so as to maximize consumers' expected utility subject to normal profits. (Alternatively, if producers do not offer compensation, buyers will purchase the same amount of insurance from third parties.) Because pM is the cost of insurance to provide compensation, M , consumers' expected utility, EV , is

$$\begin{aligned} EV &= (1-p)V(\text{no failure}) + pV(\text{failure}) \\ &= (1-p)V[\omega_0 - s - c(r) - pM] \\ &\quad + pV[\omega_0 - s - c(r) - pM - L + M]. \end{aligned}$$

This expression is at a maximum when the partial derivatives with respect to r and M are equal to 0. Let r^* and M^* denote the optimal values of r and M . Working with M yields this expression in terms of marginal utilities: $V'(\text{no failure}) = V'(\text{failure})$, or

$$\begin{aligned} V'[\omega_0 - s - c(r^*) - pM^*] &= \\ V'[\omega_0 - s - c(r^*) - pM^* - L + M^*]. \end{aligned}$$

Thus consumers will use insurance (voluntarily supplied with the product or sold separately by third parties) to equalize the marginal utility of income between situations in which a loss occurs and those in which no loss occurs.³⁴ Clearly this condition is met when $M^* = L$, that is, when consumers are fully insured against the monetary loss.

33. Other models (for example, Danzon, "Tort Reform") use one variable to represent total price, including costs of prevention, bundled insurance, and so forth. We keep these separate for expositional ease.

34. If the price of insurance includes a loading factor, as all insurance does, consumers will purchase less than the amount of insurance necessary to equalize marginal utility across states; see Danzon, "Tort Reform," appendix A. If consumers are not risk-averse—that is, if the utility of wealth is simply proportional to wealth, so that V' is a constant—

With full insurance, consumers are indifferent between the two states of failure and no failure, so

$$EV = V(\text{no failure}) = V(\text{failure}) = V[w_0 - s - c(r) - pL].^{35}$$

In addition to setting M , producers will adjust r , the level of safety or precaution, to the utility-maximizing level. This yields a condition relating the marginal cost of safety and the marginal probability of failure. Letting MC denote marginal cost and MP marginal probability yields

$$\frac{MC(\text{prevention})}{MP(\text{failure})} = \frac{c'(r^*)}{-p'(r^*)} = M = L.$$

This result, familiar in analyses that consider only monetary losses,³⁶ may be rewritten as

$$\begin{aligned} MC(\text{prevention}) &= MP(\text{failure}) \times L \\ &= \text{marginal benefit of prevention.} \end{aligned}$$

When consumers are unaware of the risks, the market will behave imperfectly in several ways and first-party liability is not an efficient rule. Now suppose consumers are aware that a risk exists, but their perceptions are inaccurate. Let $h(p)$ = consumer perceptions of p . Spence derives the result that after consumers purchase desired insurance, the marginal utility of income in the different states will deviate in the following way:

$$V'(\text{no failure}) = V'(\text{failure}) \left[\frac{(1-p)h}{p(1-h)} \right].^{37}$$

If consumers underestimate risk ($p > h$), sellers provide no compensation and consumers purchase too little self-insurance. Competitive sellers

then they will have no reason to purchase insurance even if it is priced at an actuarially fair level.

35. If consumers are risk-neutral and do not purchase insurance, one can work directly in terms of changes in wealth rather than utility of wealth and will reach the same result as the one that follows.

36. See, for example, Brown, "Toward an Economic Theory of Liability." In the present model, total expected social costs, TC , consist of the costs of producing the product, subsumed in price s ; costs of prevention, $c(r)$; and expected loss from failure, pL , so that $TC = s + c(r) + pL$, which is minimized when the derivative with respect to r is equal to 0: $c'(r) = -p'(r)L$.

37. Spence, "Consumer Misperceptions," p. 564.

will now set the level of safety according to an expression that involves costs of prevention, $c(r)$, and perceived failure probability, $h(p)$:

$$\frac{\text{MC (prevention)}}{\text{perceived MP (failure)}} = \frac{c'(r)}{-h'[p(r)]} = L.$$

The resulting level of prevention, r , is likely to be less than optimal for reasonable specifications of $c(r)$, $h(p)$, and $p(r)$.

NONMONETARY LOSSES. With nonmonetary losses the impact of consumer information on the effects of first-party liability is qualitatively the same as with monetary losses. Suppose consumers know p , the probability of failure. Again, competitive producers will maximize consumer utility. With nonmonetary losses in addition to monetary losses, consumers' expected utility is

$$\begin{aligned} EV &= (1-p)V_n(\text{no failure}) + pV_f(\text{failure}) \\ &= (1-p)V_n[w_0 - s - c(r) - pM] \\ &\quad + pV_f[w_0 - s - c(r) - pM - L + M]. \end{aligned}$$

Again let r^* and M^* denote the optimal values of r and M . The first-order condition with respect to M again yields this expression in terms of marginal utilities: $V'_n(\text{no failure}) = V'_f(\text{failure})$, or

$$V'_n[w_0 - s - c(r^*) - pM^*] = V'_f[w_0 - s - c(r^*) - pM^* - L + M^*].$$

Thus consumers will use insurance to equalize the marginal utility of income among situations in which a loss occurs and those in which no loss occurs, just as they did for monetary losses. But without knowing more about how the loss affects the utility function, it is impossible to know how large M^* will be; it could even be negative if the injury sufficiently decreases the marginal utility of money (death being an extreme example).³⁸

Adjusting r , the level of safety or precaution, yields a condition relating the marginal cost of safety and the marginal probability of failure. Letting MC denote marginal cost and MP marginal probability yields

38. A consumer who purchases an annuity is essentially purchasing negative insurance against death in the sense of providing for less wealth in case of "failure" and more in case of nonfailure.

$$\begin{aligned}\frac{MC(\text{prevention})}{MP(\text{failure})} &= \frac{c'(r^*)}{-p'(r^*)} \\ &= \left[\frac{V_n(\text{no failure}) - V_f(\text{failure})}{(1-p)V'_n(\text{no failure}) + pV'_f(\text{failure})} \right] + M^*.\end{aligned}$$

Because insurance, M^* , is chosen to equate marginal utility between states, $V'_n = V'_f$. Therefore the bracketed expression in the denominator can be denoted as simply V' , the marginal utility of wealth in either situation (failure or no failure). Then

$$\begin{aligned}\frac{MC(\text{prevention})}{MP(\text{failure})} &= \frac{c'(r^*)}{-p'(r^*)} \\ &= \left[\frac{V_n(\text{no failure}) - V_f(\text{failure})}{V'(w)} \right] + M^* \\ &= U + M^*,\end{aligned}$$

where U denotes willingness to pay to prevent the utility loss from the failure.³⁹ This term applies because the expression in brackets is total utility loss divided by the marginal utility of wealth. So the previous equation may also be viewed as

$$\begin{aligned}\frac{c'(r)}{-p'(r)} &= U + M^* \\ &= \left[\text{willingness to pay} \right] + \left[\text{amount of insurance} \right] \\ &\quad \left[\text{to prevent injury} \right] \quad \left[\text{consumers wish to pay for} \right].\end{aligned}$$

Again, without knowing more about how the injury affects the utility function, we can say little about the level of prevention, r^* , or the costs of prevention, $c(r^*)$. In the present situation, however, in which consumers know the probability of failure, manufacturers will simply choose r^* in order to maximize profits, and $c(r^*)$ will be willingly paid by consumers along with production costs, s , and an insurance premium, pM^* (possibly paid to a third party). The amount $(V_n - V_f)/V'$ is of course never actually paid unless there is an opportunity to reduce the probability of failure from 1 to 0. Rather, the willingness to avoid the loss induces the producer to invest $c(r^*)$ and the buyer to pay this amount. Thus when consumers are fully informed, the presence of

39. U is related to the "compensating variation" used in welfare analysis; see P. R. G. Layard and A. A. Walters, *Microeconomic Theory* (McGraw-Hill, 1978), p. 151. We are indebted to Ralph Winter for this point.

nonmonetary losses makes it difficult to know the optimal level of insurance or precaution but does not create a market imperfection because individual actors have an incentive to solve the problem without external rules.

If consumers do not know the failure probability, p , the market imperfections that arise are qualitatively similar to those that obtained in the case of monetary losses. If consumers are aware that a risk exists but their perceptions are inaccurate, the effect again depends on the marginal relation between actual and perceived risk. Again, let $h(p)$ = consumer perceptions of p . Spence's result continues to obtain:

$$V'(\text{no failure}) = V'(\text{failure}) \left[\frac{(1-p)h}{p(1-h)} \right].^{40}$$

As when losses are entirely monetary, consumer underestimation of risk results in too low a level of compensation. The effect of imperfect information on the level of safety provided by producers depends on the *marginal* relation between actual and perceived risk. As Spence shows,

$$\begin{aligned} \frac{MC(\text{prevention})}{MP(\text{failure})} &= \frac{c'(r^*)}{-p'(r^*)} \\ &= h'(p) \left[\frac{V_n(\text{no failure}) - V_f(\text{failure})}{(1-p)V'_n(\text{no failure}) + pV'_f(\text{failure})} \right] + M^*. \end{aligned}$$

This is equivalent to the condition for optimal prevention only when $h' = 1$, that is, when consumers correctly assess marginal changes in risk. The effect of consumer underestimation of risk is ambiguous: it can lead to either too little or too much prevention.

