

Economic Review

Federal Reserve Bank of Dallas
November 1987

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 A Law and Economics Analysis**

Gerald P. O'Driscoll, Jr.

This article examines the current liability crisis. The article concludes that long-term, cumulative changes in tort law—the area of law covering personal liability—are primarily responsible for the current crisis. The gradual transformation of tort law is explained, and economic analysis is used to assess the impact of the changes. The analysis focuses on the factors producing the current situation, rather than offering any detailed reform recommendations. A future article, however, will examine tort reform.

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The *Economic Review* is published by the Federal Reserve Bank of Dallas and will be issued six times in 1987 (January, March, May, July, September, and November). The views expressed are those of the authors and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System.

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The Liability Crisis: A Law and Economics Analysis

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This article uses economic analysis to examine some of the issues raised by the crisis in tort law. Tort law is the area of common law governing personal injury cases. For the public, the crisis has manifested itself primarily as an insurance problem. Insurance coverages have been reduced, premiums increased, and policies canceled. In the article, difficulties in obtaining liability insurance are treated as symptomatic of problems in tort law. If the analysis of the article is correct, then problems specific to the insurance industry have played a secondary role.

Legal problems experienced by businesses, as well as by municipalities and individuals, have larger economic and social consequences. Regardless of whether they purchase a policy on the market or self-insure, affected firms face higher costs of doing business. Eventually, higher costs will translate into higher prices to customers. More immediately, firms are rationally taking actions to limit their risks. "Defensive medicine" is a concept that has already insinuated itself into the popular vocabulary.¹ Perhaps we need to recognize the practice of "defensive entrepreneurship," as businesses withdraw existing products from the market and fail to market new products out of fear of increased liability for harm.

This article analyzes the problem first by presenting some of the available data on the quantitative dimensions of the problem and then by using economic analysis to examine it. Throughout the article, I focus on the question of risk

management and how the new developments in tort law affect that vital function. Though frequently guided by a search for risk-free solutions (or at least dramatically less risky outcomes), policymakers must accommodate themselves to the reality of risk trade-offs. Typically, a given risk can be diminished only by increasing exposure to other risks. Evolving legal doctrines overlook this constraint. Moreover, by ignoring risk trade-offs, tort law may actually be exposing us to greater risk in the aggregate. In this sense, developments in tort law may be perverse if judged by their ostensible purpose of achieving a safer society.

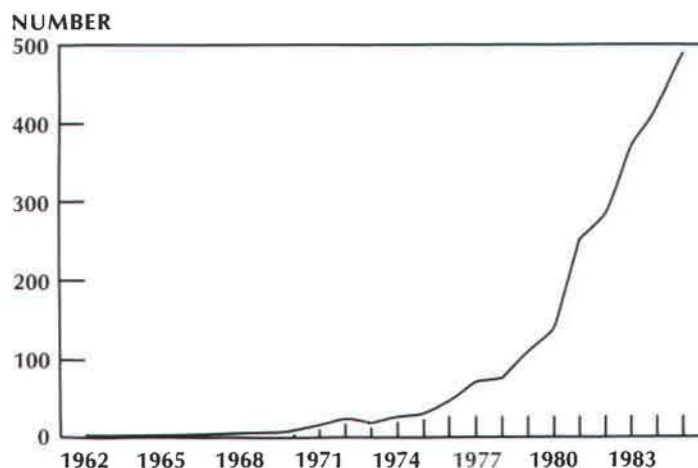
This pessimistic conclusion is tempered by the realization that the very tendency may present its own solution. If everyone is dissatisfied with the outcome, then the potential gains from reform are great. Realization of the difficulties of implementing legal change, however, suggests that such optimism be guarded. In a future article, I will examine tort reform in more depth.

The dimensions of the problem

Chart 1, which reveals the sharp, almost uninterrupted annual increase in the number of large awards in personal injury cases of all kinds, illustrates the most dramatic aspect of the problem. In this context, a large award is defined as

The comments of Randy E. Barnett, Walter Olson, Mario J. Rizzo, John Rogers, and Millard E. Sweatt, Jr., are gratefully acknowledged.

Chart 1
Growth of Million-Dollar Personal Injury Awards



SOURCE: Jury Verdict Research, Inc.

one for \$1 million or more. The first such award was in 1962. As of mid-1986, the cumulative number of large awards (or legal judgments) was more than 2,500.²

Though the most dramatic aspect of the crisis, \$1 million-plus awards are not necessarily the most informative statistic. First, though the number is rising rapidly, such awards are still far from the norm. Second, because the data are for awards of \$1 million or more, there is no way to deflate the nominal amount to account for inflation. Nonetheless, the data do suggest a trend. For one thing, judgments entered in trial courts constrain the size of out-of-court settlements. The explosion in large awards in recent years has loosened that constraint.

Data on these large awards also provide the basis for a comparative analysis of recent trends. Canada, which is legally, socially, and economically similar to the United States, has had only two million-dollar judgments entered in its court system. The population in our northern neighbor is roughly 10 percent of the U.S. population, but the number of large awards for personal injury cases in Canada is less than one-tenth of 1 percent of the U.S. total.

Comparison with Canada is relevant both legally and economically. Legally, both the U.S. and Canadian legal systems are grounded in English common law.³ Though the legal systems of the two countries have had, in principle, about 200 years to diverge, this is a small period compared

with the hundreds of years of accumulated precedent that they inherited. Indeed, this precedent has limited the potential divergence to much less than might otherwise be expected.

Against this background of legal evolution, one international legal scholar contends that Canadian courts would find "bizarre" the doctrinal basis of recent trends in U.S. tort law.⁴ Indeed, U.S. tort law is diverging not only from tort law in Canada but also from that in Australia, New Zealand, and other common-law countries. For better or worse, the U.S. tort system is out of step with systems in these countries.

Instead of considering only large awards, one can examine recent trends in the size of awards for four key categories: cervical strain, knee injury, vertebra fracture, and death of an adult male. In Table 1, the average annual percentage increases in these awards are themselves averaged to obtain an overall increase for a year.⁵ The average annual percentage increase has remained in double digits throughout the 1980s but has shown no noticeable trend.

Inflation, as measured here by the consumer price index, has generally been trending downward. In other words, relative to a basket of consumer goods, the value of awards has been increasing in real terms. A broad measure of inflation may not be the most accurate statistic with which to deflate personal injury awards, however. The cost of health care is obviously a particularly important element in any injury award (though less obviously so for wrongful death).

Table 1
**TRENDS IN PERSONAL
INJURY AWARDS**

	Overall jury awards	Consumer price index	Health care costs
Year	Rate of increase (Percent)		
1980	12.5	13.5	15.6
1981	18.0	10.4	15.7
1982	11.8	6.1	12.8
1983	11.0	3.2	10.4
1984	10.0	4.3	9.2
1985	13.1	3.6	8.9

SOURCE: Jury Verdict Research, Inc.

In the last column of the table, changes in an index of health costs are shown. It is interesting that over the six-year period for which data are presented, the average annual increases in health costs and in awards in key categories of personal injury cases are roughly the same. In 1980, health costs increased at a noticeably higher rate than did awards; in contrast, awards rose more rapidly in 1985 than did health costs.

Too much should not be made of the previous results, since they are question-begging in at least three respects. First, one cannot be sure of which way causation runs here. Overly generous awards in personal injury cases might be exacerbating outsized yearly increases in health care costs. Second, and related to the first point, the rapid rise in health costs is itself a source of major concern. From a public policy perspective, cost increases deemed unacceptably large in one area are weak justification, at best, for large increases in another area. Third, and most importantly, the whole argument implicitly accepts the *status quo ex ante* as fair or acceptable. One cannot judge the reasonableness of annual increases in awards without making a judgment about their appropriateness in the base year. Recognition of this latter point directs our attention to the central topic of the article: tort law, then and now. Before getting to the main topic, however, I first explicate the mode of analysis utilized in the rest of the article.

Economic analysis of law

The economic analysis of law comprises two distinct but interrelated parts. The more developed and widely accepted part consists in analyzing the economic implications or effects of legal change. The analysis is positive or non-

normative in that it examines what is, rather than what ought to be. The mode of reasoning is familiar to all economists, though the application is still somewhat novel. Typically, one examines the incentive effects of laws and then analyzes the resulting individual behavior and resource allocation. The theoretical building blocks of a law and economics analysis include such concepts as opportunity costs, risk, and optimizing behavior.

The modern economic analysis of law dates from a justly famous article written in 1960 by Ronald Coase.⁶ In the quarter century since then, the field has been developed and expanded by a host of other economists and lawyers. Several professional journals are devoted to publishing work in the area, and, increasingly, general law journals are publishing articles on law and economics.

The second and more controversial part of the economic analysis of law consists in employing economic reasoning normatively to develop legal doctrines. This approach applies economics to legal questions by prescribing what ought to be. Judge Richard Posner is a strong proponent of the normative approach: "I have defended, against a barrage of criticism, the ethical principle known as 'wealth maximization,' which I consider to be an attractive principle to guide political choice, especially by courts formulating and applying common law rules such as those governing tort, contract, property, and criminal law."⁷

Even among practitioners of law and economics, enthusiasm for the Posnerian position is limited, and, indeed, most working in this area focus on the positive economic analysis of law. In this article, I limit myself to positive analysis of legal change in tort law. At no point do I assume that economic considerations by themselves do or should govern legal change.

Tort law: purpose and function

Tort means "wrong" in French, and tort law covers legal wrongs or harm. It obviously does not encompass all legal harms. First, there is the category of legal harms that is dealt with under criminal law. Second, many legal harms are covered by property and contract law. There is a logic to these divisions. Property law governs the acquisition, use, and disposition of property. Tort law governs violations of these property rights.⁸ For example, tort law encompasses such categories as death, injury, or damage to property or property interests. A common denominator in the categories is that there has been a trespass or invasion of person or property. Tort law is not limited, however, to literal invasions or physical attacks on person and property. Creating a dangerous condition that results in harm to another is a tort.⁹ And, of course, theft (as opposed to destruction) of

property is a tort.¹⁰ Additionally, certain specific harms to persons, such as libel and slander, are governed by tort law.

In the broadest sense, tort law (and common law, more generally) protects the basic rights of individuals. These rights would be legally protected in the absence of a written constitution or any explicit statute (as is true in Great Britain). Common law articulates the rules of just conduct governing the social interaction of private individuals. The rules logically precede their articulation or statement as legal doctrine. In this sense, common-law judges do not so much make law as they discover it by seeking to ascertain existing practice or implications of previously articulated common-law rules. The process of discovery has extended over hundreds of years, and the accumulated findings constitute common law. Common-law legal doctrines are often codified in statutes, but the codification is not what makes them law.¹¹

Common law is constructed by judges who try to fit new fact patterns into previously cast molds, so that, reasoning by analogy if not by strict deductive logic, they can apply old rules to new cases. If the fact pattern constitutes what is known as "a case of the first impression," then a judge articulates a new rule. The new rule now becomes the precedent for future such cases. The judge is not, of course, free to announce any rule he pleases. If he did, he would not be followed by other judges and would be overruled in an appellate system. The new rule must fit into the existing body of rules in a way that is consistent with the existing rules and with the underlying principles of the legal system.

The most basic and fundamental function of a common-law court is first to ascertain whether a legal injury has occurred and then to assign liability for the injury. If both these findings are made, then an award may be granted. Each of these steps is crucial before a judgment is entered in a tort case.¹² First and foremost, the category of legal injury is, of necessity, much narrower than that of harm. For instance, a firm that suffers monetary losses because a competitor undercuts the firm's price cannot recover damages in a tort suit. The harm suffered is an example of harm without legal injury (*damnum absque iniuria*). Without such a concept, which encompasses far more acts than does the law of torts, every action would be litigable, and national wealth would be consumed in legal transaction costs. As one observer noted, this doctrine "was the common law technique of restricting compensable harms so that all purposive human conduct does not become actionable."¹³

In assigning liability for harm to a plaintiff, a court must investigate causal questions. In the simplest case, the defendant may have struck the plaintiff with his fist. But the defendant might plead that the plaintiff struck him first.

And so on. In a more complicated case, defendant's automobile may have struck the plaintiff, but the defendant claims that the plaintiff brought on his own injury by staggering drunkenly into the path of defendant's car. If the defendant were driving recklessly, this further complicates the causal analysis.

Causal questions aside, there is more than one legal theory that can be applied in tort law. Both logically and temporally, strict liability in tort is the first such theory. The most basic principle of tort law is that if you injure a person, you must make him whole. In property cases, the thing converted or damaged by trespass must be restored if possible or, failing that, compensation paid. The rule of strict liability dominated in tort cases from medieval times through the 19th century.

The negligence doctrine is the traditional alternative to strict liability. A negligence standard holds a defendant liable for injury only if he both caused the harm and failed to exercise reasonable care. Inherent in a negligence standard is the use of a cost-benefit calculus, which holds a defendant liable only if he failed to expend resources in accident avoidance up to the expected benefits. The attraction of a negligence standard is that defendants are not held liable for failing to avoid accidents that it made no economic sense for them to invest in avoiding.

Support for a negligence standard derived from moral arguments that a defendant should be held liable for harm not just because he caused it but only if he also was at fault in a moral sense. Ascertaining the latter is obviously fraught with difficulty, so the law evolved toward what is known as the "reasonable man" standard. Under that standard, a defendant is liable only if he failed to take actions that a reasonable man would have taken to avoid the accident. "Reasonableness" came to be equated with cost-effective accident avoidance. Reasonable men surely would not spend more to prevent an accident than the expected value of the accident.

This argument has a certain seductive appeal until one recognizes that it sloughs over the distinction between individuals. Even if the costs of accident avoidance would have greatly exceeded the value of the harm avoided, there is a distributional issue. The defendant reaps the gains and the plaintiff suffers the loss in those accidents that it was inefficient to avoid. Consider the implications of a negligence standard if it were applied outside the areas where it gained a 20th-century foothold: accident cases and product liability. Suppose a defendant had illicitly converted the goods of a plaintiff to the defendant's use. Under a negligence standard, the defendant's very gains form a basis for his defense!

With situations involving strangers, the law of negligence in its mature formation provided, in effect, that the defendant's benefits from his own conduct formed a valid excuse for not paying the plaintiff for the harm that such conduct caused. A theory of strict liability, however, sharply disputes this central premise: if the gains derived from certain activities are indeed as great as the defendant contends, there is all the more reason why he should pay for the harm those activities caused to the person or property of another, for, as against an innocent plaintiff who has nothing to do with the creation of the harm in question, it is only too clear that the defendant who captures the entire benefit of his own activities should, to the extent that the law can make it so, also bear its entire costs.¹⁴

The tension between strict liability and negligence is the background for understanding modern tort law. Until recently, however, there often was little *practical* difference between the outcomes of tort cases, whether liability was found under a strict-liability or a negligence standard. Obviously, if the standard of care were sufficiently high, then the defendant would be found liable for harm about as often as he would under a strict-liability standard. This is what occurred in product liability law. Moreover, the development of legal doctrines imputing liability reinforced the merging of legal standards as *judged by outcomes*.¹⁵

In recent years, however, tort law has moved away from either a strict-liability or a negligence standard in the areas of personal and product liability. More than the liability standard has changed in the process. There has been an implicit but far-reaching transformation of the purpose and function of tort law. Even if a negligence or strict-liability standard were reinstated by statute, the reform would not alter the attitude of judges toward their social function. I examine this revolution in tort law in the next section.