Producers' utility, $U(w)$, can also be taken into account. Again, a product failure may impose nonmonetary as well as monetary losses on producers and may affect marginal utility. The condition for optimal prevention is

$$\frac{c'(r^*)}{-p'(r^*)} = \left[\frac{V_n - V_f}{(1-p)V'_n + pV'_f} \right] + \left[\frac{U_n - U_f}{(1-p)U'_n + pU'_f} \right] + M^*.$$

This expression reflects the willingness of both consumers and producers to pay to prevent the nonmonetary losses associated with product failure. Analyzing producer utility rather than just producer wealth might be relevant for certain kinds of producers such as physicians or day-care

centers, whose skills cannot easily be converted to other uses or who may suffer a utility loss of their own as a result of product failure.⁴¹

Strict Liability

MONETARY LOSSES. If losses are exclusively monetary, strict liability essentially requires the producer to sell insurance against failure. Again, expected consumer utility is

$$\begin{aligned} EV &= (1-p)V(\text{no failure}) + pV(\text{failure}) \\ &= (1-p)V[w_0 - s - c(r) - pM] \\ &\quad + pV[w_0 - s - c(r) - pM - L + M]. \end{aligned}$$

Analytically, the situation is identical to first-party liability except that compensation is necessarily provided by the producer rather than by a third party. The producer absorbs all costs and therefore minimizes expected liability costs by undertaking optimal prevention, r^* , and optimal insurance, M^* . If the classic insurance problems of moral hazard and adverse selection do not arise, product price will correctly reflect risk, and thus the quantity purchased will be appropriate.

NONMONETARY LOSSES. Nonmonetary damages by definition have no obvious monetary equivalent, and thus it is not clear how the courts would measure them. A plausible measure is the sum of two factors: U , which is the amount the victim would have paid to avoid the injury (given that compensation will be paid for monetary loss), and desired compensation if injury occurs despite precautions. So let $D = U + M$, where D equals damages payment.

As noted previously, M depends on monetary losses and on how injury affects marginal utility of wealth, and it may be zero or negative. We also noted that the condition for optimal prevention is

$$\begin{aligned} \frac{MC(\text{prevention})}{MP(\text{failure})} &= \frac{c'(r^*)}{-p'(r^*)} \\ &= \left[\frac{V_n(\text{no failure}) - V_f(\text{failure})}{(1-p)V'_n(\text{no failure}) + pV'_f(\text{failure})} \right] + M^* \\ &= U + M^*. \end{aligned}$$

41. Patricia M. Danzon, "Liability and Liability Insurance for Medical Malpractice," *Journal of Health Economics*, vol. 4 (December 1985), p. 311, notes that liability can impose uninsurable costs on physicians for loss of time and reputation.

Because this equation defines the optimal degree of prevention, requiring the producer to pay the amount $D = U + M^*$ has the effect that the producer treats potential consumer losses as his own and thus provides the correct incentive for prevention.⁴² But this damages rule distorts product price. The price will include costs of production, costs of prevention, and the insurance premium: $\text{price} = s + c(r^*) + p(U + M^*)$.

But the insurance premium, $p(U + M^*)$, does not correspond to the amount of insurance the consumer would prefer to purchase, which is only M^* . Consumers are thus forced to pay for extra insurance, the value of which is (by the definition of M^*) less than the premium. Spence showed that this problem can be solved by splitting the payment into two parts, with M^* going to victims and U being paid to the state, which would then use the payment to subsidize product price.⁴³ This solution would avoid compulsory overinsurance but would not solve the pricing problem because price would not reflect the risks of using the product. This dilemma has not been solved.

42. See Spence, "Consumer Misperceptions," p. 566.

43. *Ibid.*, pp. 561-72.

Prices and Profits in the Liability Insurance Market

Scott E. Harrington

COMMERCIAL liability insurance premiums increased dramatically in 1985 and 1986. The growth for general liability insurance was especially pronounced: net premiums written increased from \$6.5 billion in 1984 to \$20 billion in 1986. During this time, limits of coverage were shrinking for many of those insured, and cancellations and denials of renewal were widespread for some types of business in some states. Premium growth had moderated substantially by the end of 1986, but the large increases in the previous two years undoubtedly imposed high costs on many businesses and professionals. Insurers reported large accounting losses on operations in 1984 and 1985. The causes of the premium increases—whether rapidly escalating and unpredictable claim costs, severe underpricing of business written before 1985 because of cyclical influences in the industry, or both—have been vigorously debated, as has the extent to which industry operations actually were unprofitable. While widespread deregulation of commercial insurance rates occurred during the 1970s, a few states have enacted new forms of rate regulation in response to recent experience.

This chapter provides an overview of prices and profitability in the commercial liability insurance market to examine the nature and causes of recent experience. It describes the structure of the market and possible causes of underwriting cycles and reviews financial and operating results for recent years. Detailed information is provided about growth rates in losses for general liability and other major liability lines. A model of break-even (that is, zero-profit) insurance prices is used to provide evidence of whether increases in general liability premiums were commensurate with increases in the discounted value of losses and expenses. The chapter does

not deal directly with tort reform, nor with allegations of collusion recently raised in several lawsuits against major liability insurers, but the analysis sheds light on some of the key issues.

The findings suggest that overall financial results for the property and liability insurance industry deteriorated substantially in 1984 and 1985, regardless of the accounting conventions used to measure income. Losses for commercial liability coverage, especially general liability insurance, were largely responsible for this decline. Growth in several measures of insured losses for general liability coverage increased significantly relative to GNP. The results also suggest that the total increase in premiums since 1981 can largely be explained by increases in the discounted value of reported losses. However, premium increases appear to have been much smaller than cost increases through 1984, with the result that substantial increases were needed to catch up with the growth in the discounted value of losses. While questions remain concerning why premiums failed to keep pace with losses through 1984, the analysis suggests that, based on what we know, significant changes in regulatory policy for the industry are not warranted.

Overview of the Market

Table 3-1 presents national market shares for the largest property and liability insurer group, the four largest groups, and the twenty largest groups by line of business. The low concentration levels indicate that the commercial liability insurance market is competitively structured.¹ The

1. See Paul L. Joskow, "Cartels, Competition and Regulation in the Property-Liability Insurance Industry," *Bell Journal of Economics and Management Science*, vol. 4 (Autumn 1973), pp. 375-427, for an early analysis of market structure in the property-liability industry. The competitive structure of the industry also has been emphasized by the Department of Justice, *The Pricing and Marketing of Insurance: A Report of the U.S. Department of Justice to the Task Group on Antitrust Immunities* (Washington, D.C., 1977). Also see the discussion in Tort Policy Working Group, *Report of the Tort Policy Working Group on the Causes, Extent and Policy Implications of the Current Crisis in Insurance Availability and Affordability* (Washington, D.C.: Department of Justice, 1986); and the Herfindahl-Herschmann indices reported by the Department of Justice, Antitrust Division, "The Crisis in Property-Casualty Insurance," in Tort Policy Working Group, *An Update on the Liability Crisis* (Washington, D.C.: Department of Justice, 1987), appendix. For some coverages, a more appropriate definition of the market might be the state. Average statewide concentration levels probably would not be much higher than those shown in table 3-1. Based on data reported on *Best's Insurance Management Reports: Property-Casualty Edition* (weekly), the mean market share of the largest firm across states for general liability was 12 percent in 1985; the maximum was 27 percent (these figures

Table 3-1. Shares of National Net Premiums Written for Leading Property and Liability Groups, 1985

Percent unless otherwise specified

Line of business	Estimated 1986 net premiums written (billions of dollars)	Market share (1985)		
		Largest group	Largest 4 groups	Largest 20 groups
General liability	20.0	9.0	22.4	66.1
Medical malpractice	3.6	19.9	38.6	73.7
Commercial multiperil	16.0	7.7	23.4	68.8
Commercial auto liability	9.5	5.1	18.5	59.9
Private passenger auto liability	34.3	18.8	39.8	62.5
Workers' compensation	19.6	10.0	24.8	65.4
All property and liability	176.4	9.8	22.1	55.1

Sources: Market shares calculated from data in *Best's Aggregates and Averages: Property-Casualty, 1986* (Oldwick, N.J.: A. M. Best, 1986). Net premiums written are from estimates in Paul E. Wish, "Review and Preview: Up from the Ashes," *Best's Review: Property/Casualty Insurance Edition*, vol. 87 (January 1987), p. 12. Separate estimates for commercial and private passenger auto liability were not provided; the figures for these two lines are based on 1985 proportions.

data suggest that the minimum efficient scale of operations is small relative to the size of the market.² Most premiums are written through independent agents and brokers. There would appear to be no major barriers to companies entering this distribution channel, although some modest barriers exist because of such regulations as minimum capital and surplus requirements and other licensing requirements.³

exclude Michigan, in which a subsidiary of General Motors had a 41 percent market share because it provided insurance for its parent). For commercial multiperil insurers, who sell property and liability coverage as a package to small and medium-sized businesses, the mean market share was 12 percent and the maximum was 21 percent. The single-firm shares reported by *Best's* were much higher for medical malpractice, but they often do not reflect experience of provider-owned mutual companies.

2. Some studies have suggested that average costs of production in the property-liability insurance industry decrease as the size of the firm decreases. See, for example, Joseph E. Johnson, George B. Flanigan, and Steven N. Weisbart, "Returns to Scale in the Property and Liability Insurance Industry," *Journal of Risk and Insurance*, vol. 48 (March 1981), pp. 18-45. These studies have, however, been plagued by the lack of information about average account size and other factors that could produce a bias toward finding decreasing costs.

3. Patricia Munch and Dennis E. Smallwood, "Solvency Regulation in the Property-Liability Insurance Industry: Empirical Evidence," *Bell Journal of Economics*, vol. 11 (Spring 1980), pp. 261-79. Joskow, "Cartels, Competition and Regulation," suggested the possibility of entry or growth barriers for direct-writing distribution methods. Whether this is likely has been disputed; see, for example, Mark Pauly, Howard Kunreuther, and Paul Kleindorfer, "Regulation and Quality Competition in the U.S. Insurance Industry,"

The insurance industry is largely exempt from federal antitrust legislation as a result of the McCarran-Ferguson Act of 1945. The exemptions allow insurers to pool loss data through various rating organizations or bureaus. In most states, rating bureaus promulgate premium rates for most lines of business, and subscribers may use the rates. The available data for at least private passenger auto insurance nevertheless suggest that despite these pooling arrangements insurers display considerable pricing independence. The key exceptions are small companies that tend to use bureau rates to economize on costs.⁴ The evidence and concern about underwriting cycles also suggest vigorous price competition in commercial liability lines, regardless of the existence of rating bureaus.⁵

Price information is likely to be readily available to consumers through agents and brokers, and there is considerable standardization of coverage as a result of both the influence of rating bureaus and state regulation of policy forms, especially for small to medium-sized buyers. Little information is available, however, for consumers to assess differences in claim settlement practices. To the extent that consumer preferences for quality of claim service differ, independent agents may play some role in placing coverage with appropriate insurers. Most states also have laws dealing with unfair claim practices, and consumers may seek tort recoveries in the event of arbitrary treatment.

Many consumers may not be aware of differences in financial strength among insurers, and both consumers and agents may find it difficult to assess whether an insurer will be able to pay claims. This problem has generally been used to justify state regulation designed to reduce the number of insurance company failures and to protect consumers from the consequences of defaults that do occur.⁶ Before 1970, regulations

in Jörg Finsinger and Mark V. Pauly, eds., *The Economics of Insurance Regulation: A Cross-National Study* (St. Martin's Press, 1986), pp. 75-78.

4. See Department of Justice, *Pricing and Marketing of Insurance*; Patricia M. Danzon, "Rating Bureaus in U.S. Property-Liability Insurance Markets: Anti- or Pro-Competitive?" *Geneva Papers on Risk and Insurance*, vol. 8 (October 1983), pp. 371-402; and Scott Harrington, "The Impact of Rate Regulation on Prices and Underwriting Results in the Property-Liability Insurance Industry: A Survey," *Journal of Risk and Insurance*, vol. 51 (December 1984), pp. 578-623.

5. As is discussed later, at one time rating bureaus and the antitrust exemption may have facilitated cartel behavior. See also Joskow, "Cartels, Competition and Regulation."

6. Jörg Finsinger and Mark Pauly, "Reserve Levels and Reserve Requirements for Profit-Maximizing Insurance Firms," in Günter Bamberg and Klaus Spremann, eds., *Risk and Capital* (Berlin: Springer-Verlag, 1984,) pp. 160-80, consider whether consumer failure to base purchasing decisions on the probability of default leads to excessive risk

emphasized direct controls of pricing, product mix, and investment policy. Since then they have emphasized monitoring, primarily through the National Association of Insurance Commissioners (NAIC) Insurance Regulatory Information System, and paying the claims of insolvent insurers through state guaranty funds.⁷ The extent to which state guaranty funds have increased insurer risk taking by reducing the incentives of buyers to purchase coverage from financially sound companies is not known.

Information problems facing insurers are also substantial. First, for a given average expected loss per unit of coverage in a given line of business, considerable heterogeneity exists among consumers. For liability insurance, rates generally vary by industry and state. Rating plans also commonly allow underwriters to apply credits and debits on the basis of firm-specific characteristics and judgment. While such experience rating commonly is used for medium and large corporate risks, the low frequency of liability claims for most businesses and professionals and the resulting lack of statistical credibility of a risk's own loss experience often seriously limits the extent to which experience rating can reduce problems of adverse selection and moral hazard.⁸

Adverse selection is the tendency for high risks to buy more coverage than low risks at any given rate. Because insurers cannot identify differences in risk with perfect accuracy and those insured often will have more knowledge about their risk than insurers, some adverse selection

taking by insurers; see also Patricia Munch and Dennis Smallwood, "Theory of Solvency Regulation in the Property and Casualty Insurance Industry," in Gary Fromm, ed., *Studies in Public Regulation* (MIT Press, 1981), pp. 119-67. Compulsory coverage requirements might also lead buyers of third-party coverage with few assets at risk to seek coverage from insurers with low premiums but a high probability of default. For detailed discussion of the insolvency problem and associated regulation, see Scott E. Harrington and Patricia M. Danzon, "An Evaluation of Solvency Regulation in the Property-Liability Insurance Industry," report to the Alliance of American Insurers, American Insurance Association, and National Association of Independent Insurers (University of Pennsylvania, Wharton School, June 1986).

7. All states have guaranty funds for property and liability insurance. New York prefunds its plan through assessments on insurers. The remaining states assess surviving companies following a default. The maximum claim payable through the funds for liability coverage commonly is no more than \$500,000. A recent amendment to the NAIC model legislation allows guaranty funds to seek recovery from corporations with net worth greater than \$50 million for liability claims paid on their behalf.

8. General liability insurance rating procedures are described in Michael F. McManus, "General Liability Ratemaking: An Update," *Proceedings of the Casualty Actuarial Society*, vol. 67 (November 1981), pp. 144-80.

will exist and will tend to become more pronounced as heterogeneity among buyers in a rate class increases.

The theory of competitive insurance markets with adverse selection has emphasized the existence and characteristics of market equilibrium when insurers can identify the total amount of coverage owned by each buyer and compete by offering different combinations of price and coverage.⁹ But it is not clear that this theory describes reality in liability insurance markets. Adverse selection could cause the market for particular types of coverage to disappear.¹⁰ For a given rate, low risks might be unwilling to buy coverage. As they drop out of the pool, the rate must go up, causing more risks with low expected loss relative to the group average to drop out, and so on. Given expense loadings in premiums, the highest risks may not be willing to insure unless subsidized by low risks. If so, no market would exist.¹¹ Whether this is true is not known, but adverse selection may help explain instances in recent years in which coverage has been alleged to be unavailable at any price.

Moral hazard is the tendency for the presence and characteristics of insurance coverage to produce inefficient changes in buyers' loss prevention activities, including carelessness and fraud, which are often emphasized in the insurance literature. If insurance prices were to reflect perfectly the influence of loss prevention activities on expected losses, moral hazard would not exist. But while experience rating, deductibles, and other forms of copayment by buyers may mitigate moral hazard, the inability of insurers to monitor loss prevention activities accurately leads to too little prevention and too many losses.

Prices are also determined by the average expected loss per unit of exposure in a given rating class and for all classes combined, which may vary considerably over time. Liability insurance contracts sold on an occurrence basis promise to pay all claims that arise out of actions during the policy period, regardless of when the claim is made. The long time that can elapse before all claims are paid for such coverage requires companies to predict payments that often will not be made for

9. Michael Rothschild and Joseph Stiglitz, "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," *Quarterly Journal of Economics*, vol. 90 (November 1976), pp. 629-49.

10. George A. Akerlof, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism," *Quarterly Journal of Economics*, vol. 84 (August 1970), pp. 488-500. Also see George L. Priest, "The Current Insurance Crisis and Modern Tort Law," *Yale Law Journal*, vol. 96 (June 1987), pp. 1521-90.

11. For liability coverage, high-risk buyers with few assets to protect also could be unwilling to buy coverage unless subsidized by low risks.

many years.¹² As is discussed later, difficulty in accurately estimating future claims may cause coverage to be priced below expected costs. This difficulty may be a principal cause of underwriting cycles in the liability insurance market.

The possibility of destructive competition has been closely associated with regulation of property-liability insurance prices. Before the McCarran-Ferguson Act was passed in 1945, allegations of destructive competition were used to justify cartel behavior. Rating bureaus were effective in controlling prices and commissions, at least in property insurance where deviations from bureau rating schemes could be detected. Following the enactment of McCarran-Ferguson, most states passed laws that required prior approval of rates by regulators for all property-liability lines. These laws often encouraged insurers to use bureau rates by making it difficult or costly to obtain approval of independent rate filings. A period of rate deregulation began in the late 1960s. With the exception of workers' compensation rates, which remain heavily regulated in most states, property-liability insurance rates are now subject to some form of prior approval in just under half of the states. Regulation in these states, however, probably has not had much impact on rates for commercial lines in recent years because of passive administration of the laws, pricing flexibility provided to underwriters by rating plans, and other influences.¹³ In contrast, there is considerable evidence that rate regulation has lowered average prices for private passenger auto liability insurance in recent years.¹⁴ Evidence also suggests that restrictive rate regulation is more likely in states with high losses per insured driver.¹⁵

12. This so-called tail reflects lags between the time that rates are made and their effective date for all policies, between the accident date and the date the claim is made, and between the date the claim is made and the date it is paid.

13. For a review of the impact of rate regulation, see Harrington, "Impact of Rate Regulation." Also see Richard E. Stewart, *Remembering a Stable Future: Why Flex Rating Cannot Work* (New York: Insurance Services Office and Insurance Information Institute, 1987).

14. See Henry Grabowski, W. Kip Viscusi, and William N. Evans, "The Effects of Regulation on the Price and Availability of Automobile Insurance," paper presented at the Nineteenth Atlantic International Economic Conference in Rome, 1985; Pauly and others, "Regulation and Quality Competition"; and Scott E. Harrington, "A Note on the Impact of Auto Insurance Rate Regulation," *Review of Economics and Statistics*, vol. 69 (February 1987), pp. 166-70.

15. Scott E. Harrington, "Cross-Subsidization and the Economics of Regulation: Theory and Evidence from Automobile Insurance," working paper 87-12 (University of Pennsylvania, Center for Research on Risk and Insurance, August 1987), develops a model that suggests consumer pressure for lower prices is likely to increase with costs if

As a result of recent experience in the liability insurance market, a few states have reregulated rates for commercial lines. These so-called flex-rating laws require prior approval only for rate changes in excess of a given statutory benchmark. Whether rate regulation is likely to be an appropriate response to the problems of the liability insurance market is discussed later in this chapter and again in the concluding chapter of this volume.