Absolute liability

Courts increasingly hold firms to a standard of absolute liability, which makes companies responsible for all losses resulting from products they introduce into commerce.¹⁶ Absolute liability gained prominence in the blasting cases. To understand the cases, consider the following fact pattern. The defendant had set off dynamite at an urban construction site and damaged plaintiff's nearby building and property. If there was physical invasion of plaintiff's property (for example, flying debris), then the case was straightforward. Cases involving no trespass or physical invasion were more complicated, however. Damage involved indirect harm, and the cases were tried under a negligence

standard. The cases raised questions of causation and the standard of care.

The causation issue was easily resolved. As previously noted, tort law never limited itself to cases of actual physical invasion. The extension of the causal paradigm to cover damage by shock waves was merely a refinement of the causal paradigm. Even with a broader concept of causation, defendants in blasting cases were left with substantial grounds for defense. In the absence of trespass, blasters could be held only to a standard of reasonable care. Courts became increasingly dissatisfied, however, with applying a different liability standard depending on precisely how blasting damage occurred (that is, with or without trespass). In a reversal of precedent, the New York State Court of Appeals declared that "a blaster is absolutely liable for any damages he causes, with or without trespass."¹⁷

Blasting cases involved what later came to be designated "ultrahazardous activities" or "abnormally dangerous activities." In abandoning negligence in these cases, courts imposed a standard stricter than strict liability. In practice, absolute liability eliminates defenses available to defendants under strict liability. Under absolute liability, defendants cannot rebut plaintiff's *prima facie* case by invoking consent or assumption of risk. The narrowing of defenses may be sensible if application of the doctrine is circumscribed and predictable. In such cases, the absolute-liability standard can be viewed as reducing the transaction costs of assigning liability. Presumably, in these cases, permitting the defenses would not alter the result but only prolong the trial.

By extending the doctrine of absolute liability to products, courts have implicitly accepted the idea that introducing any product to the marketplace is an ultrahazardous activity. This is a one-sided if not defective view of commerce. Moreover, the application denies defendants relevant defenses. A recent California case illustrates the issues.

[I]n the case of *Bigbee v. Pacific Telephone Co.* (1983). . . . a man was injured when an allegedly intoxicated driver lost control of her car, veered off the street, and crashed into a telephone booth in which the man had been standing. A lawsuit was brought against the companies responsible for the design, location, installation, and maintenance of the telephone booth. The court found that the risk that someone might veer off the road and crash into the telephone booth was not unforeseeable as a matter of law. The court also determined that it was of no consequence that the harm to the plaintiff came about through the negligent and reckless acts of an allegedly intoxicated driver.¹⁸

The California Supreme Court's reasoning may seem to defy both ordinary logic and common sense. And ultimately it does, for this accident was foreseeable only in a sense that robs the term of all meaning. What would not be foreseeable under this rule? Though couched in the language of negligence doctrine, the case was decided neither on that theory nor on one of strict liability (there being no causal connection between the location of the telephone booth and the driver's allegedly reckless behavior). The case was implicitly decided on a standard of absolute liability, which equates supplying telephone services to the public with setting off dynamite charges in a central business district. The case has its own logic and that logic increasingly rules in product liability cases.

In their decisions in liability cases, judges frequently refer to the availability of insurance to pay for the judgments.¹⁹ Indeed, it has long been a cornerstone of the theory of enterprise liability that liability for harm associated with the use of products is just a cost of doing business, which should be borne by the manufacturer.²⁰ This conclusion and the assumptions behind it are central to the debate over liability and tort. In the next section, I examine the issue of insurance and its relationship to the current crisis.

Insurance: theory and practice

Insurance is not manna from heaven, available for disbursement in socially beneficial ways. The observation may seem trite, but much of modern legal scholarship on the subject, including court opinions, implicitly has a manna-from-heaven view of insurance. Recall the proposition that the cost of accidents will be covered out of insurance proceeds and that the premiums for coverage are merely part of a manufacturer's cost of doing business. In this view, liability in tort becomes a mechanism for spreading the costs of accidents. Courts become not mechanisms for ascertaining the existence of legal injury and assigning liability but intermediaries for disbursing insurance payments to victims. Unfortunately, provision of insurance would be impossible on an actuarially sound (that is, cost-recovering) basis if this vision were implemented systematically.

Most actions are neither insured nor insurable. The major factors affecting the insurability of an outcome are (1) moral hazard, (2) adverse selection, and (3) the common-risk peril. A brief discussion of each factor follows, along with a discussion of its relation to the current controversies.²¹

Moral hazard occurs when the provision of insurance itself increases the probability of the risk that is being insured against. It is obvious that, when uncontrolled, moral hazard would be sufficient to preclude insuring against any risk.

Moreover, the moral hazard problem is widespread—far more so than accounted for in most of the literature advocating using tort law as insurance.

Consider a simple example. If insurance is provided against fire, then homeowners and factory owners face a diminished incentive to guard against the risk of fire. This conclusion does not imply that anyone sets out to *increase* the likelihood of fire (although this does happen). By its nature, risk is something that must be actively guarded against. Knowledge that someone else stands ready to make the insured whole tends to diminish his vigilance.

Other things equal, the risk of fire would increase on the margin. Of course, fire insurance is successfully provided, and the risk of fire is contained. The reason is that, first of all, insurance companies do not stand ready to make us whole. Through deductibles and coinsurance, we bear some of the cost of our own mistakes. It is vital that the insured have an incentive to control the risk because he almost always is best able to exert the most effective and direct control on the risk. Sharing in prospective losses provides the incentive.

Insurance companies are often not content to take risks as they exist but actively seek to reduce risk by providing incentives in the insurance contract. Actions that reduce the risk result in lower rates. Discounts for nonsmokers in life insurance, for driver education courses in automobile liability insurance, and for sprinkler systems in fire insurance are examples. Moreover, insurers may refuse coverage if would-be purchasers do not take actions to reduce risks—a practice especially prevalent in commercial insurance.

The implication for the theory for modern tort law is straightforward. The incidence of accidents is not a constant but is susceptible to variation. Plaintiffs are not passive agents, unable to influence the probability of accidents. Those afforded extended protection by tort law will have an incentive to behave less safely. In so doing, they not only may offset (partially or wholly) the beneficial effects of increased safety on themselves but also may make life riskier for others.

To the degree the literature considers incentive effects of judgments, it is the effects on manufacturers and their agents (including retailers) that are emphasized. But manufacturers are not typically in the best position to control the risk of accidents once a product passes from their hands. They certainly can design safety features into their products. The features making a product safer in ordinary use, however, may do nothing for safety (or may even decrease it) if the product is put to unintended uses.²²

By pushing all liability for injury back to manufacturers, modern tort law separates responsibility and control. Yet

the joining of responsibility and control is a *sine qua non* of risk management. Only the individual who controls risk can reduce it.

The law compounds the problem by denying manufacturers the possibility of bargaining out of this situation. In a Coasean world, this would be the way out of the situation in which modern tort law has placed firms. But contracts specifying a reduced level of care or accepting liability are increasingly void at common law.²³

Those placing inherently dangerous products on the market would be liable in tort almost without regard to the theory employed. They are strictly liable, liable under an implied-warranty theory, liable under the doctrine of *res ipsa loquitur*, and liable in contract (even under the privity rule).²⁴

In other words, none of the features of modern tort theory critically examined in this article is necessary to protect the innocent victims of callous manufacturers. By expanding manufacturers' liability to encompass harm caused by wholly unintended use of a product, courts are creating a potentially major moral hazard problem.

Modern tort law may also be producing a situation of adverse selection, in which only high-risk applicants seek insurance. The characteristic of insurance that makes it attractive to purchasers is the risk spreading. For a certain premium, the buyer gives up liability for an unknown loss in the future. The bargain is compensatory when the insurer can form a pool that includes many who will not experience losses. If the structure of the risks changes (as when liability is expanded), the insurer faces losses. If, in response, he raises premiums, he may drive away his low-risk customers. The latter prefer exposure to loss over paying premiums reflecting the higher risk faced by others. The insurer is then left with an adverse selection of high risks. In the end, he may be compelled to withdraw from the business entirely.

The responses of the two parties—a buyers' boycott of insurance and a sellers' strike—seem to describe a growing phenomenon in liability insurance. Firms and municipalities are self-insuring or are pooling risks with others, and sellers are refusing to write policies for the remaining market. The responses are occurring against a background of heightened uncertainty, in which neither insurance providers nor purchasers are sure of the structure of risks confronting them. One other force is probably at work generating this outcome, however. This is the common-risk peril.

Insurers diversify risk to reduce the probability of loss and to enable them to offer insurance at rates that make it attractive to potential purchasers. In the ideal case, insurers would write policies on totally independent risks. Risks are

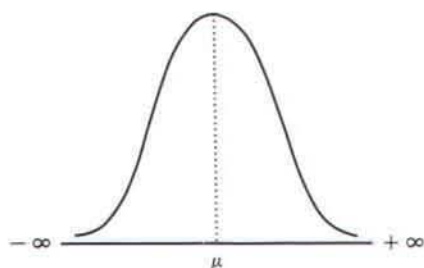
independent when the occurrence of one risk does not alter the probability of other insured risks. Obviously, fire risks in a single urban neighborhood are not independent. Over the whole city, there is less of a relationship among fire risks—and still less among risks in different cities and states. Conversely, war represents a common-risk peril that increases the probability of loss and, hence, claims in virtually all property and casualty, as well as life insurance, lines. For this reason, war-related losses are excluded from most insurance policies.

The expansion of tort liability has an impact across virtually all commercial and even personal lines. The impact takes on aspects of a common-risk peril. The expansion of tort liability increases the probability of claims, even if there has been no increase in the frequency of losses. Instead, incidents and behavior not previously considered actionable result in tort liability and insurance claims (for example, the case of *Bigbee v. Pacific Telephone and Telegraph Company*).

There is not only enhanced tort liability under the new regime but also greater uncertainty concerning applications of the absolute-liability doctrine. The doctrine, as its name suggests, implies the widest possible liability for harm. When applied in circumscribed situations—such as flying aircraft or blasting—the doctrine is constrained and limited in scope. If potentially applicable to all human behavior, the doctrine's scope is unconstrained. No one really knows what it would be like for everyone to be absolutely liable in tort for all actions. Even in product liability law, the scope of the doctrine is yet to be fully defined. Consequently, even experienced trial lawyers have difficulty predicting outcomes. The following example illustrates the unpredictability in outcomes.

The following experiment performed by the Johns-Manville Company summarizes our current legal situation. They held a mock trial, with professional plaintiffs, professional defendants, lawyers, and so forth. They then had four juries sitting side by side hear the evidence. They were asked, "On the strength of the evidence presented to you in this case, how do you come out with respect to actual damages and punitive damages?" With the same evidence and the same arguments, one jury came out with no liability for anything and another jury came out with actual liability and punitive damages. The other two juries were somewhere in between with respect to the amount. A system of rules which is consistent with any set of outcomes is not a system of rules at all. It is a travesty.²⁵

Chart 2
Distribution of Outcomes



against losses by giving up the possibility of future gains or losses in return for a fixed payment now. This is accomplished, for instance, when a farmer sells his crop for future delivery.²⁶

Insurance is what is known as a one-sided hedge. Individuals who purchase insurance essentially sell part of the negative half of the distribution to the insurer for a fixed payment—the premium.²⁷ Someone who is fully insured against risk of loss would no longer be in a position to experience any undesirable outcome. (Because of moral hazard, individuals typically cannot purchase insurance completely covering the unwanted occurrence, but this pure case is a useful reference point.) As suggested above, the insurer spreads the risk across many insureds. Payments for losses derive from premiums collected from the many who suffer no loss in any one period.

Risk comprises the eventuality of statistically unexpected events. The risk of loss (the relevant risk in insurance markets) is an undesirable outcome. But all action typically involves risk. To seek a gain is to risk a loss. This insight can be represented as the risk-reward trade-off in Chart 3. U_1 , U_2 , and U_3 are indifference curves showing that, in order to achieve the possibility of a greater reward, a decision-maker will accept more risk. RR , RR' , and RR'' are opportunity loci, showing the feasible trade-offs between risk and return under different technologies. A change in the trade-off, as from RR to RR' , constitutes a technological change.

Two basic points are illuminated in this simple, though widely accepted, model of risk. First, to demand, in the absence of a technological change, a riskless or dramatically less risky world is, by implication, to insist on a world in which we are also less well off. The prospective gain must be foregone along with the possibility of loss. Second, if, as suggested above, modern tort law is generating moral hazard, then we must actually accept *greater* risk for a given return. Moral hazard is equivalent to a move from RR to RR'' —a negative technological change wrought by a change in tort law.

As the indifference curves are actually drawn in Chart 3, risk does diminish as the opportunity locus rotates from RR to RR'' . Along with the decline in risk, there is also a smaller return. Most importantly, however, there is a movement to a lower indifference curve. Real income, which incorporates the disutility of risk, is lower ($U_1 < U_2 < U_3$). As this analysis illustrates, individuals can be made worse off in a "safer" world. Moreover, depending on the shape of individuals' preferences toward risk, they may not only be worse off but also face a riskier environment.

Technology. In reading and listening to justifications for the rising award levels in tort cases, one often finds refer-

Risk

Trade-offs. Risk is a factor whenever outcomes are not certain. For any given action, there may be a highly likely or expected outcome, but there is almost always a possibility of other outcomes—some even better, some worse. The distribution of outcomes can be pictured graphically, as in Chart 2. The average or expected outcome is labeled μ , or the arithmetic mean. To the right of the mean are preferred outcomes, and to the left, less desirable outcomes.

If the distribution were one of profits for a firm or returns on equity shares, then μ would be a long-run normal or equilibrium rate of return, from $-\infty$ to μ losses and from μ to $+\infty$ economic profits. An individual can *hedge*

Chart 3
Risk-Reward Trade-off

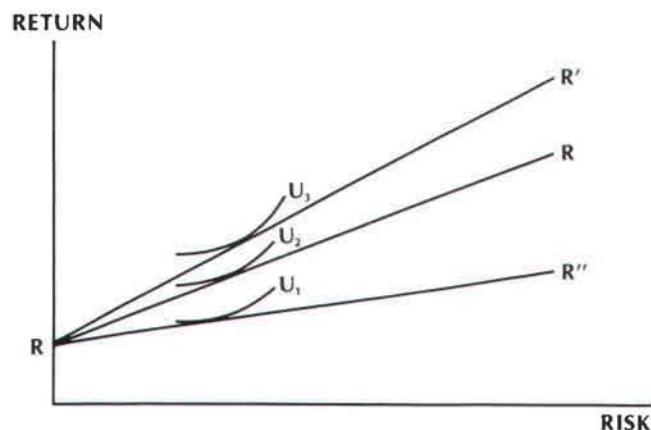


Table 2
LIFE EXPECTANCY AT BIRTH

Period	Total U.S. population	White		Black	
		Male	Female	Male	Female
		Years of life			
1900-1902	49.2	48.2	51.1	32.5	35.0
1959-1961	69.9	67.6	74.2	n.a.	n.a.
1969-1971	70.8	67.9	75.5	60.0	68.3
1980	73.7	70.7	78.1	63.7	72.3
1983p	74.5	71.4	78.7	66.5	75.2

n.a.—Not available.

p—Preliminary.