Overview of Financial Results

Table 3-2 shows reported income, capital structure, and insolvencies for the property-liability insurance industry from 1972 to 1986. Ratios of several alternative measures of income to both earned premiums and statutory surplus adjusted for prepaid acquisition expenses are shown in table 3-3.¹⁶ All the income measures shown in tables 3-2 and 3-3 reflect calendar year losses, which equal losses paid plus the change in the loss reserve during the given year. As a result, the income measures for each year reflect revisions in the loss reserve for claims from previous years as well as loss experience for new claims during the year.¹⁷

The time period shown in tables 3-2 and 3-3 allows recent experience to be compared with that of the insurance crisis of 1974-75. Operating losses have been the major cause of problems in 1984-85; unrealized capital losses were the principle factor leading to the sharp declines in surplus in 1973-74. While unrealized capital gains contributed to rapid

demand is inelastic. The model provides a possible explanation of regulatory emphasis on affordability of coverage.

16. An introduction to insurance accounting and profit measurement using both statutory accounting principles (SAP) and generally accepted accounting principles (GAAP) is provided in appendix A. The underwriting income measures in table 3-3 are calculated with the combined ratio, which is defined as the sum of the ratio of incurred losses and policyholder dividends to earned premiums and the ratio of underwriting expenses to written premiums. As discussed in appendix A, 1 minus the combined ratio approximately equals the pretax GAAP underwriting profit margin relative to earned premiums. The income measures shown are divided by the average of the beginning and end-of-year values of adjusted surplus. Adjusted surplus is defined as SAP surplus plus the average underwriting expense ratio for the current and preceding year times the unearned premium reserve. GAAP surplus, which would also reflect items such as deferred taxes, generally is not reported for the aggregate industry.

17. Throughout the chapter *loss* refers to the sum of insurer loss-adjustment expenses and losses payable to claimants.

Table 3-2. Selected Financial Results for the Property-Liability Industry, 1972-86

Millions of dollars unless otherwise specified

Item	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986 ^a
Combined ratio (percent)	96.2	99.2	105.4	107.9	102.4	97.1	97.4	100.6	103.1	106.0	109.6	112.0	118.0	116.3	108.6
Ratio of net investment income/earned premiums	7.1	7.6	8.3	8.2	8.1	8.5	9.3	10.7	11.8	13.6	14.6	14.9	15.4	14.6	13.0
Before-tax operating income ^b	3,724	3,100	959	-322	2,405	6,928	8,586	7,978	7,729	6,960	4,617	2,651	-3,609	-5,780	4,500
After-tax operating income ^b	2,895	2,631	1,284	232	2,256	5,913	7,197	7,083	7,137	6,906	5,333	3,869	-1,942	-3,822	6,000
Realized capital gains	301	412	-154	139	286	329	57	300	533	276	572	2,110	3,063	5,483	5,500
Unrealized capital gains	2,836	-4,915	-6,999	4,035	3,803	-1,083	41	2,030	4,274	-2,666	2,908	1,358	-2,848	5,227	4,500
Net capital and surplus paid in ^c	-458	-1,084	-185	17	-78	-72	-736	-1,199	-1,495	-1,775	-1,248	-1,945	233	5,561	1,300
Surplus at yearend ^b	23,812	21,389	16,270	19,712	24,631	29,300	35,379	42,395	52,174	53,805	60,395	65,606	63,809	75,511	91,000
Percent change in surplus	24.9	-10.2	-23.9	21.2	24.9	18.9	20.7	19.8	23.1	3.1	12.2	8.6	-2.7	18.3	20.5
Percent change in net premiums written	10.1	8.1	6.2	11.0	21.8	19.8	12.8	10.3	6.0	3.9	4.7	4.8	8.4	22.0	22.3
Ratio of net premiums written/surplus	1.63	1.97	2.75	2.52	2.45	2.47	2.31	2.13	1.83	1.85	1.72	1.67	1.86	1.92	1.94
Ratio of liabilities/surplus	2.12	2.64	3.70	3.47	3.29	3.32	3.21	3.10	2.79	2.95	2.84	2.80	3.15	3.12	n.a.
Ratio of loss reserves/surplus	1.12	1.42	2.13	2.00	1.91	1.94	1.94	1.91	1.77	1.90	1.85	1.87	2.11	2.05	n.a.
Number of insolvencies	2	2	5	20	4	6	6	3	4	6	9	4	20	20	n.a.

Sources: *Best's Aggregates and Averages: Property-Casualty*, 1986; and earlier years; and Wish, "Review and Preview." Number of insolvencies provided by National Committee on Insurance Guaranty Funds.

n.a. Not available.

a. Estimated.

b. Income and surplus calculated according to statutory accounting principles.

c. Net capital and surplus paid in equals new capital and surplus paid in less dividends to stockholders.

Table 3-3. *Adjusted Income Measures as a Percentage of Earned Premiums and Adjusted Surplus, 1972-86*

Income measure ^a	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986 ^b
<i>Earned premiums</i>															
Pretax underwriting income	3.8	0.8	-5.4	-7.9	-2.4	2.9	2.6	-0.6	-3.1	-0.6	-9.6	-12.0	-18.0	-16.3	-8.6
Pretax operating income	10.9	8.4	2.8	0.3	5.6	11.4	11.9	10.1	8.7	7.6	5.0	2.9	-2.6	-1.7	4.4
After-tax operating income	8.7	7.2	3.6	1.4	5.4	9.9	10.1	9.0	8.1	7.5	5.7	4.0	-1.2	-0.2	5.3
After-tax operating income plus realized capital gains	9.5	8.2	3.2	1.7	5.9	10.4	10.2	9.4	8.6	7.8	6.3	6.0	1.5	3.9	8.7
After-tax operating income plus realized and unrealized capital gains	17.0	-3.8	-12.8	10.2	12.5	8.8	10.2	11.7	13.2	5.1	9.1	7.3	-1.0	7.8	11.4
<i>Adjusted surplus</i>															
Pretax underwriting income	5.5	1.2	-9.7	-15.9	-4.8	5.9	5.1	-1.1	-5.1	-9.3	-14.5	-17.3	-26.8	-25.9	n.a.
Pretax operating income	15.6	12.4	5.1	0.5	11.3	23.0	23.4	18.5	14.4	11.8	7.5	4.2	-3.9	-2.7	n.a.
After-tax operating income	12.5	10.7	6.5	2.9	10.8	20.0	19.9	16.6	13.4	11.7	8.6	5.8	-1.8	-0.3	n.a.
After-tax operating income plus realized capital gains	13.6	12.2	5.8	3.5	11.8	21.0	20.0	17.2	14.3	12.1	9.4	8.6	2.2	6.2	n.a.
After-tax operating income plus realized and unrealized capital gains	24.5	-5.6	-23.0	20.5	25.2	17.8	20.1	21.5	21.9	7.9	13.7	10.5	-1.5	12.5	n.a.

Sources: *Best's Aggregates and Averages: Property-Casualty*, 1986 and earlier years; and Wish, "Review and Preview."

n.a. Not available.

a. Underwriting income, operating income, and surplus are adjusted for prepaid acquisition expenses. Taxes do not include deferred income taxes.

b. Estimated.

surplus growth in both 1975-76 and 1985-86, realized capital gains also had a major impact in the latter period. New inflows of capital accounted for over 40 percent of the growth in surplus in 1985. Increases in premiums written in 1985 and 1986 were larger relative to the preceding few years than those in 1975 and 1976. However, the absolute increases in 1985 and 1986 are only slightly greater than those that occurred in 1976 and 1977. The percentage increases in surplus following the decline in 1984 have been smaller than those following the steeper declines in 1973 and 1974, but the data indicate that large unrealized capital gains played a relatively greater role in rebuilding surplus during the earlier period.

If unrealized capital gains are not included, 1984 ranks as the worst year for all of the income measures in table 3-3. When unrealized capital gains are included, results were worse in 1973 and 1974. If all capital gains are excluded, 1985 ranks second to 1984 as the worst year during the period. In fact, 1984 and 1985 are the only two years with negative income exclusive of capital gains. As will be discussed later, whether capital gains should be included in income has been a major issue in the debate about whether operations actually were unprofitable in recent years.

The three measures of financial leverage shown in table 3-2 indicate that the highest values occurred in 1974. The ratios of premiums to surplus and total liabilities to surplus are substantially higher for 1974 and 1975 than for 1984 and 1985. Part of this difference reflects higher premium levels in the earlier period, which have a direct impact on both ratios.¹⁸ The ratio of loss reserves to surplus is about the same during both periods. A major problem in comparing results for the two periods is that small differences in reserve adequacy over time can have a large impact on reported income and measures of leverage.¹⁹ In both periods a historically large number of insolvencies occurred, with the total number in 1984 and 1985 much larger than in 1974 and 1975. While detailed data are not yet available, the number of insolvencies most likely remained high in 1986. Premium increases also were much larger

18. Premium levels influence the magnitude of the unearned premium reserve as well as net premiums written.

19. George M. Gottheimer, Jr., "Crisis of Confidence," in Numan A. Williams, ed., *Crisis Avoidance: Insurance Responsibilities* (Malvern, Pa.: Society of Chartered Property and Casualty Underwriters, 1986), pp. 67-84, provides an illustration of the potential impact of underreserving on the premium-to-surplus ratio in 1985.

for commercial liability lines during 1985 and 1986 than in 1976 and 1977.

Table 3-4 presents calendar year combined ratios and operating ratios for each insurance line from 1977 to 1986.²⁰ Since more net investment income and realized capital gains are allocated to the longer-tailed lines, the difference between the combined ratio and the operating ratio is greater for general liability and medical malpractice than for commercial multiperil and auto business.²¹ With the exception of workers' compensation, the data show gradually increasing ratios through 1984. For general liability, medical malpractice, and private passenger auto liability, the ratios increased through 1985. The operating ratios generally began to exceed 100 percent in 1981 and 1982. These results indicate substantial accounting losses for commercial liability lines after investment income, including realized capital gains, was allocated to operations during 1984 and 1985. While operating ratios were not available for 1986, the data suggest that they will be about 100 percent for general liability and will exceed 100 percent for medical malpractice. Since these are calendar year results, the high ratios in recent years reflect increases in reserves for losses experienced in earlier years.

Errors in Estimating Reserves

As noted, previous errors in estimating loss reserves will affect calendar year financial results in the year in which reserves are restated to reflect the errors. Accident year results, which include losses only for accidents during a given calendar year, provide a better measure of experience during the period in which premiums were earned. However, errors in the reserve estimates as of any given statement date may be substantial, so that calendar year and accident year results and reported surplus may

20. A combined ratio greater than 100 percent indicates a pretax GAAP underwriting loss (exclusive of investment income). As discussed in appendix A, the operating ratio equals the combined ratio minus the ratio of net investment income and realized capital gains to earned premiums. An operating ratio greater than 100 percent indicates a pretax GAAP operating loss exclusive of both unrealized capital gains and the amount of net investment income and realized capital gains that are allocated to surplus.

21. General liability, which is denoted "other" or "miscellaneous" liability on annual statements and in many publications, includes all commercial liability coverage other than auto, workers' compensation and employers' liability, liability coverage provided in commercial multiperil contracts, and medical malpractice.

Table 3-4. Combined Ratios and Operating Ratios, by Insurance Line, 1977-86^a
Percent

<i>Insurance line</i>	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
General liability										
Combined ratio	100.0	97.3	98.2	107.2	116.0	129.4	138.1	151.8	145.8	120.3
Operating ratio	90.4	87.5	86.0	92.7	96.5	106.4	113.8	125.1	125.8	n.a.
Medical malpractice										
Combined ratio	93.7	104.9	113.9	129.2	137.6	150.9	151.2	162.2	166.9	144.4
Operating ratio	79.6	87.3	92.0	99.8	101.4	109.8	108.9	118.3	129.5	n.a.
Commercial multiperil										
Combined ratio	87.2	84.9	93.3	98.8	107.1	116.4	123.2	134.9	121.3	97.2
Operating ratio	82.8	80.7	88.6	93.4	100.5	109.1	114.8	125.1	112.2	n.a.
Commercial auto liability										
Combined ratio	98.8	99.9	105.0	109.5	118.3	126.4	132.9	143.1	127.1	112.8
Operating ratio	92.7	93.7	97.6	101.1	108.4	115.3	121.3	130.8	116.4	n.a.
Private passenger auto liability										
Combined ratio	99.5	99.8	101.6	103.3	109.6	110.9	112.1	113.6	119.6	119.0
Operating ratio	93.7	93.8	94.8	96.1	101.4	102.1	102.9	103.9	109.5	n.a.
Workers' compensation										
Combined ratio	108.6	105.0	103.0	101.4	102.8	103.9	112.5	121.9	118.8	120.5
Operating ratio	101.2	97.2	93.7	90.7	89.8	88.9	96.3	105.2	103.8	n.a.
All property-liability										
Combined ratio	97.1	97.4	100.6	103.1	106.0	109.6	112.0	118.0	116.3	108.6
Operating ratio	91.8	91.8	94.1	95.9	97.6	100.5	102.3	107.4	106.3	n.a.

Sources: *Best's Aggregates and Averages: Property-Casualty*, 1986; and Wish, "Review and Preview."

n.a. Not available.

a. All ratios are computed after payment of policyholder dividends.

differ greatly from the values that would be reported if future claims were known with certainty.

The problem of errors in estimating reserves always makes interpretation of insurance company financial results tenuous. Large errors in forecasting claims are often highly correlated among firms because of changes in factors that influence losses, such as inflation and the level of economic activity. Reserves also can be deliberately misstated to manage earnings and taxes. Consistent overstatement defers income taxes (or costs associated with tax avoidance, such as lower yields on tax-exempt securities). If shareholders are concerned about net cash flow and if tax deferral reduces costs and hence premiums, neither they nor policyholders would object to overstatement, provided they are aware that reported income and surplus are understated.²² But deliberate understatement of reserves allows an insurer to show higher income and surplus. Whether shareholders, policyholders interested in security, or regulators would systematically be misled by such a strategy is uncertain.²³

Errors in estimating reserves eventually can be measured by comparing total claim payments (or total payments plus any remaining reserve) with values initially reported. A number of studies have analyzed errors using historical data from the 1940s through the early 1970s on reserves and claims paid that are reported for third-party lines of business in schedule P of insurance company statutory statements. Almost all empirical studies have analyzed reserve errors for auto liability. Several have analyzed data for general liability and workers' compensation as well. The results, which often differ considerably among companies, indicate overreserving in the 1940s and 1950s for large auto liability insurers and in the 1950s for general liability.²⁴ The results for the

22. The Internal Revenue Service would object, but it could be difficult to prove deliberate misstatements in reserves, given the possibility of large random errors.

23. Companies that default are almost always grossly underreserved. A number of analysts have considered whether insurers are likely to use reserves to smooth reported income and have provided some evidence to this effect. See, for instance, Barry D. Smith, "An Analysis of Auto Liability Loss Reserves and Underwriting Results," *Journal of Risk and Insurance*, vol. 47 (June 1980), pp. 305-20; and Mary Weiss, "A Multivariate Analysis of Loss Reserving Estimates in Property-Liability Insurers," *Journal of Risk and Insurance*, vol. 52 (June 1985), pp. 199-221.

24. See Stephen Forbes, "Loss Reserving Performance within the Regulatory Framework," *Journal of Risk and Insurance*, vol. 37 (December 1970), pp. 527-38; Dan Robert Anderson, "Effects of Under and Overvaluations in Loss Reserves," *Journal of Risk and Insurance*, vol. 38 (December 1971), pp. 585-600; R. J. Balcarek, "Loss Reserve Deficiencies and Underwriting Results," *Best's Review: Property/Liability Insurance Edition*, vol. 76 (July 1975), pp. 20-23; Craig F. Ansley, "Automobile Liability Insurance Reserve

1960s and early 1970s indicate underreserving both for auto liability and for general liability.²⁵

Table 3-5 presents accident year results and evidence on errors in reserve estimates in recent years for schedule P lines of business. The table shows the accident year loss ratios (incurred losses divided by earned premiums) originally reported and accident year loss ratios developed (that is, reflecting all payments and the remaining reserve) through 1985.²⁶ Results are shown for the industry for accident years 1980-85 using the consolidated schedule P information reported in *Best's Aggregates and Averages: Property-Casualty, 1986*, and for 1976-85 using aggregate information for forty-five large companies supplied by Aetna Life and Casualty.²⁷

The data indicate substantial upward development in the loss ratios for malpractice and, especially, general liability in 1981-84. Loss ratios for general liability increased substantially during this time.²⁸ Substantial upward development occurred for accident years 1976 and 1977 for general liability in the sample data, but developments for malpractice were large and negative. In general, the results for multiperil (aggregated in schedule P and including first-party property losses for homeowners, farmowners, and commercial multiperil business), auto liability (aggregated for private passenger and commercial business), and workers' compensation generally indicate a smaller increase in loss ratios and smaller

Adequacy and the Effect on Inflation," *CPCU Journal*, vol. 31 (June 1978), pp. 105-12; Stephen W. Forbes, "The Credibility of the Earnings per Share of Nonlife Insurance Companies," *CPCU Journal*, vol. 31 (March 1978), pp. 30-36; and Smith, "Analysis of Auto Liability Loss Reserves."

25. For auto liability, see Anderson, "Effects of Under and Overvaluations"; Balcarek, "Loss Reserve Deficiencies"; Ansley, "Automobile Liability Insurance Reserve Adequacy"; Forbes, "Credibility of Earnings per Share"; and Smith, "Analysis of Auto Liability Loss Reserves." For general liability, see Anderson, "Effects of Under and Overvaluations"; and Balcarek, "Loss Reserve Deficiencies." See also Forbes, "Credibility of Earnings per Share."

26. Accident year incurred losses include only paid losses and the loss reserve for claims that have occurred (including those incurred but not reported) during the given year. Accident year incurred losses are divided by calendar year earned premiums to obtain the accident year loss ratios.

27. In 1985 these companies represented 69, 34, 76, and 69 percent of net premiums written for general liability, medical malpractice, commercial multiperil, and all property-liability lines, respectively.

28. Developed incurred losses for these years and initial reserves for 1985 still included a sizable reserve for unpaid losses.

Table 3-5. Accident Year Loss Ratios by Insurance Line: Originally Reported (R) and Developed through 1985 (D), 1976-85

Sample	General liability		Medical malpractice		Multiperil ^a		Auto liability ^b		Workers' compensation		Schedule P ^c	
	R	D	R	D	R	D	R	D	R	D	R	D
<i>Industry</i>												
1980	0.69	0.73	1.05	1.34	0.69	0.71	0.79	0.78	0.74	0.68	0.74	0.74
1981	0.79	0.86	1.13	1.48	0.69	0.69	0.85	0.85	0.77	0.72	0.78	0.79
1982	0.87	1.02	1.18	1.58	0.75	0.77	0.87	0.88	0.79	0.78	0.82	0.85
1983	0.94	1.09	1.19	1.51	0.75	0.80	0.89	0.91	0.84	0.86	0.85	0.90
1984	0.99	1.10	1.09	1.33	0.77	0.79	0.92	0.96	0.90	0.93	0.88	0.92
1985	0.95	0.95	1.20	1.20	0.77	0.77	0.92	0.92	0.89	0.89	0.88	0.88
<i>45 companies</i>												
1976	0.69	0.86	0.75	0.66	0.63	0.62	0.79	0.78	0.77	0.89	0.73	0.76
1977	0.63	0.66	0.76	0.58	0.59	0.58	0.75	0.73	0.77	0.78	0.69	0.69
1978	0.62	0.59	0.77	0.73	0.58	0.57	0.75	0.75	0.77	0.73	0.69	0.68
1979	0.65	0.64	0.95	0.91	0.65	0.66	0.77	0.78	0.78	0.72	0.73	0.72
1980	0.69	0.71	1.15	1.10	0.69	0.70	0.79	0.79	0.76	0.69	0.75	0.74
1981	0.81	0.85	1.39	1.45	0.70	0.70	0.86	0.86	0.79	0.73	0.80	0.79
1982	0.90	1.05	1.40	1.65	0.75	0.77	0.88	0.87	0.80	0.78	0.83	0.85
1983	0.97	1.08	1.37	1.66	0.76	0.81	0.89	0.91	0.86	0.87	0.86	0.89
1984	1.03	1.12	1.09	1.24	0.78	0.79	0.92	0.95	0.92	0.94	0.89	0.92
1985	0.99	...	1.19	...	0.78	...	0.93	...	0.90	...	0.89	...