SOURCE: *The World Almanac and Book of Facts 1986*.

ence to new technology's creating risk. Some even argue that modern products carry more risk of harm than do products embodying older technology. Actually, the opposite is more nearly true in both cases. It would be a paradox, indeed, if technological advances typically brought increased risk in the aggregate. It is generally accepted that the individual's taste for safety is at least a normal good, if not a superior good. That is, people demand more safety as income rises, and if safety is a superior good, they demand proportionately more safety as income rises. To say that this demand is not being satisfied by manufacturers is akin to saying that manufacturers are throwing away profits. Safety can be produced profitably, like any other attribute, and there is no more reason to suppose safety is being underproduced systematically than to think automobile manufacturers deliberately produce cars in the wrong color combinations. It is surely easier (cheaper) for a manufacturer to produce only black automobiles. As Henry Ford discovered, however, this is not a strategy with survival characteristics. So, too, with products less safe than preferred by consumers.

Mortality rates are the most general measure of safety and health. Table 2 shows that, overall, death rates have declined systematically during this century. Life expectancy has increased continuously for the U.S. population throughout the century: from a little over 49 years in 1900 to 74 1/2 years in 1983. In a span as short as the 1980-83 period, life expectancy increased nearly one year. Moreover, there has been a tendency for life expectancy to equalize among subgroups. Those with the lowest life expectancy in 1900 have experienced proportionately greater gains.

Improved life expectancy reflects to a large extent the advance of technology across all fronts: central heating, diagnostic procedures, pharmaceuticals, and safer products generally. Much of the technological innovation precedes the era of either modern tort law or extensive safety regulation. Rising income levels have led to a demand for safer products and, along with scientific and engineering achievements, have given us the safer world in which we live.²⁸

Technological advance encompasses major engineering achievements but also the cumulated small changes that make for safer products. For instance, a can of commercially produced vegetables is far less likely to contain botulin today than was the case 50 years ago.

Of course, there is always an attribution problem. Was it technology or law that reduced death rates? Certainly, I do not wish to argue that liability rules have no effect on death rates or well-being generally. If the moral hazard argument is at all correct, however, we must be very careful about inferring the *direction*, much less the magnitude, of any effect. Moreover, even safety gains that appear to have a regulatory or legal basis must be partly attributed to technological improvements. Seldom, if ever, do regulatory agencies or courts mandate the use of a nonexistent technology. In this sense, technological development is a precondition for the regulation. Viewed in that light, regulatory change, at best, speeds up the usage of a safety device.

Even in the latter case, the question remains whether the use of a safety device for one person may not increase risks for others. Here we must recognize that, in reality, there are different kinds of risks and trade-offs among types of risk. This realization moves us beyond the two-dimensional world of our risk-reward trade-off, though it does not

undermine the model's basic conclusion. Technological change undoubtedly does sometimes present new risks at the same time it reduces old risks. Substituting oil for coal in power generation reduces air pollution but raises the risk of a supply cutoff (the United States being more self-sufficient in coal than in oil). Yet, recognizing this complexity actually strengthens the economic critique of public policy toward risk (modern tort law being one part of the policy).

Every action, policy, and technology brings its own unique set of risks (and benefits). Inexorably, however, modern tort law is moving toward a system of "undiscriminating deterrence," in which all risk taking is sanctioned.²⁹ What is needed is some distinction between risks worth taking and those that are not. Modern tort law does not do this, as can be seen by examining the issue of vaccination. One risk analyst concluded that

Vaccines have contributed more to the improvement of public health in this country than any other pharmaceutical product with the possible exception of penicillin. Yet I'm prepared to bet that if an AIDS vaccine is developed in the next few years, no major pharmaceutical company will be willing to manufacture and distribute it without some kind of immunity from liability.³⁰

The need for immunity from liability stems from potential litigation by those harmed after being administered vaccines. Vaccines are inevitably hazardous products whose very efficacy produces a potential for harm, even death, to a very small percentage of users. This is true no matter how much care is devoted to the vaccine's preparation. Consequently, manufacturers have a duty to warn the physicians who administer the product, and, in turn, the physicians have a duty to warn the patients.³¹ The question is what should be done about those injured by vaccines.

Absent negligence, the answer must surely be that no private action at common law should be sustained.³² By assumption, individuals clearly and rationally assessed the risk of injury from disease and that from the vaccine. In legal terms, there was an assumption of risk.³³ Moreover, a myriad of private insurance mechanisms exist to compensate those injured: health, disability, and workers' compensation.

As a matter of public policy, the risk calculus is often overwhelming. Vaccines save hundreds, thousands, and even millions of lives annually. Those placed at risk typically constitute a fraction of 1 percent of those vaccinated. Any comparative risk assessment would favor vaccination in these cases. The risks from vaccinating must be compared with those from *not* vaccinating. There is no third option.

Surely public policy does not want put at risk such a socially beneficial activity as protecting the public from serious disease.³⁴

Notwithstanding vaccination's demonstrable benefits, there is a serious problem of pharmaceutical firms' withdrawing vaccines from the market because of enhanced liability. All but two producers have withdrawn their whooping cough vaccine from the market. A number of vaccines are now being produced by only one manufacturer. The risk that the public will lose access to a vaccine increases with each firm's departure from the market. In no other area are the effects of modern tort law so risk-enhancing and, perhaps, even life-threatening. Not only is modern tort law a poor distributor of risk, but, as argued below, it is an inefficient distributor of compensation for victims of harm.

Tort law as a compensation system

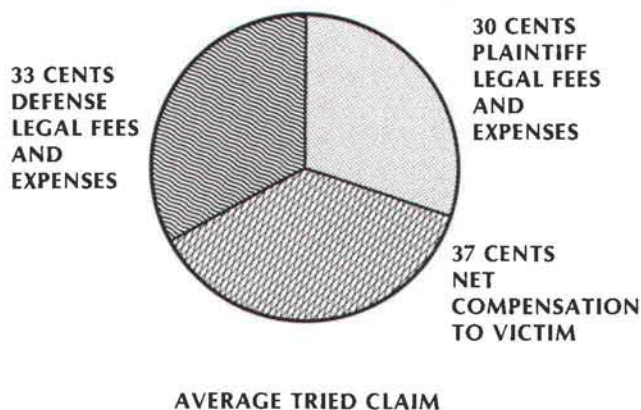
Proponents and opponents of recent trends in tort law tend to agree on one point: tort law has been changed from primarily a system of ascertaining fault to one for compensating victims. Yet this consensus does not survive challenge. Certainly, great sums of money are being spent by defendants in responding to suits and paying for settlements and judgments. This observation does not imply, however, that even successful plaintiffs are receiving significantly greater amounts of compensation. And it certainly does not imply that victims have been made better off by recent trends.

Chart 4 shows the distribution of dollars paid out in asbestos claims. Only about one-third of the sums expended by defendants reached plaintiffs. The mildest conclusion that one can draw is that litigation is a high-transaction-cost method of securing compensation for victims.³⁵ The problem is that tort law is particularly ill-suited to serving as a compensation system: "there is no more expensive, clumsy, and erratic method of comprehensive social insurance than tort litigation, where the preoccupation with defect, causation, and plaintiff's conduct directs massive inquiries toward issues manifestly irrelevant to the hardship question."³⁶ In comparison, for all its problems, the Social Security system is administered at a cost of only 4 percent of claims paid.³⁷

The bottom line is that even successful plaintiffs may not be gaining from the current system of tort law. Recall the difficulty in demonstrating that judgments have been increasing in real terms in recent years. Given the share of transaction costs in total defendant expenditures, it is even less clear that plaintiffs' receipts are rising in real terms. And successful plaintiffs are a small fraction of the total number

Chart 4

Allocation of Every Dollar Paid Out in Asbestos Claims



SOURCE: *Manhattan Report*.

of individuals suffering harm and having reasons to litigate. For example, the Consumer Federation of America estimates that there are 30 million product-related injuries annually but only 70,000 product liability suits filed.³⁸ Some of these potential litigants are undoubtedly being dissuaded by the very high transaction costs that deny even successful plaintiffs much compensation.

The very inefficiency of tort law has provided an impetus for alternative dispute resolution (ADR) systems. Traditional arbitration by the American Arbitration Association, or similar groups, is often employed as low-cost dispute resolution systems. Parties agree contractually to submit their dispute to binding arbitration and, typically, jointly choose the arbitrators. The decisions are legally binding, and in no federal jurisdiction, nor in most state jurisdictions, can the outcome be challenged. At least one for-profit firm has been established to provide arbitration services using former judges, who use rules of law in hearing cases.

Proponents of ADR systems believe that the very inefficiency of tort law provides potential gains for those providing a less costly measure of relief. The transaction costs of litigation drive an enormous wedge between what the defendant pays and what the plaintiff receives. Though arbitrated awards are often (though by no means always) smaller than would be received in a successfully litigated suit, the size of the wedge in arbitration cases is very much smaller. And, crucially, there is a time value to money.

Tort cases typically take years from the time of filing to completion of trial.

If ADR systems help relieve some of the caseload in civil jurisdictions, then they will have succeeded on the theory that matters have gotten so bad that they must improve. Considerations of balance, however, require presentation of the case for pessimism.

I'm a pessimist with respect to finding winning coalitions at the present time. Torts is big business. What might shift opinion is a great public tragedy. I don't want one but vaccines are a perfect illustration of what could go wrong. If you lose 100,000 people in an epidemic, people may start to reconsider the one life lost through injecting a vaccine against the 100,000 lives lost for want of its development.

On an intellectual level, most people, and most legislatures, simply do not believe that standard market assumptions about rational behavior work. Instead, they work in the crazy world of judges where all demand curves are perfectly inelastic and all lawsuits are perfectly costless.³⁹

Conclusion

Of necessity, this article has been a blend of economic and legal reasoning, of fact and theory, and of example and generalization. It deals with a phenomenon that has been developing for a quarter century in the courts but has only recently attracted public scrutiny. A critical understanding of trends in modern tort law requires acquaintance not only with tort law but also with economic reasoning. In this article, I have attempted to provide some of each.

Present law reflects the slow accretion of legal precedent through judicial decision making, not legislative enactment. Some changes in common law have been codified, but repealing the codifying statutes would undo neither the case law nor the attitudes that generated it. The attitudes played a crucial role in a 50-year evolutionary process that produced our present liability standard.

It is, then, extremely difficult to legislate major change in common-law systems. Any rush to find a quick fix is unlikely to produce lasting results that will satisfy anyone. For now, what we can best hope for is better data on the dimensions of the problem and more applications of law and economics reasoning in this area.

None of the above argues against reasoned attempts at changing tort law. Though difficult to quantify, there are long-term consequences of the current system for U.S. economic growth. The United States is out of step with the rest of the world in implementing enterprise liability. Our product liability law makes this country an increasingly

poor location choice for international firms, especially manufacturers. Firms looking around the world to do business can choose from a variety of democracies with essentially the same common-law system but not having our eccentric tort law: Canada, the United Kingdom, Australia, and New Zealand all come to mind readily. Losses of manufacturing opportunities and investment capital are not good prospects for a country justifiably concerned about international competitiveness. These considerations alone argue against acquiescence, even if a case for optimism cannot be sustained.

1. "Defensive medicine" refers to actions taken by health care professionals purely in the avoidance of potential legal liability rather than in the furtherance of patients' well-being. For example, a physician may order laboratory work to eliminate the very small probability of a serious medical problem. By assumption, the test is contraindicated by the patient's symptoms but called for by the prevailing liability climate. The physician's potential legal liability tips his cost-benefit calculus in favor of ordering a test to the financial (and possibly medical) detriment of the patient. In the hypothetical case, the law has driven a wedge between the interests of patients and of physicians. In technical economic terms, there is a principal-agent problem generated by the liability rule.
2. See Jury Verdict Research, Inc., *Injury Valuation*, prepared by Don L. Marshall, in vol. 1 of *Personal Injury Valuation Handbooks* (Solon, Ohio: Jury Verdict Research, Inc., 1986), 15-17. The data in Chart 1 are also from this publication. The 1962 case reveals some of the difficulties in examining the growth of large awards. The case involved actor John Henry Faulk, who alleged that he had been "blackballed" as a Communist. The judgment of \$3,500,000 entered in the case was eventually remitted to \$450,000 (*Injury Valuation*, 15).
3. The English origins of U.S. law are emphasized in Jonathan R. T. Hughes, *The Governmental Habit: Economic Controls from Colonial Times to the Present* (New York: Basic Books, 1977).
4. Ernest J. Weinrib, "The Insurance Justification and Private Law," *Journal of Legal Studies* 14 (December 1985): 681. As Weinrib points out, the Commonwealth countries are scarcely illiberal in their policy toward those suffering economic harm. These countries are more advanced in the use of no-fault insurance, and all have more extensive social welfare systems than the United States has (Weinrib, 682-83).
5. The table is adapted from one in Jury Verdict Research, Inc., *Injury Valuation*, 7. Only data since 1980 are presented because Marshall questions the comparability of data for earlier years (pp. 3-4).
6. R. H. Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (October 1960): 1-44.
7. Richard A. Posner, "The Justice of Economics" (Paper presented at the 1986 General Meeting of the Mont Pèlerin Society, St. Vincent, Italy, 2 September 1986), 1. For a critical assessment of the normative implications of the economic analysis of law, see the symposium papers contained in the March 1980 issue of the *Journal of Legal Studies*.
8. In reality, there are only personal rights at common law. Property rights protect the owner of the property, not the property owned. See

Richard A. Epstein, *Takings: Private Property and the Power of Eminent Domain* (Cambridge: Harvard University Press, 1985), 58-59, 52-53.

9. "Although causation begins with trespass, no private system has ever been content to make trespass the entire law of tort. In both common and civil law, causation must embrace some instance of indirect harm or consequential damages. . . . The defendant hurts the plaintiff not by striking him directly but by setting a spring gun or trap that the plaintiff triggers. Or the defendant does not injure the plaintiff but tells him there is a safe path out of the bottom of the canyon when there is not. The extension of the causal chain must be made" (Epstein, *Takings*, 48).
10. What is ordinarily called theft is the tort of conversion, which consists of the use of force to remove a thing from possession of its owner (Epstein, *Takings*, 38).
11. For a contemporary restatement of the view that common law is the articulation of the rules of just conduct, see F. A. Hayek, *Law, Legislation and Liberty*, vol. 1, *Rules and Order* (Chicago: University of Chicago Press, 1973). That account emphasizes the distinction between law and legislation. The U.S. Constitution cannot be made intelligible except by recognizing that the rights enumerated there precede their explicit statement. Consider the Ninth Amendment, which states (in whole): "The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people."
12. This presentation greatly simplifies the process by not discussing the division of responsibility between judge and jury in a jury trial. For instance, a jury may enter a verdict for the plaintiff involving monetary damages, but the judge must enter the final judgment. The judgment may, in certain cases, involve some modification of the jury's verdict—including outright reversal on grounds such as "passion and prejudice."
13. Epstein, *Takings*, 340 n. 17.
14. Richard A. Epstein, *Modern Products Liability Law* (Westport, Conn.: Quorum Books, 1980), 27.
15. Epstein, *Modern Products Liability Law*, 30-35.
16. Absolute liability in product cases is also known as "enterprise liability." For a history of the doctrine, see George L. Priest, "The Invention of Enterprise Liability: A Critical History of the Intellectual Foundations of Modern Tort Law," *Journal of Legal Studies* 14 (December 1985): 461-527.
17. *Schlansky v. Augustus V. Riegel, Inc.*, 9 N.Y.2d 493, 496, 215 N.Y.S.2d 52, 53, 174 N.E.2d 730, 731 (1961); cited in the decision of the New York State Court of Appeals in *Spano v. Perini Corp.*, 25 N.Y.2d 11, 250 N.E.2d 31, 302 N.Y.S.2d 527 (1969). The latter case overturned the rule—first announced in the 1893 case of *Booth v. Rome, W. & O. T. R. R. Co.*, 140 N.Y. 267, 35 N.E. 592—that proof of negligence was required in blasting cases unless there was an actual physical invasion of property. See Charles O. Gregory, Harry Kalven, Jr., and Richard A. Epstein, *Cases and Materials on Torts*, 3d ed. (Boston: Little, Brown and Company, 1977), 495-517.
18. Richard Willard, remarks in "The Liability Crisis: A Manhattan Forum," *Manhattan Report* 6, no. 2 (1986): 7. Mr. Willard is Assistant Attorney General in charge of the Civil Division of the U.S. Justice Department. *Bigbee v. Pacific Telephone and Telegraph Co.*, 34 Cal. 3d 49, 665 P.2d 947, 192 Cal. Rptr. 857 (1983). The issue before the California Supreme Court was whether foreseeability remained a triable issue in the case. The judgment of dismissal was reversed and the case remanded to the trial court.

19. "[I]mposition of liability would not be unduly burdensome to defendants given the probable availability of insurance for these types of accidents which defendants themselves maintain do not recur with great frequency" (*Bigbee*, 665 P.2d 947, 953). In some jurisdictions (including Texas), introduction of the topic of insurance at the trial court level would result in a mistrial.
20. This point is detailed in Priest, "The Invention of Enterprise Liability." Also, see the opinions of Justice Traynor in the two classic cases in the modern tort law tradition: *Escola v. Coca-Cola Bottling Co.*, 24 Cal. 2d 453, 150 P.2d 436 (1944); and *Greenman v. Yuba Power Products, Inc.*, 59 Cal. 2d 57, 377 P.2d 897, 27 Cal. Rptr. 697 (1962).
21. For a more detailed and thorough discussion, see Richard A. Epstein, "Products Liability as an Insurance Market," *Journal of Legal Studies* 14 (December 1985): 645-69.
22. On the latter point, see Epstein, *Modern Products Liability Law*, 84-87.
23. Epstein, a proponent of contractual solutions to liability questions, concluded that "today it is tilting at windmills to fight the anticontractual bias" in modern tort law (*Modern Products Liability Law*, 55).
24. The first three doctrines constitute different analyses of liability in tort. Implied warranty and *res ipsa loquitur* are doctrines in a negligence theory of tort liability. On privity, see Epstein, *Modern Products Liability Law*, 9-24; and Epstein, "Products Liability as an Insurance Market," 654-64. On strict liability and negligence, see Epstein, *Modern Products Liability Law*, 25-35. On contract, see Epstein, *Modern Products Liability Law*, 49-56; and Richard A. Epstein, "Medical Malpractice: The Case for Contract," *American Bar Foundation Research Journal*, 1976, no. 1: 87-149.
25. Richard Epstein, comments in "The Liability Crisis: A Manhattan Forum," *Manhattan Report* 6, no. 2 (1986): 6.
26. For a more detailed discussion of hedging risk, see Armen A. Alchian and William R. Allen, *Exchange and Production: Theory in Use* (Belmont, Calif.: Wadsworth Publishing Company, 1969), 181-90.
27. The graphical analysis of insurance is drawn from Roger W. Garrison, Eugenie D. Short, and Gerald P. O'Driscoll, Jr., "Financial Stability and FDIC Insurance," in *The Financial Services Revolution: Policy Directions for the Future*, ed. Catherine England (Boston: Kluwer, forthcoming), chap. 8.
28. "[L]ife is getting safer, and new products and processes are almost uniformly safer than the old ones they replace" (Peter Huber, "Discarding the Double Standard in Risk Regulation," *Technology Review*, January 1984, 14). Compare Peter W. Huber, "Bad Science, Worse Justice," *Across the Board*, January 1986, 34.
29. Huber, "Bad Science, Worse Justice," 35.
30. Peter Huber, comments in "The Liability Crisis: A Manhattan Forum," *Manhattan Report* 6, no. 2 (1986): 4.
31. On the duty to warn, see Epstein, *Modern Products Liability Law*, 93-118.
32. This reasoning does not imply that no compensation system ought exist. Weinrib sharply distinguishes between the goals of private law and those of public policy ("The Insurance Justification and Private Law," 685-87). Private law is governed by rules of corrective justice, and public policy presumably by additional constraints. To burden the former with achieving public policy goals would be to destroy its efficacy in fulfilling its unique role. Huber suggests a legislated compensation system "to attend to the needs of victims—the unfortunate few who are injured by the whooping-cough vaccine, the FDA-approved intrauterine device, or the EPA-approved toxic-waste dump. . . . [T]he option of not attending to the needs of the victims is unreal, given the existing public and legal sentiments regarding technology-caused injuries" ("Bad Science, Worse Justice," 37). But see also the text immediately following citation of this note, and see note 37 here.
33. The defense of assumption of risk by contract has been sharply limited in modern tort law. If viewed as an issue of private choice, contract law should govern. In limiting the scope of contract law while extending that of tort law, courts have also moved from a concept of common law as private law to one of common law as public law. On this, compare Epstein, *Modern Products Liability Law*, 146-47, and Weinrib, "The Insurance Justification and Private Law," 684, 684 n. 6.
34. I have deliberately avoided the philosophical issues arising from the fact that some, though by no means all, vaccination is compulsory. If someone who was compelled to take the vaccine is injured, this argues for public compensation of the victim, not private action in tort against the firm supplying the vaccine.
35. Others have a harsher view: "Certainly, as a general compensation system, the tort law is a disaster. It has become terribly costly. For every dollar that ends up in the pockets of an injured plaintiff, \$3 to \$5 are diverted to lawyers. If a private insurance company or a charity creamed off that much of the take, it would be prosecuted for fraud" (Huber, comments in "The Liability Crisis: A Manhattan Forum," 4).
36. Epstein, *Modern Products Liability Law*, 46.
37. This reasoning does not argue for a comprehensive system of compensation for people harmed in the ordinary course of living. This is what private health, disability, and life insurance already accomplishes. If individuals do not consider such insurance worthwhile *ex ante*, the source of society's obligation to provide it *ex post* is by no means obvious. Still, if compensation is thought desirable, tort law is a particularly inefficient mechanism for providing it.
38. Reported by Willard in "The Liability Crisis: A Manhattan Forum," 9.
39. Comments of Epstein in "The Liability Crisis: A Manhattan Forum," 11.

Problem Loans and the Profitability of Eleventh District Commercial Banks in 1986

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Several forces combined to produce a sharp decline in Eleventh District commercial bank profitability in 1986. Over recent years, for example, banking deregulation has led to increased competition among commercial banks and between them and other financial institutions, both depository and nondepository. Increased competition, in turn, has placed downward pressure on profitability at Eleventh District commercial banks and probably contributed to the decline in profitability in 1986.

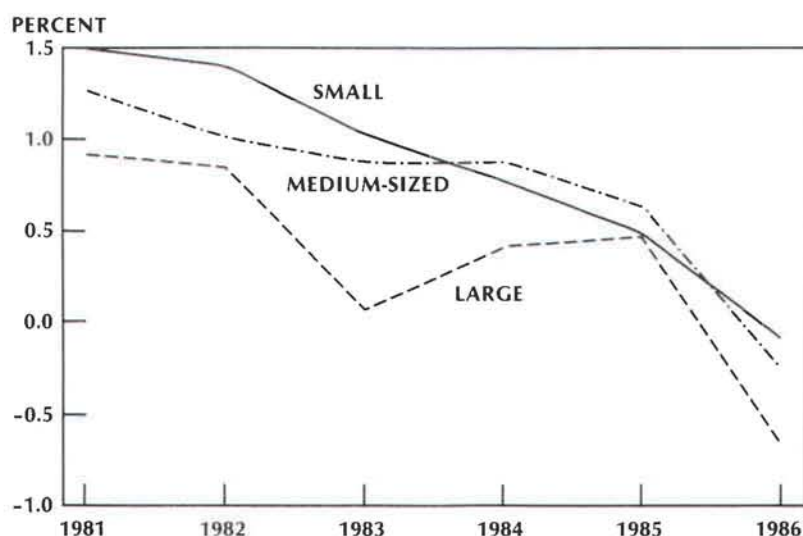
Far more potent, however, have been the adverse effects on bank earnings of the recent economic downturn in the Eleventh District. This downturn stemmed from the marked decline in crude oil prices beginning in December 1985. The price of West Texas Intermediate Crude oil fell from \$30.72 in November 1985 to \$11.72 in July 1986. The drilling industry, already depressed from oil price declines earlier in the decade, likewise suffered a sharp downturn. As a result, energy-related manufacturing also dropped dramatically. The major declines in the energy sector, in turn, had significant repercussions in other sectors of the regional economy. For example, the service industries that had supported

the energy industry faced a sudden curtailment of demand. Also, the demand for office and commercial space fell off at the same time that large quantities of new space were being completed, which resulted in a severe contraction in construction and its own supporting industries.

The financial stress associated with the regional economic decline resulted in many borrowers becoming delinquent in their loan payments. Such loan difficulties affected District commercial bank profitability as the banks lost both principal and interest on their problem loans. To some extent, the decline in bank profitability resulted from loan portfolios that were not diversified across industries or geographically. The severity of the decline in profitability is evidenced by the sharp increase in the number of commercial bank failures in the District from 15 in 1985 to 32 in 1986. The bank failure rate was 1.58 percent in the District in 1986, well above the 0.89-percent rate for the rest of the nation.

Although the general role of problem loans in reducing the profitability of the District commercial banks has been widely recognized, this article provides a detailed account of the profitability decline, the rise in problem loans, and the

Chart 1
**Return on Assets, Eleventh District Insured
 Commercial Banks, 1981-86**



SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

relationship between the two. The measure of bank profitability used in this study is return on assets—the ratio of net income to average assets.¹ The results of the present analysis suggest that increased provision for loan losses was responsible for 56 percent of the forces reducing the return on assets at the District commercial banks in 1986, and that rising problem loans also substantially hurt bank profitability in other ways.

The first section of this article gives an overview of the declines in the return on assets at the District commercial banks and compares these to changes in the return on assets at banks in the rest of the nation. The rise in problem loans at the District commercial banks is discussed in the second section. The third and fourth sections survey the increased provision for loan losses and the decline in net interest margin at the District banks. The discussion of the decline in the return on assets at these banks is divided into several major components in the fifth section. Conclusions make up the sixth section.

Drop in bank profitability

Profitability has been on a downward trend at the District

banks over the past five years, and the particularly large decline in 1986 lowered their return on assets to less than zero. The return on assets at these banks declined from 1.21 percent in 1981 to 0.54 percent in 1985.² Then it plummeted to -0.35 percent in 1986.

Comparing profitability at banks of different asset sizes is difficult because asset size is correlated to the composition of asset and liability portfolios, which affects net income. For example, the proportion of assets represented by commercial and industrial loans tends to increase substantially with bank size. Consequently, banks were divided for this analysis into three size categories. Small banks were defined as those with end-of-year assets under \$100 million, medium-sized banks as those with assets of \$100 million or more but less than \$1 billion, and large banks as those with assets of \$1 billion or more.³

The decline in return on assets in 1986 was most severe at the large District banks, but the small and medium-sized banks also had sharp declines. As shown in Chart 1, after declining significantly in 1983, the return on assets at the large banks rose in 1984 and edged upward in 1985. Then, it plummeted 1.14 percentage points to -0.66 percent in

1986. The return on assets at the small and medium-sized District banks had dropped steadily over the previous five years. As occurred at the large banks, the declines in 1986 were the most severe, reducing the return on assets to -0.08 percent at the small banks and -0.25 percent at the medium-sized banks.

The gap between bank profitability in the District and in the rest of the nation widened substantially in 1986. The -0.35 -percent return on assets at the District banks in 1986 compared unfavorably with a 0.72 -percent return on assets at banks in the rest of the nation, a difference of -1.07 percentage points. In 1985, that gap was only -0.18 percentage points. At the small banks, the return on assets declined in both the District and the rest of the nation over the past five years, but the decline at the small District banks was larger. The difference between the return on assets at the small District banks and these other banks deteriorated from -0.25 percentage points in 1985 to -0.73 percentage points in 1986. At the medium-sized banks, the deterioration in relative performance was even worse. The downward trend of profitability at the large District banks occurred during a period of improving profitability at large banks in the rest of the nation. In 1986, the return on assets at the large District banks was 1.36 percentage points lower than that at the large banks in the rest of the nation.

Sharp increase in problem loans

The marked decline in profitability at the District banks was largely the result of increases in problem loans. In this study, problem loans were defined broadly to include loans that (1) have been charged off, minus those that have been recovered over a given year, (2) loans that are past due 90 days or more and still accruing, or (3) nonaccrual loans.⁴ Because nonperforming loans—the sum of delinquent and nonaccrual loans—often deteriorate to the point of becoming loan losses, they are considered a predictor of future charge-offs.

As a percentage of average loans, charge-offs less recoveries—or net charge-offs—rose from 1.33 percent in 1985 to 1.95 percent in 1986 at the District banks. As shown in Table 1, the net charge-off rates (hereafter, all references to charge-offs imply net charge-offs) were fairly similar across bank size, with the medium-sized banks reporting the highest rate in 1986 at 2.12 percent.