Sources: Industry data are from *Best's Aggregates and Averages: Property-Casualty, 1986*. Data for forty-five companies from Aetna Life and Casualty Co.

a. Includes commercial and homeowner's insurance.

b. Includes commercial and private passenger vehicle insurance.

c. Denotes aggregate for schedule P lines—general liability, medical malpractice, multiperil, auto liability, and workers' compensation.

Table 3-6. *Estimated Reserve Inadequacy for General Liability Lines, Based on Paid-Loss Development Methods, as of 1985^a*

Percent

Accident year	Industry				45 companies			
	Method A		Method B		Method A		Method B	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1980	-19	0	-17	0	-16	0	-15	0
1981	-28	-14	-26	-12	-22	-10	-21	-10
1982	-39	-27	-34	-23	-23	-14	-20	-12
1983	-36	-27	-34	-25	-26	-18	-26	-20
1984	-38	-31	-38	-31	-22	-16	-24	-18
1985	-12	-6	-15	-10	9	13	3	7
1980-85	-27	-18	-26	-18	-11	-4	-13	-7

Sources: Industry data are from *Best's Aggregates and Averages: Property-Casualty*, 1986. Data for forty-five companies are from Aetna Life and Casualty Co.

a. Values shown are 1985 statement reserve minus projected reserve as a percentage of 1985 statement reserve. Method A uses sum-of-the-year digits to weight loss development factors. Method B uses the most recent factor. Values shown under (2) assume that the ratio of incurred losses to losses paid as of 1985 for accident year 1980 is accurate and applicable to future years. Values shown under (1) are based on paid loss development factors back through 1976. Development factors are shown in appendix B.

absolute development than for general liability. Thus the results generally suggest greater reserve inaccuracy for the longer-tailed liability lines.²⁹

Another look at reserve adequacy for general liability is provided by table 3-6, which includes estimates of reserve inadequacy as of 1985 as a percentage of 1985 reported reserves for general liability business. The estimates were calculated using a basic reserve forecasting methodology involving historical data on paid losses. Negative values indicate estimated reserve inadequacy; positive ones indicate estimated redundancy.³⁰ Results are shown both for the industry and the forty-five-company sample and for two methods of weighting development factors (see appendix B, table 3-16) and two methods of projecting development of claims paid for years six and beyond.³¹

29. Data on cumulative development of statement reserves from 1976 through 1984 for the forty-five-company sample supplied by Aetna Life and Casualty generally had similar implications. The results for general liability and medical malpractice combined indicated especially large underreserving as of 1976 and 1977.

30. For a description of the paid loss development method, see Timothy M. Peterson, *Loss Reserving: Property/Casualty Insurance* (New York: Ernst and Whinney, 1981).

31. With regard to the latter issue, method (1) uses historical paid loss development factors for years six through ten to project future losses, and assumes that development beyond ten years will total 3 percent. Industry data were not available to calculate development factors for all payment years. Factors for the sample were used for method (1) in these instances (see appendix table 3-16). To allow for the possibility that the historical development factors for these years might overstate future development, method (2) uses the ratio of incurred losses to total payments for accident year 1980, as developed

In general, the projections imply that calendar year financial results reported during 1980-85 for the industry as a whole are likely to have overstated surplus and income from operations.³² With the exception of 1985, reserves reported as of 1985 for the accident years shown in table 3-6 and for years 1980-85 combined were substantially lower than reserves projected using these methods. For 1985 the estimated inadequacy is considerably less for the industry, and projections for accident year 1985 losses for the forty-five-company sample were lower than the reported reserve. Since the sample includes the largest insurers in the industry, the results suggest that small companies may be underreserved to a greater extent than large companies. But the large potential error in projections using paid claims for long-tailed lines should be kept in mind when evaluating the results. In particular, any slowdown (or acceleration) in the rate of claim payment for 1985 accidents could cause projections for 1985 to be far too small (or large).

Disputes about Profitability

The magnitude of profits in the property-liability insurance industry has been debated for at least two decades. In the late 1960s the dispute concerned whether profitability was inadequate compared with that of other industries based on comparisons of accounting returns for assets or net worth. In the 1980s the adequacy of profits was still being questioned based on similar analyses.³³ Recently profitability has been debated by the Insurance Services Office (ISO) and the National Insurance Consumer Organization (NICO).³⁴ ISO has argued that the indus-

through 1985, as the development factor beyond year five for each accident year. This procedure assumes that, as of 1985, reserves for accident year 1980 are accurate and that no development is expected after the sixth year for 1980 and subsequent accident years. This assumption might be considered optimistic, given recent experience and the possibility of continued growth in claims in such areas as liability for environmental hazards (see chapter 5). But changes in tort law might have some downward impact on future development compared with recent years.

32. A firm statement in this regard would require analysis of the impact of errors for each accident year on results in each calendar year.

33. See Emilio C. Venezian, "Are Insurers Under-Earning?" *Journal of Risk and Insurance*, vol. 51 (March 1984), pp. 150-56; and Insurance Services Office, *Insurer Profitability: A Long-Term Perspective* (New York, 1987).

34. See Insurance Services Office, *Insurer Profitability: The Facts* (New York, 1986); ISO, *Insurer Profitability: A Long-Term Perspective*; and National Insurance Consumer

try experienced large losses on operations in 1984 and 1985 and that it is inappropriate to consider capital gains, especially unrealized capital gains, when assessing income from insurance operations. NICO has argued that the industry's emphasis on operating income is deficient in that it fails to consider capital gains, fails to deduct GAAP expenses, inappropriately deducts policyholder dividends, and fails to discount future losses.³⁵ NICO concluded that the industry's measure of operating income seriously understates profitability and that the robust performance of stock prices for the industry in 1985 illustrates that operations were profitable despite large reported operating losses.

Accounting Results

As table 3-3 shows, the inclusion of either realized or unrealized capital gains substantially improves income relative to premiums and net worth in 1985 and 1986. In contrast to NICO, ISO argued in 1986 that it is inappropriate to include capital gains because they are highly variable and nonrecurring. The variability of unrealized capital gains is pronounced, as can be seen in tables 3-2 and 3-3. In 1987 ISO has shown that unrealized capital gains had little impact on average return on equity for the industry during 1970-86, but that they substantially increased the variability of return on equity. This study also argued that the average return on equity (as defined by ISO) for the property-liability industry was below the average for other industries during 1970-86, regardless of whether unrealized capital gains were included in income.

The theory of competitive insurance prices provides some insight into the appropriate treatment of capital gains.³⁶ The theory has been developed under the assumption of zero default risk on insurance contracts.

Organization, "And Now the Real Facts: A Response to the Insurance Services Office's 'Insurer Profitability: The Facts'" (Alexandria, Va., undated).

35. NICO frequently cites a General Accounting Office study that argued SAP income was inappropriate for tax purposes; see Natwar M. Gandhi, group director, tax policy, of the General Government Division, U.S. General Accounting Office, speech before the 1985 meeting of the American Risk and Insurance Association, Vancouver.

36. See William B. Fairley, "Investment Income and Profit Margins in Property-Liability Insurance: Theory and Empirical Results," *Bell Journal of Economics*, vol. 10 (Spring 1979), pp. 182-210; also in J. David Cummins and Scott E. Harrington, eds., *Fair Rate of Return in Property-Liability Insurance* (Boston: Kluwer Nijhoff, 1987), pp. 1-26; and Stewart C. Myers and Richard A. Cohn, "A Discounted Cash Flow Approach to Property-Liability Insurance Rate Regulation," in Cummins and Harrington, *Fair Rate of Return*, pp. 55-78.

Since the risk from investing in risky assets is borne completely by shareholders (policyholders are assumed to be unaffected by investment risk), the higher expected return on such investments does not affect the break-even price of insurance paid by policyholders. Instead, the theory suggests that break-even prices will reflect only the risk-free rate of interest on funds supplied by policyholders.³⁷

While there is not an exact relationship, most net investment income (interest, dividends, and rents) has a relatively low risk, whereas most realized capital gains and all unrealized capital gains may constitute returns to shareholders for holding risky investments.³⁸ As a result, the industry's emphasis on a definition of operating income that includes net investment income but excludes capital gains may be reasonable. If so, the magnitude of capital gains may be largely irrelevant to assessing whether income from insurance operations has been inadequate or subject to large increases or decreases.³⁹

As noted in appendix A, the failure of SAP income to match revenues and expenses generally produces an income measure that is lower than GAAP income. However, as is shown in tables 3-2 and 3-3, the magnitude of this difference is unlikely to be significant when assessing profitability in recent years.⁴⁰ Moreover, common profit measures, such as the combined ratio and the operating ratio, measure income on a GAAP basis by implicitly adjusting for prepaid expenses.

The appropriate treatment of policy dividends depends on how they

37. This result is obtained by solving for the premium level or underwriting profit margin that leaves shareholder wealth unchanged when policies are sold. With default risk, policyholders would be affected by investment risk in the absence of guaranty funds. The theory of break-even prices is not well developed under these conditions, but the existence of guaranty funds suggests that the assumption of zero default risk may be reasonable in this context.

38. Most of the realized capital gains for 1985, the latest year for which data are available, were for stocks rather than bonds.