Although charge-off rates also rose at banks in the rest of the nation, the increase was not nearly as marked. The charge-off rate for these banks rose modestly from 0.78 percent in 1985 to 0.87 percent in 1986. Consequently, the difference in charge-off rates between the District banks and those in the rest of the nation widened from 0.55 to

Table 1
**NET LOAN CHARGE-OFF RATES,
INSURED COMMERCIAL BANKS, 1985-86¹**
(Percent)

Banks	1985	1986
Eleventh District		
All banks, by size ²		
Total	1.33	1.95
Small	1.50	2.07
Medium-sized	1.16	2.12
Large	1.35	1.71
Limited sample of banks ³		
Real estate	0.41	1.11
Commercial and industrial	2.21	2.86
Consumer	1.03	1.44
Agricultural production	2.90	5.25
Rest of the United States		
All banks, by size		
Total	0.78	0.87
Small	1.33	1.42
Medium	0.74	0.82
Large	0.70	0.81
Limited sample of banks		
Real estate	0.21	0.31
Commercial and industrial	0.94	1.01
Consumer	1.20	1.58
Agricultural production	3.45	3.33

1. Defined as 100 times the ratio of loan charge-offs less recoveries made during the year to average loans. Average loans were based on call dates in December of the preceding year and in June and December of the current year.

2. Small banks are defined as those with end-of-year assets under \$100 million, medium-sized banks as those with assets of \$100 million or more but less than \$1 billion, and large banks as those with assets of \$1 billion or more.

3. The rates for the separate loan categories were calculated from reports for banks that had assets of at least \$300 million or a foreign office.

SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

Table 2
**NONPERFORMING LOAN RATES,
 INSURED COMMERCIAL BANKS, 1985-86¹**
 (Percent)

Banks	1985	1986
Eleventh District		
All banks, by size ²		
Total	3.40	5.34
Small	2.66	3.91
Medium-sized	3.20	5.12
Large	4.15	6.61
Limited sample of banks ³		
Real estate	3.64	7.05
Commercial and industrial	5.53	8.09
Consumer	0.93	1.24
Agricultural production	8.37	5.12
Rest of the United States		
All banks, by size		
Total	2.39	2.35
Small	3.11	2.95
Medium-sized	2.16	2.03
Large	2.31	2.33
Limited sample of banks		
Real estate	2.46	2.61
Commercial and industrial	3.35	3.32
Consumer	1.03	1.09
Agricultural production	8.05	7.98

1. Defined as 100 times the ratio of end-of-year nonperforming loans to end-of-year loans in domestic offices.

2. See note 2 to Table 1.

3. See note 3 to Table 1.

SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers and acquisitions at the Board of Governors of the Federal Reserve System.

1.08 percentage points.

Charge-off rates increased from 1985 to 1986 in all loan categories at the District banks.⁵ In 1986, agricultural loans had the highest charge-off rate at 5.25 percent, up from 2.90 percent in the previous year. Agricultural loans, however, represent only a small fraction of total assets at the District

banks.⁶ Two categories of major concern examined were commercial and industrial loans and real estate loans. Nearly 3 percent of the commercial and industrial loans, which represented roughly one-fifth of the total assets held by the District banks, were charged off in 1986. The high loss rate for real estate loans, at 1.11 percent, also was especially disturbing because these loans represented roughly one-fifth of total assets at the District banks. The concentration of lending to the real estate industry was even greater at some banks. This lack of diversification made the banks more vulnerable to sectoral economic shocks.

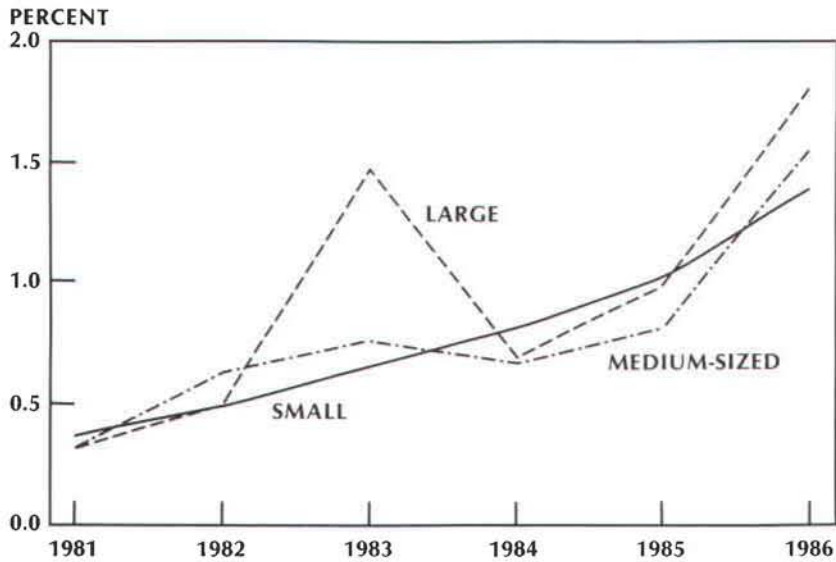
Nonperforming loans also contributed to the decline in profitability at the District banks. As shown in Table 2, end-of-year nonperforming loans as a percentage of end-of-year loans rose from 3.40 percent in 1985 to 5.34 percent in 1986. The rate of nonperforming loans in 1986 was highest at the large District banks, at 6.61 percent, and declined with bank size. The increase in the rate of nonperforming loans was the largest at the medium-sized and large District banks, increasing 1.92 and 2.46 percentage points, respectively. The small District banks had an increase of 1.25 percentage points.

Relative to banks in the rest of the nation, these increases in nonperforming loans were even more dramatic. While the rates of nonperforming loans were rising at the District banks, they were relatively stable at banks in the rest of the nation. Consequently, the gap between the rate of nonperforming loans at the District banks and that at the banks in the rest of the nation increased from 1.01 percentage points in 1985 to 2.99 percentage points in 1986.

While commercial and industrial loans had the highest rate of nonperformance at the District banks in 1986, the substantial increase in the rate of nonperforming real estate loans suggests that these loans had a greater impact on bank performance.⁷ While the rate of nonperforming commercial and industrial loans between 1985 and 1986 increased 2.56 percentage points to 8.09 percent, the rate of nonperforming real estate loans for the same period rose 3.41 percentage points, reaching 7.05 percent. The dollar increase in nonperforming real estate loans over this period was over one and a half times greater than that in nonperforming commercial and industrial loans.

While charge-offs represent the loss of principal from problem loans, the negative effect of problem loans on bank earnings results primarily from a corresponding provision for loan losses. As nonperforming loans are charged off, bank income is not directly affected because charge-offs are absorbed by loan loss reserves—a component of primary capital—not earnings. Charge-offs affect bank income, however, primarily by inducing banks to increase their loan

Chart 2
**Provision for Loan Losses, Eleventh District Insured
 Commercial Banks, 1981-86**
 (Percent of Average Assets)



SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

loss reserves through provision for loan losses—an expense item on the income statement.⁸ Similarly, nonperforming loans can also induce banks to increase their loan loss reserves through provision for loan losses in anticipation of ensuing loan losses. The rise in provision for loan losses at the District banks is addressed in the next section.

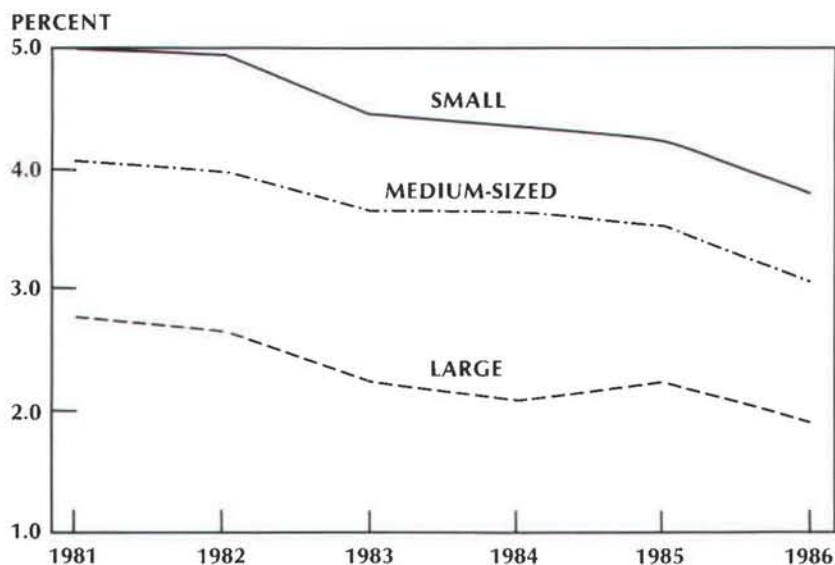
Soaring loan loss provision

Provision for loan losses surged at the District banks, rising from 0.94 percent of assets in 1985 to 1.61 percent in 1986. This dramatic increase resulted from the sharp and unanticipated rise in problem loans over this same period. Ideally, income should be allocated to loan loss reserves gradually over time so that reserves are maintained at sufficiently high levels to cover cyclical increases in loan losses. In this way, the potentially disruptive effects of loan losses on bank income can be smoothed out. In practice, however, it can be extremely difficult to forecast future losses accurately. As a result, loan loss reserves are often kept at levels insufficient to cover upswings in loan losses, thereby

necessitating sharp increases in loan loss provision when unexpectedly high loan losses occur.⁹ The District banks made huge increases in their provision for loan losses when the oil price shock resulted in an unanticipated downturn in economic activity and a corresponding unexpected increase in loan losses.

As a percentage of average assets, the provision for loan losses increased by the greatest margin at the large District banks, but the small and medium-sized banks also experienced substantial increases. As shown in Chart 2, the provision for loan losses increased sharply twice in the past five years at the large District banks. At these banks, the loan loss provision relative to assets rose 0.98 percentage points in 1983 and 0.83 percentage points in 1986, ending at 1.82 percent. The provision for loan losses as a percentage of average assets trended upward over the past five years at the small and medium-sized District banks. In the small-bank category, it rose 1.03 percentage points from 1981 to 1986, reaching 1.40 percent. Over one-third of this increase at the small banks occurred in 1986. At the medium-sized

Chart 3
**Net Interest Margin, Eleventh District Insured
 Commercial Banks, 1981-86**



SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

banks, over the same time period, the provision for loan losses relative to assets rose 1.24 percentage points, to 1.56 percent. Of this increase, 60 percent occurred between 1985 and 1986.

While the provision for loan losses generally has been rising at banks in the rest of the nation, the rise at the District banks has been more rapid. In 1981, little difference existed between the provision for loan losses relative to assets at the District banks and the same ratio at banks in the rest of the nation—a difference of only 0.07 percentage points. By 1986, however, that gap had widened to 0.92 percentage points. The greater increase in the provision for loan losses at the District banks generally has been the result of the relatively weak regional economy. Differences in the treatment of various types of problem loans in the supervision and examination process also may explain some of the differences in provision for loan losses.¹⁰

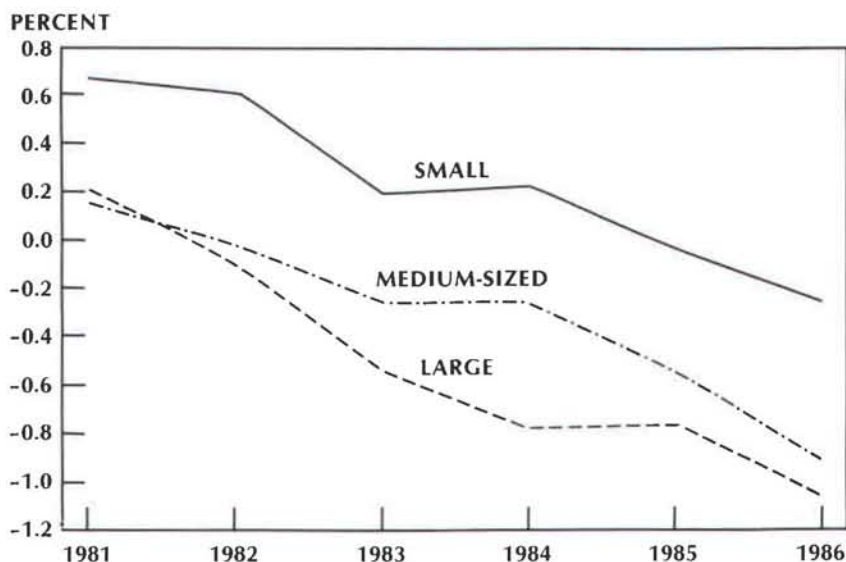
Rising problem loans also affected profitability at the District banks through other avenues besides the increased provision for loan losses. First, many nonperforming loans, while still requiring funding, were not accruing interest.

Second, the rise in problem loans increased awareness in the financial markets concerning the risk exposure of these banks. Consequently, it is likely that the risk premiums paid to acquire funds also increased. These two factors, along with other effects of the weak regional economy, reduced the net interest margin and profitability. For example, the yield on the loan portfolio at the District banks has fallen 1.65 percentage points more than the yield at banks in the rest of the nation over the past five years. For the same period, the effective rate paid for gross federal funds purchased and for repurchase agreements fell 1.51 percentage points less at the District banks than at their national counterparts. In the next section, movements in net interest margin are examined for the period under analysis.

Drop in net interest margin

Net interest margin—interest revenue less interest expense relative to average assets—fell from 3.25 percent in 1985 to 2.86 percent in 1986 at the District banks.¹¹ Rising loan difficulties were a major factor contributing to that decline.

Chart 4
**Net Interest Margin Gap, Eleventh District Insured
 Commercial Banks versus Those in Rest of Nation,
 1981-86**



SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

The net interest margin had been on a downward trend over the past five years at the District banks in all size categories, as shown in Chart 3. The declines were the most dramatic in 1983 and 1986. From 1985 to 1986, the decline in net interest margin ranged from 0.33 percentage points at the large District banks to 0.46 percentage points at the medium-sized banks. Net interest margin, various income and expense items relative to average assets, and return on equity for the District banks are listed in the Appendix tables.

It is impossible to measure precisely the contribution made by the rise in problem loans at the District banks to the decline in net interest margin, because the rising loan difficulties affected the net interest margin in many subtle ways. For example, as an increasing proportion of loans at the District banks ceased accruing interest, downward pressure was placed on interest revenue relative to assets. The calculation of this effect, however, would require data that are unavailable to show yields on the loans that shifted to a nonaccrual status. At the same time, to the extent that

the rise in problem loans called into question the safety of uninsured deposits at these banks, depositors demanded higher interest rates, thus putting upward pressure on interest expense relative to assets. The associated risk premiums in deposit interest rates can, at best, only be estimated, however. Moreover, these types of developments probably induced portfolio shifts which significantly affected the net interest margin, although these are not easily identifiable as stemming ultimately from the rise in problem loans.

Even though the full impact of rising problem loans on net interest margin at the District banks cannot be measured precisely, the effect can be estimated roughly by comparing the changes in the net interest margin at these banks with those at banks in the rest of the nation. This approach assumed that the changes in the net interest margin at the District banks differed from those at banks in the rest of the nation primarily because of the comparatively large increase in loan difficulties.¹² It should be recalled that at the banks in the rest of the nation, the charge-off rate increased only

Table 3
**CHANGE IN RETURN ON ASSETS AT ELEVENTH
DISTRICT INSURED COMMERCIAL BANKS, 1985-86¹**

	Bank size ²		
	Small	Medium-sized	Large
Effect on return on assets			
Net interest margin	-0.43	-0.46	-0.33
Net noninterest margin ³	-0.02	-0.01	-0.28
Securities, gains or losses	+0.10	+0.06	+0.10
Loss provision	-0.38	-0.75	-0.83
Taxes	+0.15	+0.27	+0.20
Return on assets	-0.57	-0.90	-1.14

1. Defined as 100 times the change in the ratio of each income or expense category to average assets net of loan loss reserves. Average assets were based on call dates in December of the preceding year and June and December of the current year.

2. See note 2 to Table 1.

3. Defined as extraordinary items net of taxes plus noninterest income less noninterest expense.

SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

slightly from 1985 to 1986, while their rate of nonperforming loans actually declined.

Over the past five years, the net interest margin at the District banks has deteriorated substantially, relative to that at banks of comparable size in the rest of the nation. As of 1981, as shown in Chart 4, the net interest margin at the District banks was above that at banks in the rest of the nation in all size categories. The net interest margin subsequently fell faster at the District banks than at their counterparts in the rest of the nation. In 1982, the net interest margin at medium-sized and large District banks fell below that of their national counterparts. By 1986, the net interest margin at the medium-sized and the large District banks was 0.91 and 1.06 percentage points, respectively, below that at banks of comparable size in the rest of the nation. The small District banks maintained a positive, though declining, difference in net interest margin over their counterparts in the rest of the nation through 1984. In 1986, the net interest margin at the small District banks was 0.25 percentage points below that at the small banks in the rest of the nation.

To estimate the effect of rising loan difficulties on net interest margin, the declines in the net interest margin at the

banks in the rest of the nation were subtracted from those at the District banks. For example, the net interest margin at the small District banks fell 0.43 percentage points from 1985 to 1986, whereas it dropped only 0.21 percentage points at the small banks in the rest of the nation. The difference between these declines suggests that a 0.22-percentage-point decline in the net interest margin at the small District banks is attributable to their relatively large increase in loan difficulties. Similarly calculated figures suggest that problem loans accounted for 0.36- and 0.30-percentage-point declines in the net interest margin at the medium-sized and the large District banks, respectively.

The discussion to this point has provided an overview of the two primary avenues through which problem loans affected profitability at the District banks—the provision for loan losses and the net interest margin. The next section examines the magnitude of the impact of the loan difficulties in relation to other factors that also influenced profitability.

Profitability loss from problem loans

The increase in provision for loan losses and the decline in net interest margin were the primary factors in reducing

profitability at the District banks in 1986. Because a significant portion of the decline in net interest margin is attributable to the rising problem loans, loan difficulties emerge as the predominant factor accounting for the dramatic decline in return on assets.

The higher provision for loan losses was an important factor in reducing profitability at the District banks from 1985 to 1986. As reported in Table 3, among all the broadly defined factors that reduced the return on assets at the medium-sized and large District banks, the provision for loan losses was predominant. It accounted for 58 percent of the forces that reduced the return on assets at the large banks and for 61 percent of those forces at the medium-sized banks. At the small banks, the loan loss provision represented 46 percent of the negative forces.

The decline in return on assets at the District banks can be attributed broadly to three sources. The first was the effects of the rise in problem loans on both the increased provision for loan losses and the reduction in the net interest margin. The second effect was a decline in the net interest margin unrelated to the region's relatively large increase in problem loans. The third effect was attributable to other factors. At the large District banks, problem loans—through a higher provision for loan losses and their negative effect on net interest margin—accounted for an estimated 79 percent of the negative factors affecting the return on assets. A decline in net interest margin unrelated to the region's loan difficulties accounted for roughly 2 percent of the negative factors, while other factors accounted for about 19 percent. At the medium-sized District banks, problem loans accounted for approximately 91 percent of the factors that lowered the return on assets, while an unrelated decline in net interest margin accounted for an additional 8 percent. Other factors were unimportant in the decline in the return on assets at the medium-sized banks. The decline in the return on assets at the small District banks can be divided as follows: 73 percent resulted from problem loans, 25 percent resulted from a decline in net interest margin unrelated to the region's disproportionate loan difficulties, and 2 percent resulted from other factors. Lower taxes mitigated the negative effect of the problem loans on the profitability at banks of all three size categories.

Concluding remarks

Problem loans were the predominant factor in the large reduction in the profitability of Eleventh District banks in 1986, accounting for an estimated 82 percent of the forces reducing the return on assets. The dramatic and largely unanticipated rise in loan difficulties led to a sharp increase in the provision for loan losses, thereby markedly reducing net

income at the District banks. Moreover, the increase in loan difficulties reduced the net interest margin through a variety of subtle channels, which hurt the District banks' profitability still further.

The effects of the regional economic downturn were magnified by the lack of diversification in the District banks' loan portfolios. The structure of banking laws in Texas during 1986 inhibited the diversification of these portfolios. The state banking laws prohibiting branching and interstate banking had limited the geographical markets within which the District banks could operate easily. And it has been shown that operating in a state with geographical market restrictions increases the probability of bank failure.¹³

The recent changes in banking law that have removed restrictions on interstate banking in Texas and Louisiana in 1987 can help Eleventh District banks.¹⁴ These changes provide banks with an opportunity to diversify their loan portfolios and thereby potentially reduce the impact of a sectoral economic shock on bank profitability in the future.

1. Assets are calculated net of loan loss reserves. Profitability as measured by return on equity reflects the same pattern of movements as occurred in the return on assets at the District banks over the period of interest. Return on equity is the product of the return on assets and the inverse of the capital-to-asset ratio. The capital-to-asset ratio changed little over the period of interest.
2. The individual bank data used in calculating aggregate statistics were obtained from the Consolidated Reports of Condition and Income. Balance sheet data for merging banks, reported at various call dates over the course of a year, were adjusted at the Board of Governors of the Federal Reserve System to ensure they corresponded as closely as possible to the data on the end-of-year income statement for the merged banks.
3. Loan loss reserves were not counted in defining bank size because they partly reflect trends and cycles in the level of problem loans.
4. Banks are allowed to count interest as income even when the interest and principal are 90 days or more overdue, provided that the obligation is both well secured and in the process of collection.
5. The data used in constructing charge-off rates by loan category were obtained only from banks that had assets of at least \$300 million or a foreign office. Although other banks also report loan losses by loan category, they follow a schedule which defines the loan categories differently and more loosely, making the calculation of truly consistent rates for all banks impossible. The banks from which the data for this study were obtained held a large share of total real estate loans (49 percent) and commercial and industrial loans (63 percent) at the District banks in 1986. Agricultural (at 22 percent) and consumer loans (at 28 percent) were less well represented.
6. Although agricultural loans represent only a small fraction of assets at the District banks as a group, they account for a much larger proportion of assets at some individual banks. The high proportion of agricultural loans at some District banks is an example of undiversified loan portfolio.

lios. For these banks, the high rate of agricultural loan losses could be a grave concern. Because of such considerations, measuring the profitability of District banks as a group does not reflect all of the factors behind the recent rise in bank failures.

7. The data on nonperforming loans by loan category were collected from the same sample as those for loan charge-offs by category. (See note 5.)
8. Charge-offs can have a direct negative effect on income under some circumstances. If unpaid interest from a nonperforming loan is still being accrued and counted as income when the loan is charged off, then interest income will be reduced by the charge-off.
9. For a discussion of the general inadequacy of loan loss provision and reserves in smoothing bank income over cyclical swings in loan losses, see S. Wayne Passmore and Betsy B. White, "The Effect of Loan Losses on Bank Profitability," *Recent Trends in Commercial Bank Profitability*, Federal Reserve Bank of New York, 1986, chap. 8, 141-58.
10. Problem energy, real estate, and agricultural loans had drawn quick pressure from bank examiners to increase provision for loan losses. In contrast, provision for questionable loans to Third World borrowers was not required. Provision for these foreign loans began to be made in the second quarter of 1987, but setting aside the provision was a private decision of bankers that was not required by bank examiners.
11. Although it is often useful to adjust tax-exempt income from state and local government obligations upward to a taxable equivalent basis when analyzing net interest margin, such is not the case here. Declining net income stemming from the increases in problem loans reduced marginal tax rates for many District banks. This lowered the taxable equivalent return on state and local securities and induced a shift in the investment portfolio toward other types of securities. These developments had a positive effect on the net interest margin calculated on an after-tax basis, which is reflected in changes in the net interest margin when tax-exempt revenue is unadjusted, but not when it is adjusted.
12. This approach captures all of the effects on net interest margin associated with the downturn in the regional economy, not just the isolated effects of the problem loans themselves. For example, lower business activity would make generating new loans more difficult, thereby possibly adversely affecting the net interest margin.
13. See Hilary H. Smith, "Agricultural Lending: Bank Closures and Branch Banking," *Economic Review*, Federal Reserve Bank of Dallas, September 1987, 27-38.
14. See Dean Amel and Daniel Keane, "State Laws Affecting Commercial Bank Branching, Multibank Holding Company Expansion, and Interstate Branching," Board of Governors, Federal Reserve System, Unpublished Paper (Mimeographed), August 1986.

Appendix

Table A
**INCOME AND EXPENSES OF ELEVENTH DISTRICT INSURED COMMERCIAL BANKS,
 1981-86¹**
 (All banks)

	1981	1982	1983	1984	1985	1986
Gross interest income	12.15	11.41	9.53	10.20	9.31	8.14
Gross interest expense	8.29	7.67	6.22	6.95	6.07	5.28
Net interest margin	3.87	3.74	3.31	3.25	3.25	2.86
Noninterest income	0.74	0.78	0.83	0.83	0.95	0.89
Loss provision	0.33	0.54	1.02	0.71	0.94	1.61
Other noninterest expense	2.60	2.65	2.57	2.59	2.75	2.82
Gains or losses on securities	-0.11	-0.08	0.00	0.01	0.11	0.19
Taxes	0.36	0.18	-0.04	0.12	0.08	-0.13
Extraordinary items	0.00	0.00	0.00	0.00	0.01	0.01
Net income	1.21	1.07	0.60	0.67	0.54	-0.35
MEMO						
Return on equity ²	18.41	16.49	9.24	10.49	8.07	-5.44

1. Defined as 100 times the ratio of each income or expense category to average assets net of loan loss reserves. Average assets were based on call dates in December of the preceding year and June and December of the current year. In 1984, average assets were based on call dates in December of the preceding and current years only.

2. Defined as 100 times the ratio of net income to average equity capital. Average equity was based on call dates in December of the preceding year and June and December of the current year. In 1984, average equity was based on call dates in December of the preceding and current years only.

NOTE: On May 24, 1984, eight counties in Southeast Oklahoma were transferred from the Dallas Federal Reserve District (11) to the Kansas City District (10). In this study, the banks in these counties were not counted as belonging to the Eleventh District either before or after that date.

SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

Table B
INCOME AND EXPENSES OF ELEVENTH DISTRICT INSURED COMMERCIAL BANKS,
1981-86¹

(Banks with less than \$100 million in assets)

	1981	1982	1983	1984	1985	1986
Gross interest income	12.03	12.06	10.47	11.05	10.22	9.10
Gross interest expense	7.05	7.12	6.02	6.69	5.98	5.28
Net interest margin	4.98	4.94	4.46	4.37	4.24	3.81
Noninterest income	0.91	0.89	0.93	0.94	0.98	0.94
Loss provision	0.37	0.49	0.66	0.81	1.02	1.40
Other noninterest expense	3.47	3.54	3.48	3.51	3.66	3.65
Gains or losses on securities	-0.09	-0.02	0.01	-0.01	0.09	0.20
Taxes	0.46	0.37	0.21	0.21	0.15	-0.01
Extraordinary items	0.00	0.00	0.00	0.01	0.01	0.02
Net income	1.50	1.41	1.04	0.78	0.49	-0.08
MEMO						
Return on equity	17.62	16.37	12.07	9.30	5.81	-0.98

1. See notes to Table A.

SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

Table C
INCOME AND EXPENSES OF ELEVENTH DISTRICT INSURED COMMERCIAL BANKS,
1981-86¹

(Banks with \$100 million to \$1 billion in assets)

	1981	1982	1983	1984	1985	1986
Gross interest income	12.14	11.54	9.75	10.44	9.48	8.26
Gross interest expense	8.06	7.57	6.08	6.78	5.95	5.18
Net interest margin	4.08	3.98	3.67	3.66	3.53	3.07
Noninterest income	0.73	0.74	0.79	0.88	0.86	0.86
Loss provision	0.32	0.63	0.76	0.67	0.81	1.56
Other noninterest expense	2.77	2.83	2.80	2.82	2.93	2.94
Gains or losses on securities	-0.09	-0.12	0.00	0.01	0.09	0.15
Taxes	0.37	0.10	0.02	0.20	0.10	-0.17
Extraordinary items	0.01	0.00	0.00	0.01	0.01	0.01
Net income	1.27	1.03	0.88	0.88	0.64	-0.25
MEMO						
Return on equity	18.57	15.07	12.84	12.87	9.27	-3.81

1. See notes to Table A.

SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

Table D
**INCOME AND EXPENSES OF ELEVENTH DISTRICT INSURED COMMERCIAL BANKS,
 1981-86¹**

(Banks with \$1 billion or more in assets)

	1981	1982	1983	1984	1985	1986
Gross interest income	12.27	10.81	8.71	9.39	8.47	7.29
Gross interest expense	9.49	8.15	6.46	7.29	6.23	5.37
Net interest margin	2.77	2.66	2.25	2.10	2.24	1.91
Noninterest income	0.62	0.72	0.79	0.73	1.00	0.88
Loss provision	0.31	0.50	1.48	0.69	0.99	1.82
Other noninterest expense	1.74	1.83	1.75	1.75	1.91	2.06
Gains or losses on securities	-0.15	-0.10	-0.01	0.02	0.14	0.24
Taxes	0.27	0.11	-0.27	-0.02	0.02	-0.19
Extraordinary items	0.00	0.00	0.00	0.00	0.00	0.00
Net income	0.92	0.85	0.07	0.42	0.47	-0.66
MEMO						
Return on equity	19.35	18.36	1.54	9.12	9.40	-13.28

1. See notes to Table A.

SOURCE OF PRIMARY DATA: Statistics were derived from data taken from the Consolidated Reports of Condition and Income. Balance sheet data for all years were adjusted for mergers at the Board of Governors of the Federal Reserve System.

Money Market Deposit Accounts Versus Money Market Mutual Funds

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Until the early 1980s, interest rate ceilings on bank deposits and other liability regulations prevented depository institutions from offering the public a market rate of return on highly liquid accounts. In response to depositors' demands for higher earnings on invested funds, money market mutual funds had come into existence in the early 1970s. In contrast to banks, the money funds offered both checking (for large withdrawals) and market rates of return on depositors' funds.