39. The lack of information concerning unrealized capital gains on bonds may complicate this issue. Depending on insurer investment strategy, changes in the value of the bond portfolio could be anticipated as a source of funds to pay losses. For example, if insurers held immunized portfolios of assets and liabilities, part of a reduction in net investment income due to declining interest rates would be expected to be offset by realized or unrealized capital gains on bonds. Under these conditions, it might be argued that a portion of capital gains on bonds would need to be included in any ex post analysis of profitability.

40. While pretax statutory income generally will be less than GAAP income, statutory surplus generally will be less than GAAP surplus. It is thus not clear that income relative to equity will be understated on a statutory basis relative to GAAP. Data reported in *Insurance Facts* (New York: Insurance Information Institute, annual) suggest that SAP returns on equity or surplus will often exceed similar measures based on GAAP.

affect ex ante prices. If dividends are not anticipated when policies are issued in a given line but instead arise only from favorable deviations of overall losses from those expected, then NICO's suggestion that dividends should not be deducted from income when assessing industry performance and price adequacy may have merit.⁴¹ However, the only line in which dividends accounted for a substantial portion of premiums in 1984-86 was workers' compensation.⁴² In this line, regulated premiums often are set well above expected costs so that dividends are anticipated when policies are issued, and it is reasonable to treat dividends as premium refunds. For general liability, medical malpractice, commercial multiperil, and commercial auto liability, the treatment of dividends does not materially affect measures of income relative to premiums or surplus. The fact that aggregate income is higher if a large amount of workers' compensation dividends is added to reported income is irrelevant to the issue of whether income was inadequate on any of these lines.

The failure of reported income to discount future claims payments tends to understate both income and surplus if undiscounted reserves are accurate. As a result, it is not clear that accounting returns to equity are either higher or lower than would be the case if reserves were to be discounted. Moreover, the impact on income and surplus of discounting reserves would depend on reserve adequacy with or without discounting. The evidence that undiscounted reserves probably were inadequate in recent years suggests that the use of discounted but accurate reserves would have much less impact than simply discounting statement reserves.⁴³ In any case, it is unlikely that discounting reserves would have

41. Claims of inadequate prices and profits in conjunction with large dividends would be incongruous. The GAO has suggested that dividends should not be deducted for tax purposes (Gandhi, address before American Risk and Insurance Association). Also see the statement by Johnny C. Finch, which argues that dividends should not be deducted from income because they are discretionary; statement of Johnny C. Finch, senior associate director, General Government Division, U.S. General Accounting Office, before the Subcommittee on Oversight, House Committee on Ways and Means, on profitability of the property/casualty insurance industry, Washington, D.C., April 28, 1986.

42. For example, according to data reported in *Best's Aggregates and Averages: Property-Casualty, 1986* (Oldwick, N.J.: A. M. Best, 1986), policyholder dividends in 1985 equaled 9.3 percent of earned premiums for workers' compensation but only 0.5, 1.0, 0.7, and 0.1 percent of earned premiums for general liability, medical malpractice, commercial auto liability, and commercial multiperil, respectively.

43. A study in *Best's Insurance Management Reports: Property-Casualty Edition*, June 7, 1986, of loss reserves for the one-hundred largest property-liability groups estimated that reported reserves in 1984 exceeded discounted (at 9 percent) estimates of future claims for ninety of the groups. The results were not disaggregated by line of business.

changed the evidence that operating income *fell* substantially in 1984 and 1985. The level of income would be higher, but the relative reduction in income would probably be similar.

In short, there is some merit to both the industry's position and the views of NICO. It also is not surprising that the magnitude of insurance accounting profits would be vigorously debated given the large premium increases that have occurred since 1984. What is clear is that reported income from operations, whether SAP or GAAP, declined abruptly in 1984, remained relatively low in 1985 and began to increase in 1986. Discounting of reserves, if done consistently over time, would be unlikely to change this picture very much. Omniscient elimination of errors in estimating reserves might well accentuate it. Capital gains contributed substantially to surplus growth in 1985 and 1986, but theory suggests that this may not be relevant to making statements about whether products sold in 1984-86 were priced above or below expected costs.

The debate over profitability has suffered from lack of attention to accident year results and to market values of bonds, the possibility of large errors in estimating reserves, and the lack of a clear standard based on theory against which to judge profitability, however defined. The detailed discussions of calendar year accounting results, especially total dollar income measures, have shed little light on the crucial questions of whether and how much policies in any given year were underpriced or overpriced relative to expected costs. The focus on aggregate results, as opposed to results for commercial liability or general liability alone, involves the implicit assumption that favorable experience in some lines makes unfavorable experience in general liability or other commercial liability lines acceptable. But multiproduct insurance companies cannot be expected to commit capital to a line that does not leave them just as well off as investing the capital in financial assets and not selling coverage in that line, regardless of the experience of other lines. The almost exclusive focus on calendar year results fails to clarify the relationship between premiums and losses for policies in force in a given period. Poor results for earlier years that influence current calendar year results need not imply anything about the adequacy of prices on current business. When evaluating recent performance, greater attention should be given to accident year results for each line, as is done for general liability later in this chapter.

The form of the insurance company annual statement, which is determined by regulators, has probably contributed to the focus on calendar year results. Accident year results are buried in schedule P and are

Table 3-7. Annual Percentage Changes in A. M. Best and Standard and Poor's Common Stock Indexes, 1981-86

Year	A. M. Best stock indexes ^a			Standard and Poor's 500	Standard and Poor's over-the-counter 250
	Property-liability	Life-health	Multiple line		
1981	37.8	15.4	25.9	-2.2	12.9
1982	18.3	23.2	-3.6	13.0	50.8
1983	14.7	30.8	13.1	15.2	29.9
1984	0.2	19.2	3.9	-0.4	-5.0
1985	59.4	31.0	48.4	26.9	32.2
1986	14.7	11.8	3.4	19.9	15.4
1981-83 ^b	22.4	22.1	10.0	8.4	30.3
1984-86 ^b	22.4	20.4	16.8	14.8	13.2
1981-86 ^b	22.4	21.3	13.4	11.6	21.4

Sources: Annual percentage changes for the A. M. Best indexes calculated using index values as of the second week of December as reported in the January issues of *Best's Review: Property/Casualty Insurance Edition*. Standard and Poor index values as of the second week of December are from *Standard and Poor's Security Price Index Service*.

a. Indexes reflect returns for about thirty property-liability, twenty life-health, and five multiple-line companies. All returns exclude dividend yield. Stocks of most insurers in the property-liability and life-health indexes are traded on the over-the-counter market.

b. Values are calculated as of December the preceding year. Values for multiyear periods are geometric mean returns.

highly aggregated for such lines as multiperil. Considerable calculation is needed to determine the impact of developments in losses for earlier years on results for the current calendar year. In addition to providing greater detail and emphasis on accident year results in the annual statement, estimates of the market value of bonds should be reported. While many bonds held by insurers are not publicly traded, it still should be possible to develop reasonably accurate estimates for users of financial statements. Accident year and calendar year losses also should be discounted to facilitate comparison of results across lines and to allow more accurate assessment of changes in income over time.

Stock Prices

Table 3-7 shows stock price performance for property and liability, life and health, and multiple-line insurers for 1981-86. Returns on the Standard and Poor's 500 and over-the-counter 250 indexes are also shown. The annual returns illustrate the source of controversy about recent insurance industry performance. Best's property-liability index appreciated by 59 percent in 1985, a year in which large operating losses were reported for the industry. Since the average beta for property-liability stocks during this period probably was less than 1, this performance probably cannot be attributed simply to factors influencing

the 32 percent return on the Standard and Poor over-the-counter 250 index during this time.⁴⁴

Rough comparison does not provide strong evidence of unusual performance for the property-liability index. Its average annual return for 1981-83, 1984-86, and 1981-86 was 22 percent in each period, about the same as those for the life-health index. The average return for the property-liability stocks during 1981-86 also is about equal to that for the Standard and Poor over-the-counter 250, although it was much less than that for the Standard and Poor over-the-counter 250 during 1981-83 and much greater during 1984-86. The same general pattern holds for the life-health index.

Stock returns are the ultimate measure of financial performance. In principle it is possible to determine whether returns are abnormally low or high in any given period conditional on some assumed asset-pricing model. However, even if such an analysis could be successfully undertaken for the property-liability insurance industry, the implications for whether business was underpriced or overpriced would be uncertain. Stock prices may reflect all information affecting security returns, but it may be impossible to sort out the impact of various factors that affect prices in a given period. The performance of the property-liability index in 1985 could be consistent with break-even premiums on business written in both 1985 and 1986. It also could be consistent with premiums above expected costs.

To illustrate, let the market value of a firm's equity at time t (the value of its common stock) be

$$(1) \quad E_t = A_t - L_t + \Pi_t,$$

where A_t is the market value of assets for business written before time t ; L_t is the market value of liabilities (that is, the market's assessment of the true value of liabilities) for business written before time t ; and Π_t is the market's assessment of the excess of assets over liabilities for busi-

44. J. David Cummins and Scott Harrington, "The Relationship between Risk and Return: Evidence for Property-Liability Insurance Stocks," *Journal of Risk and Insurance* (forthcoming). Beta is defined as the covariance of the returns on a security with the returns on a broad portfolio of common stocks. Finance theory suggests that beta is a more appropriate measure of risk than return variance for investors with diversified portfolios. Nelson J. Lacey analyzed returns for life and property-liability insurance stocks for 1982-85. His results suggested that the stocks did less well than the market, but his sample included stocks for only five property-liability insurers. See "Recent Evidence on the Liability Crisis," unpublished manuscript (University of Massachusetts, Department of General Business and Finance, December 1986).

ness written at and after time t (the market value of net cash flows on current and future business). After some manipulation, it can be shown (for Π_{t-1} not equal to zero) that if no new equity is issued, the return on equity in period t ($r_{et} = E_t/E_{t-1} - 1$) is given by

$$(2) \quad r_{et} = \frac{[r_{At} + (r_{At} - r_{Lt})k_{t-1} + r_{\Pi t}\pi_{t-1}]}{(1 + \pi_{t-1})},$$

where $r_{At} = A_t/A_{t-1} - 1$ (growth in assets), $r_{Lt} = L_t/L_{t-1} - 1$ (growth in liabilities), $r_{\Pi t} = \Pi_t/\Pi_{t-1} - 1$ (growth in Π), $k_t = L_t/(A_t - L_t)$ (market value of liabilities on old business relative to the market value of equity for old business), and π_t equals $\Pi_t/(A_t - L_t)$ (market value of net cash flows on current and future business relative to market value of equity for old business).