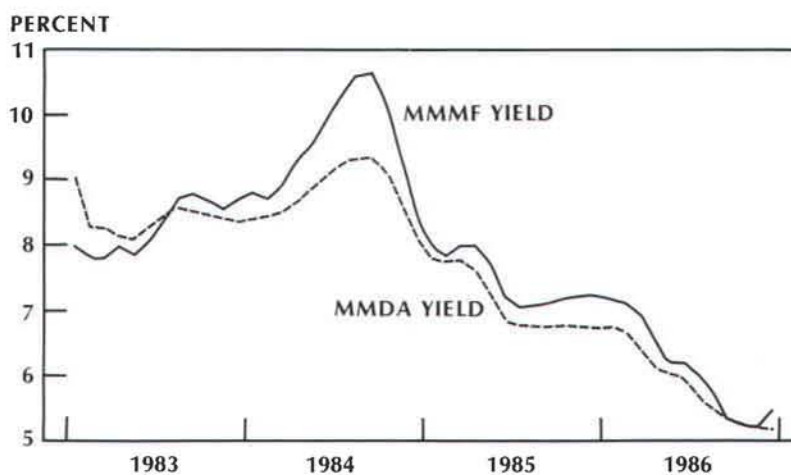
In 1982 the money market deposit account (MMDA) was introduced, allowing banks and thrift institutions to compete directly with the money market mutual funds (MMMFs). Like MMMFs, funds held in MMDAs were both checkable and interest-bearing. Unlike MMMFs, however, MMDAs were protected with insurance by the Federal Deposit Insurance Corporation (FDIC), the Federal Savings and Loan Insurance Corporation (FSLIC), or the National Credit Union Share Insurance Fund (NCUSIF).

Once money market deposit accounts came into being, many financial market observers thought that money funds would be eliminated. The argument was that since MMDAs could offer competitive market rates of interest and were federally insured, they clearly would dominate MMMFs. This scenario, however, did not occur. Instead, deposits in money funds have continued to grow and, on average, have had a higher rate of return than MMDAs (Chart 1).

This article examines the degree to which depositors view money market deposit accounts and money market mutual funds as substitutes. The specific questions addressed are, To what extent do individuals move funds from one type of account to the other in response to changes in interest rates? and Can the interest rate spread between the two accounts be explained by default risk on MMMFs? The first issue is important to liability management of banks and thrifts because of the potential for withdrawals of funds by depositors during a period of rising interest rates. The second question is important because an MMDA is a risk-free investment, up to \$100,000, while an MMMF is not. Thus, one reason investors may not readily move funds between these two accounts is that they bear different amounts of risk. In fact, this explanation is the one most commonly cited by bankers and depositors.

Alternatively, another plausible explanation for the interest rate spread is that money funds are managed more efficiently than depository institutions, allowing the money funds to pay a higher rate of return. In other words, given the recent changes in the financial sector, traditional views of the industry may no longer be valid. It is also possible, in light of the attention given to the financial condition of certain banks and thrift institutions, that some investors no longer view MMDAs as less risky than MMMFs. Hence, this article examines and extends earlier work on the money

Chart 1
**Yields on Money Market Mutual Funds
 and Money Market Deposit Accounts**



SOURCES: Board of Governors, Federal Reserve System.
 Donoghue Organization.

market mutual fund/money market deposit account debate, bringing forth a fresher perspective.

Previous work on the issue of substitutability of money market deposit accounts and money fund accounts has produced mixed evidence regarding the extent to which investors move funds between these accounts. In a 1984 article, Wall and Ford explored how banks and thrifts competed for funds during the period from September 1983 to January 1984.¹ Using weekly data on individual banks in six standard metropolitan statistical areas (SMSAs), they found that consumers showed little response to the level, or changes in the level, of weekly interest rate differentials. In contrast, using monthly data on a cross section of banks in the Twelfth Federal Reserve District for the period from January 1983 to December 1984, Keeley and Zimmerman found that MMMFs and MMDAs are indeed substitutes, but not close substitutes.²

Wall and Ford also examined whether the higher money fund rate, as compared with an MMDA rate, was mainly a compensation for risk or was an indication that banks were taking advantage of depositors' preference for convenience. They examined five categories of money funds, broken down by degree of risk, and compared the rate paid on each with the rate paid on MMDAs. The most risk-free category of money funds—those that invested only in U.S. Treasury

securities—paid a rate lower than MMDAs, while the riskiest category of money funds—those that invested in domestic prime securities and in Eurodollars—paid higher rates than MMDAs. Therefore, Wall and Ford concluded that the interest rate differential between MMMFs and MMDAs could indeed be explained by differences in risk.

The analysis here contrasts with both Wall and Ford's and Keeley and Zimmerman's, in that nationwide aggregate time series data, through December 1986, are used. The results show that, in fact, investors do not quickly switch their funds between money market deposit accounts and money fund accounts in response to changes in interest rates. Adjustment costs or personal preferences keep substitution fairly low in the short run. Over a longer period, however, a substantial amount of substitution can be expected. Further, in contrast to the Wall-Ford results, this article shows that risk explains only a small part of the rate differential between the two accounts. Hence, there must be other factors playing a role in determining the interest rate spread.

In what follows, the article first presents a brief history of the development of MMMFs and MMDAs and of the MMDAs' initial effect on the monetary aggregates. Next, the issue of substitution between these two types of accounts is discussed, and empirical results are presented. The ques-

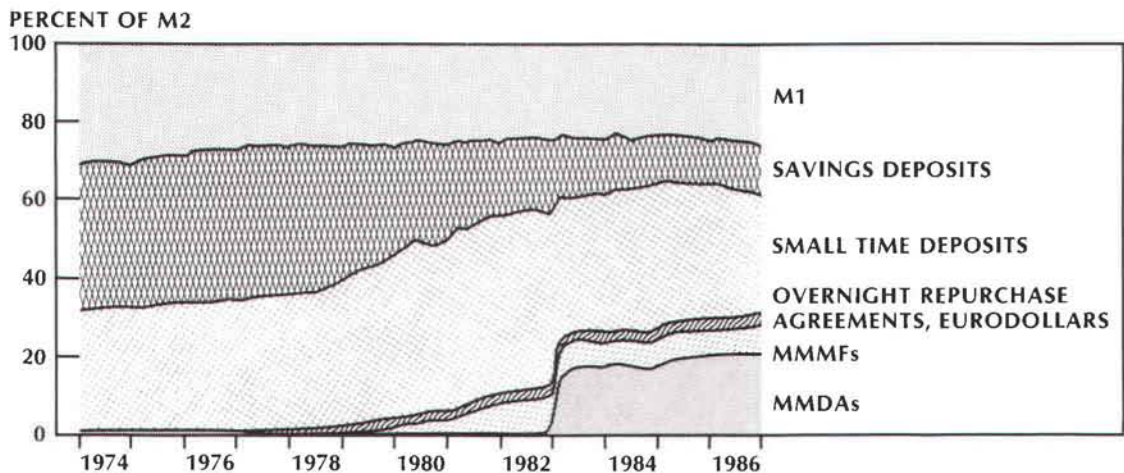
Table 1
COMPOSITION OF MONETARY AGGREGATES
(Dollar amounts in billions, not seasonally adjusted)

Aggregates and components	December 1982	December 1986
M1		
Currency	\$ 136.5 (27.8)	\$ 186.2 (24.9)
Travelers checks	4.1 (.8)	6.0 (.8)
Demand deposits	246.3 (50.2)	319.5 (42.8)
Other checkable deposits	104.1 (21.2)	235.0 (31.5)
M2		
M1	490.9 (25.1)	746.6 (26.5)
Overnight repurchase agreements and Eurodollars	38.8 (2.0)	77.3 (2.7)
Money market mutual funds, general-purpose and broker/dealer	185.2 (9.5)	207.6 (7.4)
Money market deposit accounts	43.2 (2.2)	571.3 (20.3)
Savings deposits	355.1 (18.1)	365.5 (13.0)
Small-denomination time deposits	851.5 (43.5)	854.1 (30.4)
M3		
M2	1,958.1 (79.9)	2,813.3 (80.3)
Large-denomination time deposits	328.6 (13.4)	448.1 (12.8)
Term repurchase agreements	34.5 (1.4)	81.9 (2.3)
Term Eurodollars	81.7 (3.3)	83.2 (2.4)
Money market mutual funds, institution-only	51.1 (2.1)	84.1 (2.4)
Total M3	\$2,450.3	\$3,503.8

NOTE: Figures in parentheses are percentages and indicate component's share of aggregate.
Details may not add to totals because of rounding.

SOURCE OF PRIMARY DATA: Board of Governors, Federal Reserve System.

Chart 2
M2 Components



SOURCE: Board of Governors, Federal Reserve System.

tion of whether risk can explain the interest rate differential between the two accounts is then examined.

The development of money market accounts

Though money market mutual funds came into existence in 1974, only since 1978 has their asset size become significant. In fact, from 1978 until the introduction of MMDAs, money fund shares grew rapidly, equaling nearly 17 percent of small-denomination time and savings deposits held by banks and thrifts in 1982. Money funds offer market rates of return and offer checking for large withdrawals—usually a minimum of \$500. Minimum initial investments vary; a few institutions require no minimum, while most require from \$500 to \$5,000.

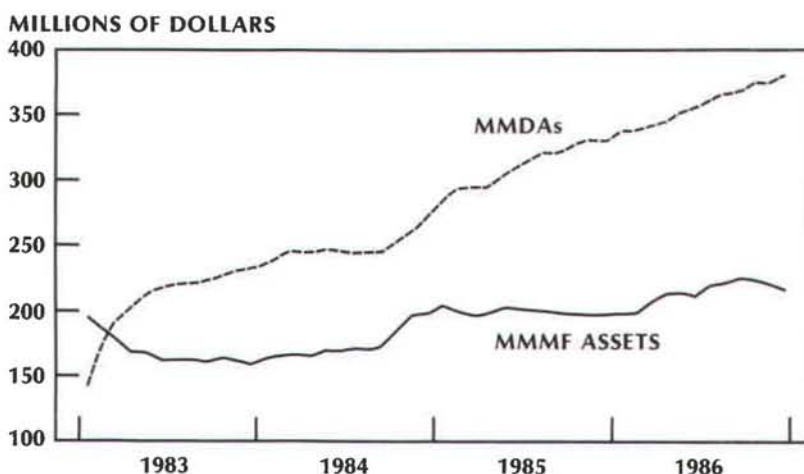
The money market deposit account was instituted in December 1982 to allow banks and thrifts to compete directly with money market mutual funds. In contrast to the money fund accounts, money market deposit accounts limit the number of withdrawals per month and, until January 1, 1986, required a minimum balance. Even today, however, minimum balances are set for earning interest and avoiding penalties.

When MMDAs were instituted, a large portion of the money flowing into them came from money market mutual funds. Yet, to understand how the introduction of MMDAs affected the monetary aggregates, it is worthwhile to con-

sider briefly all the potential sources of funds for such accounts: households and businesses could have switched some funds from transaction balances, which are components of the M1 aggregate, into MMDAs; a reallocation from savings accounts and other accounts in M2, in addition to a switch from MMMFs, could have occurred; or households and businesses could have switched from holdings of M3, or even less liquid assets, into MMDAs. Also, it is useful to note that institution-only MMMFs are in M3, while general-purpose and broker/dealer MMMFs are in M2. Therefore, a switch from institution-only MMMFs would have increased M2, while a switch from broker/dealer MMMFs would not have affected total M2.

In their 1985 article, Keeley and Zimmerman documented the sources of funds that first shifted into MMDAs.³ They noted that a substantial decline in MMMFs coincided with the growth in MMDAs. There was also a decline in large certificates of deposit because banks and thrifts reduced their offerings of CDs as they experienced inflows of MMDA deposits. There was a significant decline in small-denomination time deposits. After their initial decline, however, both the MMMFs and the small time deposits resumed their trend growth rates. Finally, there was not a significant shift from savings accounts and transaction balances into MMDAs. In sum, shifts occurred within M2 and between M3 and M2. Shifts did not occur between M1

Chart 3
**Assets of Money Market Mutual Funds
 and Money Market Deposit Accounts**



SOURCES: Board of Governors, Federal Reserve System.
 Donoghue Organization.

and M2.⁴

The components of the monetary aggregates appear in Table 1. The size of each account is listed for December 1982, the first month MMDAs were in existence, and for December 1986. As the table shows, in December 1982, MMDAs accounted for merely 2.2 percent of M2, while general-purpose and broker/dealer MMMFs accounted for 9.5 percent. By December 1986, MMDAs had grown to 20.3 percent of M2, while the share of those MMMFs had declined to 7.4 percent. Clearly, MMDAs have not eliminated MMMFs, although the money funds probably would have grown much faster if the deposit account had not been introduced.

Chart 2 shows the composition of M2 over the 1974-86 period. The chart indicates that MMDAs grew quickly, becoming nearly 20 percent of M2 by early 1983. Further, the chart indicates that small time deposits declined when MMDAs were first introduced. Savings deposits also declined as a percentage of total M2.

Finally, Chart 3 shows the deposit levels of the two money market accounts over the 1983-86 period. As can be seen, MMDAs have grown faster than MMMFs. Moreover, MMMFs were at approximately the same level in December 1986 as in January 1983.

Substitution between MMDAs and MMMFs

This section examines the extent to which MMMFs and MMDAs are substitutes. By definition, two accounts are substitutes if they both satisfy the same need of the investor. A measure of substitutability is obtained by examining how readily individuals move funds between the two accounts in response to interest rate changes. In particular, the question is, Given that banks can now bid for funds at market rates, will banks still lose their deposits to other money market accounts during a period of rising interest rates?

In order to examine the substitutability of money market mutual funds and money market deposit accounts, a stock-adjustment model of MMMF deposits is specified, based on the theory of portfolio selection. The specification is similar to that used by Keeley and Zimmerman: the desired stock of the asset—in this case, MMMF deposits—is positively related to its own rate of return, negatively related to the rates of return on substitute assets, and positively related to wealth. Therefore,

$$(1) \quad A_t^* = f(R_{1t-1}, R_{2t-1}, \dots, R_{nt-1}, W_{t-1}),$$

where

A_i^* = log of the desired stock of asset i
 R_i = log of the rate of return on asset i , $i = 1, \dots, n$
 W = log of total wealth of households.

That is, this period's desired stock is a function of last period's actual interest rates and wealth. Further, actual asset stocks do not adjust instantly to desired stocks because the adjustment is costly. Thus, only a fraction of the difference between the desired stock and the actual stock is eliminated each period. This adjustment process is specified as

$$(2) \quad \Delta A_{it} = \lambda(A_{it}^* - A_{it-1}),$$

where

$$\Delta A_{it} = A_{it} - A_{it-1}$$

λ = the fraction of adjustment per unit of time
 in the gap between the desired value and
 the actual value of the stock, $0 < \lambda < 1$.

Rewriting equation 2 and substituting equation 1 into equation 2 results in

$$(3) \quad A_{it} = (1 - \lambda)A_{it-1} + \lambda f(R_{1t-1}, R_{2t-1}, \dots, R_{nt-1}, W_{t-1}).$$

The version of equation 3 used for estimation is

$$(4) \quad A_t = \alpha + \beta_1 R_{MMMFT,t-1} + \beta_2 R_{MMMDA,t-1} + \beta_3 Y_t + \beta_4 A_{t-1} + \varepsilon_t$$

where

A_t = log of assets in money market mutual funds
 R_{MMMFT} = log of interest rate paid on money market
 mutual fund accounts
 R_{MMMDA} = log of interest rate paid on money market
 deposit accounts
 Y = log of nominal income
 α, β_i = coefficients of the regression
 ε_t = disturbance term.

Three aspects of equation 4 should be noted. First, nominal income is used as a proxy for total wealth because data for the latter are only available quarterly. Second, although theory suggests that an array of interest rates should be included in the equation, such an approach is not possible since the rates are highly collinear. Finally, two versions of this equation are presented. The first uses total assets held in money market mutual funds, *MMMFT*, as the dependent variable; the second uses assets of the funds that invest only in government securities, *MMMFG*. The latter category is analyzed as a contrast to the broader category of money funds. Investors in government security funds, a very low-

Box A

Interest Rate Elasticities

The elasticities presented here represent the percentage change in assets in MMMFs, given a 1-percent change in the level of the interest rate.

Interest rate	Elasticities			
	MMMFT		MMMFG	
	Short-run	Long-run	Short-run	Long-run
R_{MMMFT}	.363	7.56	.162	1.14
R_{MMMDA}	-.380	-7.92	-.140	-.99

Since the variables in equation 4 are expressed in logarithmic form, representing a percentage change of the level variable, the short-run elasticities are the coefficients on the interest rate variables from the estimated equations (see Table 2). The long-run elasticities are calculated by assuming that $MMMFT_t$ equals $MMMFT_{t-1}$ and solving each of the two regression equations for $MMMFT_t$. In other words, it is assumed that in the long run the lagged values and current values of MMMF assets are the same. For example, the long-run own interest rate elasticity for *MMMFG* is defined as

$$\beta \frac{1}{1 - \beta_4} = \frac{.162}{1 - .858} = 1.14.$$

risk investment, may exhibit different behavior than holders of shares in the broader category.

The results of estimating equation 4 are presented in Table 2. The coefficient on each interest rate variable is an elasticity, measuring the percentage change in assets held in money funds in response to a 1-percent change in the interest rate level. At 0.363 for the own elasticity and 0.380 for the cross elasticity, the one-month interest rate elasticities are fairly low. The long-run elasticities, however, are quite high, 7.56 and 7.92, respectively. (The elasticities and their derivation are discussed in Box A.) At only 5 percent per month, the speed of adjustment—defined as 1 less the coefficient on lagged holdings of MMMF deposits (0.952)—is quite low. The implication is that the "long run" is 20 months, or almost two years. Hence, these results suggest that interest rate changes do not lead to rapid

Table 2
**ESTIMATES OF DEMAND FOR
 MONEY MARKET ACCOUNTS**
 (Estimation period = April 1983–December 1986)

Explanatory variable	Dependent variables	
	MMMFT	MMMFG
Intercept	.230 (.11)	-2.970 (-1.09)
$R_{MMMFT\ t-1}$.363 (2.30)	
$R_{MMMFG\ t-1}$.162 (.81)
$R_{MMDA\ t-1}$	-.380 (-1.92)	-.140 (-.56)
Y_t	.025 (.14)	.289 (1.41)
$MMMFT_{t-1}$.952 (12.50)	
$MMMFG_{t-1}$.858 (12.60)
Durbin's h statistic	.28	.78
\bar{R}^2	.98	.98
Long-run elasticity		
Own interest rate	7.56	1.14
Cross interest rate	-7.92	-.99

NOTE: Figures in parentheses are t statistics.

Box B

Summary of Conclusions About Money Market Accounts

- Substitution between money market deposit accounts and money market mutual fund shares is small in the short run (one month). A change in the interest rate spread between these two types of deposits does not lead investors to adjust their holdings quickly.
- Over a longer period (several months to two years), a given movement in interest rates would result in investors shifting funds between these accounts.
- Compensation for default risk on MMMF shares (which are not federally insured) explains only a small part of the higher interest rate typically paid by money market mutual funds. The interest rate spread between MMMFs and MMDAs is also explained by a higher rate of return on MMMF shares, not solely by default risk.

movement of funds between MMDAs and MMMFs. Preferences, such as for convenience, keep the two accounts interest-inelastic in the short run. Over time, though, individuals do substitute between the two accounts in response to interest rate changes.

The second regression, involving the category of money funds that invest only in government securities, offers different results. In this specification the interest rate elasticities are much lower and are not significant. Further, the long-run elasticities are also low. In fact, the only significant explanatory variable is lagged holdings of money fund deposits, which is reasonable because this category is the most risk-free type of MMMF. If an individual is concerned about risk and thus has a strong preference for funds investing in government securities, holdings would not be altered when rates changed.

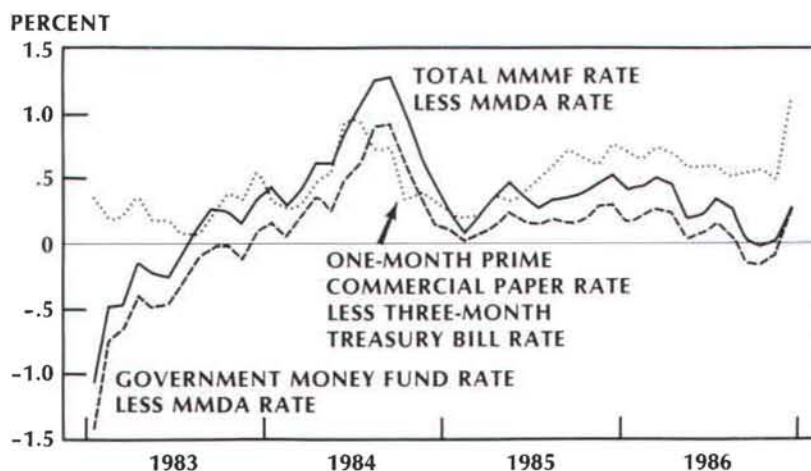
Unfortunately, the results presented in this section are not directly comparable to those in the earlier studies. Wall and Ford, using weekly data, examined competition among money market accounts, while Keeley and Zimmerman

estimated equations to explain MMDA behavior. Still, a comparison does offer some analogies. Wall and Ford concluded that on a weekly basis the MMMFs and MMDAs are interest-inelastic. The work here supports this conclusion on a monthly basis as well. Keeley and Zimmerman's empirical work also supports the idea that the two accounts are inelastic in the short run, though their short-run cross elasticity is lower than the estimate obtained here. This outcome suggests that, on a national basis, substitution between the two accounts in the short run is larger than what Keeley and Zimmerman obtained for the Twelfth District. Finally, Keeley and Zimmerman found the MMDA to be very elastic with respect to the MMMF rate in the long run—a result consistent with the one reported here for total MMMFs.

The MMDA-MMMF interest rate spread

The preceding section examines the extent to which investors moved funds between MMMFs and MMDAs in response to interest rate changes. In contrast, this section considers a factor that may differentiate the two accounts and lead to less substitution between them: specifically, the extent to which the spread between the MMMF rate and the MMDA rate is a result of default risk on MMMFs.

Chart 4
Spreads Between Selected Interest Rates



SOURCES OF PRIMARY DATA: Board of Governors, Federal Reserve System
Donoghue Organization

Since MMDAs are federally insured up to \$100,000, there is little risk of default up to this amount.⁵ MMMFs are not insured, however, and bankers and other financial market observers have hypothesized that banks and thrifts can pay a slightly lower rate of return on the MMDAs because of the insurance. Examination of assets in a money fund portfolio indicates that, in fact, money funds invest in short-term, highly liquid securities, a large portion of which are risk-free government securities. Consequently, the presumption that the interest rate on an MMDA is lower than the rate on an MMMF because the latter is a riskier investment may be based more on people's misperceptions than on reality.

Perhaps the spread is due to factors other than risk. For example, the reserve requirement on nonpersonal MMDAs calls for a small portion of MMDA funds to remain as reserves, earning no interest as an asset. It could be the case that this "cost" is passed along to depositors. Alternatively, banks and thrift institutions could be taking advantage of depositors' preferences, as Wall and Ford initially suggested. On the other hand, the spread could reflect more efficient management by money funds, resulting in lower costs for the funds, or it could reflect that MMMFs have a wider selection of assets from which to choose for investment purposes. The last consideration is based on the fact that money funds have a national base whereas many banks and thrifts are more regionally focused. Finally, even though the

individual assets held by money funds are slightly riskier than an insured money market deposit account, the funds might be able to minimize risk through diversification.

To examine the extent to which risk actually does explain the spread between the two interest rates, the following relationship is hypothesized:

$$(5) \quad R_{MMMF_t} - R_{MMDA_t} = \alpha + \beta RP_t + \varepsilon_t$$

where

RP = the default risk premium

α, β = coefficients of the regression

ε_t = disturbance term.

According to this specification, movement in the spread results from movements in the risk premium. Further, if the reserve requirement on nonpersonal MMDAs explains part of the spread, there would be a constant differential between the two rates, and this differential would be captured by the constant term in the regression.

The default risk premium used to estimate equation 5 is the spread between the one-month prime-grade commercial paper rate and the three-month Treasury bill rate. The idea behind using this variable is that Treasury bills are backed by the government and, therefore, carry essentially no default risk, while prime commercial paper is issued by highly rated corporations and carries slightly more risk.

Table 3
REGRESSION RESULTS FOR INTEREST RATE SPREADS
(Estimation period = April 1983–December 1986)

Explanatory variable	Dependent variables	
	$(R_{MMMFT} - R_{MMDA})$	$(R_{MMMFC} - R_{MMDA})$
Intercept	.145 (1.32)	-.099 (-1.10)
<i>RP</i>	.357 (2.85)	.425 (3.77)
Durbin-Watson statistic	1.11	1.38
\bar{R}^2	.31	.26
F-test statistic	11.13	8.72

NOTE: Figures in parentheses are *t* statistics.

Thus, the interest rate differential between them is a measure of default risk on a short-term investment and is an appropriate measure to use for this study.⁶ Chart 4 compares this risk variable with the $(R_{MMMFT} - R_{MMDA})$ spreads.

The results of estimating equation 5 are presented in Table 3. The first regression uses the interest rate on total MMMFs; the second regression uses the interest rate on MMMFs invested only in government securities. The first equation was corrected for second-order serial correlation, and as the results show, the risk variable *RP* is significant while the intercept is not. However, the \bar{R}^2 is quite low, 0.31, indicating that the regression explains only a small part of the interest rate spread, and the insignificant intercept suggests that the spread is not explained by the reserve requirement on MMDAs.

Overall, the equation's low Durbin-Watson statistic—evidence of autocorrelation among the residuals—suggests that there may be omitted explanatory variables. Since excluded variables are accounted for in the regression residuals, omitting relevant variables leads to autocorrelated residuals. Unfortunately, quantifying the other factors (already discussed) that most likely help to explain the spread would be difficult. Hence, it is not possible to test explicitly for their significance.

Turning to the second regression, the equation was again corrected for second-order serial correlation. The results reported are somewhat surprising because money funds that invest only in government securities carry very little default risk. That is, risk would not be expected to explain the differential between the two rates of return. As in the first regression, however, the risk variable is significant;

again, though, the low \bar{R}^2 indicates that risk explains only part of the spread.⁷

In sum, contrary to what is often hypothesized, risk explains only part of the spread between the MMDA rate and the interest rate on MMMFs. Thus, rationalization by banks and thrifts that a lower rate of interest is offered on their MMDAs because of lower risk is, at minimum, an overstatement. Moreover, in light of the well-publicized troubles in the banking and thrift industry, this regression result makes sense because it is possible that some investors no longer view bank and thrift deposits as risk-free. Instead, the higher rate paid by money funds may reflect that money funds have a national base of operation, allowing them to earn a higher rate of return on their portfolios. The higher rate may be due to better management on the part of money funds, or it may be due to diversification. In any case, risk is not the whole story.

Summary

This article has examined the extent to which investors switch funds between money market mutual funds and money market deposit accounts in response to interest rate changes. The regression results show that in the short run, substitution between the two accounts is small. Hence, a mass exodus of funds from one account to the other would not be expected if the short-run spread between their interest rates increased. Over time, however, an exodus of funds could occur, as the long-run interest rate elasticities are quite high. Therefore, the idea that the MMDAs might eliminate MMMFs has validity in the long run but not in the short run. Alternatively, if interest rates changed to favor

MMMFs, a movement of funds from MMDAs to MMMFs would be expected in the long run but not in the short run.

In fact, it is the MMMF rate that has remained higher than the MMDA rate (except during the first three months of existence of the MMDAs), so if anything, the MMMFs might be expected to eliminate the MMDAs. This scenario has not occurred, partly because the two accounts have slightly different characteristics and, therefore, appeal to different types of investors. Moreover, the depository institutions have contended that because of deposit insurance, an MMDA has lower risk than an MMMF. This characteristic might make the MMDA attractive even though it pays a lower rate of interest. As was demonstrated, however, risk explains only part of the differential between the MMDA rate and the MMMF rate. Thus, investors should be wary of the degree to which the interest rate differential can be justified on the basis of risk.

Further work remains to be done on the extent to which the development of money market accounts has altered the interest elasticity of the monetary aggregates, on the extent to which the accounts have altered the money supply process, and on the relationship between the aggregates and total spending. Such topics are important areas for future research.

1. Larry D. Wall and Harold D. Ford, "Money Market Account Competition," Federal Reserve Bank of Atlanta *Economic Review*, December 1984, 4-14.
2. Michael C. Keeley and Gary C. Zimmerman, "Competition for Money Market Deposit Accounts," Federal Reserve Bank of San Francisco *Economic Review*, Spring 1985, 5-27.
3. Keeley and Zimmerman, "Competition for Money Market Deposit Accounts."
4. It may be noted that this result contrasts with Bharat Trehan and Carl E. Walsh, "Portfolio Substitution and Recent M1 Behavior," *Contemporary Policy Issues* 5 (January 1987): 54-63. In that article the authors consider substitution only between M3 and M1.
5. Given the recent troubles of a number of banks and thrift institutions, however, there is some concern that even deposits under \$100,000 at these institutions are no longer riskless.
6. For similar uses of an interest rate spread as a risk variable, see Robert B. Barsky, "Three Interest Rate Paradoxes" (Ph.D. diss., Massachusetts Institute of Technology, 1985); and Timothy Q. Cook and Thomas A. Lawler, "The Behavior of the Spread Between Treasury Bill Rates and Private Money Market Rates Since 1978," Federal Reserve Bank of Richmond *Economic Review*, November/December 1983, 3-15.
7. These regressions were also estimated using an alternative risk measure, the spread between one-month prime-grade and one-month medium-grade commercial paper. This risk variable was not significant in either regression.

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