If investors believed that business were to be priced to break even, so that $\Pi = 0$ for all t , and if assets and liabilities were immunized against changes in interest rate risk, and forecasts of future claims were accurate, the percentage change in equity during a given period would be approximately equal to the percentage change in the value of assets. In general, property-liability assets have longer duration than liabilities, so that increases (or decreases) in interest rates will tend to produce negative (or positive) growth in the market value of equity for old business.⁴⁵ Changes in the value of equity in a given period will also reflect revisions in expectations about future claims on old business as well as changes in the profitability of current and future business. Positive or negative abnormal returns in a period could reflect any of these influences. Total returns in any period could be large and positive even if premiums on current and future business were expected to equal the discounted value of all costs.

As an example, consider a period such as 1985 in which returns on insurance company assets were large because of increasing stock prices and the favorable impact of declining interest rates on bond values. Assume that $r_{At} = 0.20$. Given the longer duration of assets than liabilities, assume that $r_{Lt} = 0.10$ and that there is no revision in expectations about claims on old business. Let $k_{t-1} = 2$. Finally, assume that $\pi_t = 0$ but that $\pi_{t-1} = -0.10$, that is, current and future business are expected to break even, but business written in period $t-1$ was priced below

45. Richard A. Derrig, "The Effect of Federal Taxes on Investment Income in Property-Liability Ratemaking," paper presented at the 1985 meeting of the American Risk and Insurance Association, Vancouver.

expected costs. Based on these assumptions, the value of r_{E_t} from equation 2 is 56 percent. While the assumptions are ad hoc, they nonetheless indicate the possibility that stock returns could be expected to be quite large in 1985 without positive profits on business written in 1985 or 1986, especially if business written in 1984 had been underpriced. The market reaction would simply reflect the return to break-even rates and favorable investment performance. The growth in premiums also could be very large, given declining interest rates, rapid growth in expected losses on new business, and a return to break-even pricing.

Growth in Premiums and Losses

Table 3-8 presents annual growth rates in written premiums, earned premiums, and calendar year incurred losses for the major third-party lines and all lines for 1977-86. The growth rates in premiums generally were large in 1977 and 1978, low and even negative during 1979-83, and very large in 1985 and 1986. This pattern is most pronounced for general liability.⁴⁶ Calendar year incurred losses, which reflect revisions in reserves on previous years' claims, show a similar pattern, although the growth in losses generally is well above zero even for 1979-83. The 78 percent growth rate in written premiums in 1985 and the estimated 73 percent growth rate in 1986 for general liability, along with smaller but still large growth rates for medical malpractice, commercial multi-peril, and commercial auto liability, clearly indicate what the debate is about, especially since the amount of coverage provided for general liability and perhaps other lines may have been declining during these years.⁴⁷

Casual observation suggests the cyclical pattern of large but declining increases in premiums written following the adverse financial experience of 1974 and 1975 and dramatic increases following the adverse results of 1984. Without cyclical influences, growth rates would primarily re-

46. J. David Cummins and David J. Nye note that general liability (including medical malpractice) had the highest annual growth rate in net premiums written for all major property-liability lines from 1952 to 1980; see "Inflation and Property-Liability Insurance," in John D. Long and Everett D. Randall, eds., *Issues in Insurance*, 3d ed., vol. 1 (Malvern, Pa.: American Institute for Property and Liability Underwriters, 1984), p. 200.

47. Since there is no standard unit of exposure for most property-liability lines, and coverage levels are not reported, statements about reductions in coverage are anecdotal. It should also be noted that the growth figures for medical malpractice could be influenced by changes in the proportion of business written by insurers that report to A. M. Best Co.

Table 3-8. *Growth Rates for Net Premiums Written, Net Premiums Earned, and Incurred Losses, by Line of Insurance, 1977-86*
Percent

Item	General liability	Medical malpractice	Commercial multiperil	Commercial auto liability	Private passenger auto liability	Workers' compensation	All property-liability
Net premiums written							
1976-77	37.5	10.2	22.7	23.5	20.3	24.2	19.8
1977-78	11.0	-2.6	17.3	11.4	9.7	20.8	12.8
1978-79	1.9	-0.9	14.4	8.8	13.0	16.5	10.3
1979-80	-3.0	5.9	3.3	0.3	9.9	8.2	6.0
1980-81	-5.7	4.9	-0.2	0.3	7.2	2.7	3.9
1981-82	-6.2	11.4	2.0	-0.1	9.4	-4.6	4.7
1982-83	0.2	5.2	4.0	-0.1	8.6	0.4	4.8
1983-84	14.1	13.2	13.6	14.2	6.3	7.9	8.4
1984-85	78.2	56.0	46.0	45.0	13.8	12.8	22.0
1985-86	73.1	29.3	32.5	n.a.	n.a.	14.7	22.3
Net premiums earned							
1976-77	36.7	8.2	22.9	23.6	22.2	24.7	20.5
1977-78	15.2	-0.4	17.3	13.2	12.9	18.7	14.3

1978-79	5.8	-1.3	15.7	11.1	11.1	17.5	10.4
1979-80	0.8	1.6	6.7	1.6	11.4	9.8	7.8
1980-81	-7.5	5.6	-0.2	1.9	7.3	3.7	4.0
1981-82	-6.3	7.3	3.0	-0.8	8.5	-3.4	4.7
1982-83	0.2	11.1	4.0	0.1	9.2	1.3	4.9
1983-84	9.1	13.2	9.4	9.5	7.3	7.5	7.2
1984-85	49.1	41.6	30.9	33.1	10.2	11.3	15.7
1985-86	77.2	35.7	38.8	n.a.	n.a.	13.9	24.0

Incurred losses (calendar year)

1976-77	27.4	-9.4	9.6	17.0	3.6	25.1	13.0
1977-78	9.1	9.7	10.7	13.6	18.1	13.4	13.4
1978-79	5.1	10.9	33.0	16.7	18.1	12.7	15.1
1979-80	11.5	17.2	13.2	5.8	6.0	5.0	10.5
1980-81	1.0	11.7	10.8	10.9	9.5	2.3	6.6
1981-82	7.6	18.8	14.2	6.5	9.5	-5.6	8.7
1982-83	8.6	11.2	12.6	6.3	10.4	10.3	7.1
1983-84	25.4	22.6	26.3	22.2	9.7	22.2	16.0
1984-85	49.9	49.3	20.5	18.9	18.7	10.9	16.4
1985-86	44.0	16.6	3.6	n.a.	n.a.	18.8	15.4

Sources: Data for 1976-85 are from *Best's Aggregates and Averages: Property-Casualty*, 1986. For 1986, estimated net premiums written are from *Wish*, "Review and Preview." Estimated net premiums earned and incurred losses for 1986 were calculated using data reported in *Wish*.
n.a. Not available.

flect growth in demand, expected losses, expenses, and changes in interest rates. As interest rates increase (or decrease), break-even premiums decline (or increase), other things being equal, since the discount rate for future losses increases (or decreases). The low and even negative growth rates in general liability premiums for 1979-82 were influenced by the sharp increases in interest rates through 1981 and their continued high level in 1982 (see appendix B, table 3-15). Whether the declines in premiums also reflected excessive competition is discussed later, as is whether decreases in interest rates after 1982 and growth in losses can explain the large growth in premiums in 1985 and 1986.

Table 3-9 shows geometric mean annual growth rates for premiums and incurred losses relative to growth in nominal GNP in 1976-86.⁴⁸ Both premiums and losses grew more slowly than GNP from 1976 to 1981, when interest rates were rising and the 11.4 percent growth rate in nominal GNP reflected a CPI growth rate of almost 10 percent. Since 1981, when interest rates were falling and the growth in GNP was slower, largely because of lower inflation, the growth of both premiums and losses significantly exceeded that for GNP. These rates contributed to substantial growth relative to GNP for the entire 1976-86 period. This pattern is most pronounced for general liability and for medical malpractice.

Growth rates for calendar year losses reflect revisions in reserves on losses incurred in earlier periods. An alternative measure of growth is provided by accident year data, which give losses incurred only for accidents (including claims not reported) during a given year. Nominal growth rates for accident year losses and rates relative to GNP growth are shown for the entire industry and for the forty-five company sample in table 3-10. Two sets of growth rates were calculated: accident year

48. The geometric mean growth rate for GNP was 11.4 percent for 1976-81, 6.6 percent for 1981-86, and 9.0 percent for 1976-86. Comparisons of real growth rates per capita would show values in all periods larger than those based on GNP, and the difference would be greatest for subperiods in the 1980s. Some of the increase in growth rates for losses relative to GNP after 1981 that are shown in table 3-9 and subsequent tables could be due to inflation in medical care costs. Norton E. Masterson has periodically reported claim cost indexes for various property-liability lines that are weighted averages of wage and price indexes that should be highly correlated with factors associated with loss costs for each line; see "Economic Factors in Liability and Property Insurance Claims Costs," *Best's Review: Property/Casualty Edition*, vol. 81 (June 1980), p. 74. Comparison of his index for "other bodily injury liability" through 1980 with the GNP implicit price deflator (Cummins and Nye, "Inflation and Property-Liability Insurance," pp. 211-15) provided little motivation for construction of a more elaborate index to analyze growth in premiums and losses in this study.