Introduction

One of the principal effects of tort liability that has stimulated the product liability reform debate has been the

W. KIP VICUSI is the George G. Allen Professor of Economics at Duke University. He received the David A. Wells Prize for the best Harvard economics PhD dissertation in 1976. Dr. Viscusi serves as an associate reporter for the American Law Institute’s Tort Liability Reform Project. He is the author of many articles and books, including Regulating Consumer Product Safety (1984), Risk by Choice: Regulating Health and Safety in the Workplace (1984), and Restructuring Product Liability to Manage Risks (forthcoming).

MICHAEL J. MOORE is associate professor of economics at the Fuqua School of Business, Duke University. He has published articles on workers’ compensation, occupational safety, and the value of life and health. Additionally his current research interests include economic studies of the effects of product liability and product safety regulation. He is the coauthor (with W. Kip Viscusi) of the recently published book, Compensation Mechanisms for Job Risks: Wages, Workers’ Compensation, and Product Liability. The authors are indebted to the Insurance Services Office (product liability data) and the Wharton-
product liability–innovation linkage. The dominant assessment of this relationship has been rather one-sided. The most prominent view in the literature on product liability reform is that product liability imposes costs that hit new products particularly hard, thus reducing firms’ incentives to innovate and their willingness to bear risks.¹

Such concerns are not entirely without foundation. Monsanto, for example, did not market an already patented phosphate fiber asbestos substitute because of the liability risk.² Widely publicized instances of liability related withdrawals of drugs and vaccines indicate that the pharmaceutical industry has been particularly affected.

These impacts, however, only reflect liability’s negative aspect. The purpose of product liability is to foster product safety. Achieving this entails some costs; otherwise firms would have adopted these measures without the spur of product liability. An effective liability system should lead to some withdrawal of products, decreased product introductions, higher prices, and a possible loss of jobs. Liability should also stimulate positive product modifications, such as improved product warnings and incorporation of safety design features.

Of the various types of product liability costs, a possible adverse impact on innovation is perhaps the most sensitive because of its long-run implications for society’s economic well-being. Most of the increased longevity and increased health in the United States over the course of this century reflects the increased productivity and social wealth, which in turn can be traced largely to technological innovation.³ Indeed, this affluence has led to society’s demand for greater safety and to the expanded role of tort liability and risk regulation. Innovation not only increases our economic well-being

PIMS Research Center (innovation data) for use of the extensive databases they have developed and to Peter Schuck, who provided numerous helpful comments. Research support from the National Science Foundation, Grant No. SES-8823002, is gratefully acknowledged.
but can also lead to improved safety-enhancing designs. Today's technologies for automobiles and airplanes, for example, are much safer than those of earlier eras. Even from the safety and health standpoint, then, fostering incentives for innovation should be an important concern.

The downside of innovation is that novel technologies may also create new, poorly understood risks. The asbestos case presents perhaps the most dramatic example. Had the cancer risks been as well understood when asbestos first gained widespread use in ship insulation and as a building construction material as they are today, the national epidemic of asbestos-related cancers would not have occurred. The pharmaceutical industry has also been a focal point for claims of birth defects from drugs taken by pregnant women. The potential risk of traumatic accidents from untried technologies may also be substantial.

Many critics of the tort system accuse the courts of emphasizing innovation's adverse effects while giving insufficient recognition to its benefits, producing an unbalanced product safety policy. But the search for an appropriate trade-off between the risks and benefits of innovation is not unique to the product liability system. Regulation of pharmaceuticals by the Food and Drug Administration (FDA) requires the government to balance innovation and safety. Some critics have charged that the FDA places so much weight on screening out risky drugs that it has caused a lag in health-enhancing innovation. Other critics contend that the agency has struck the balance too favorably to innovation, permitting unduly risky products to reach consumers.

This chapter examines the effects of the tort liability system on product innovation. Section I discusses product liability's multiple social objectives. In section II we indicate why there has been increased concern with the costs imposed by product liability, including the potential impact on innovation. Since anecdotes and selective surveys of business views on product liability may be misleading, Section III provides a more comprehensive statistical perspective on the linkage between product liability and innovation. There we present strong sta-
tistical evidence that the more innovative firms are bearing most of the product liability burden. On balance, however, we find that the innovation fostered by product liability improves product quality. Nevertheless, the current system can be improved, and section IV proposes product liability reforms that would encourage innovation.

Section I: Society's Product Design Objectives

Society cannot afford to adopt every possible product safety improvement. In each case, balancing is required between the competing objectives of safety and cost, which includes adverse effects on innovation. Federal agencies setting the stringency of proposed risk regulations look to labor market studies from which the implicit value of life, the benefit of the expected risk reduction to the party affected, can be derived. This procedure, which is now recommended by the Office of Management and Budget for use throughout the federal government,\(^5\) represents an appropriate approach to valuing life for regulatory purposes. Recent labor market estimates indicate that workers are willing to accept risks on the order of one chance in 10,000 per year for an additional wage compensation of $500–$600, leading to an implicit value per statistical life in the range of $5–$6 million.\(^6\) These numbers do not represent what a worker would require to accept certain death, nor do they represent the level of life insurance that the worker would provide for his or her family. Rather, they reflect how workers trade off income against risks of death. This figure can serve the regulator as an appropriate benchmark for establishing the benefits of risk reduction.

Value-of-life reference points are not unique and precisely defined figures. The appropriate value of averting risks will vary with the attitudes toward risk of the population being protected. Moreover, the various estimates of the value of life have a range of error, as do all statistical studies. As a result, these values establish a general range of risk-dollar trade-offs that is appropriate from the standpoint of accident deterrence.
Court adjudication of the value of life involves more than just deterrence, however. Damages have a dual purpose: to provide compensation and to generate incentives for safety. A value-of-life figure of $6 million may provide for correct safety incentives, but it will also provide too much compensation.

Prospective accident victims with access to perfect insurance would not select $6 million in insurance coverage. From the standpoint of optimal insurance, such award levels are too great. Since product liability costs will be reflected in product prices, in effect such awards will force product consumers to overinsure their losses so as to provide the product producer with correct safety incentives.

The current approach of the courts emphasizes the compensation objective almost exclusively, ignoring the deterrence value of life. Damages based on lost future earnings rather than the value of life will, from the standpoint of prevention, tend to provide too little incentive for safety. Firms making the trade-off between product cost and risk will base their safety investment decisions on the price they must pay for producing hazardous products, and if this trade-off is too low, the resulting risk level will be excessive.

Traditional notions of negligence recognize the importance of such trade-offs; an actor who does not exercise an appropriate degree of care risks being found liable for negligence. Even with strict liability, such trade-offs are central because the main methodology for implementing strict liability for dangerous products is risk-utility analysis. One formulation of the risk-utility test for defect lists seven factors that courts should consider: the usefulness and desirability of the product, product safety, the availability of substitute products, the feasibility of altering the product, the user's ability to exercise care, the importance of risk awareness and warnings, and the potential for risk spreading by the producer. Several of these factors reflect balancing notions. Feasibility of product changes and the role of substitute products would not be relevant if safety were the sole objective. The California Supreme Court's Barker test for defect reflects a similar concern with trade-offs of this kind.
Nevertheless, the risk-utility test has important shortcomings. First, the courts may exaggerate producers' potential role as insurers. In cases of manufacturing defects, producer insurance is feasible because these defects tend to affect only a small part of any product line, and the cost of insuring accident victims can be spread across all purchasers through a higher product price. In contrast, design defect liability affects an entire product line. Resulting insurance costs, which are high relative to the product revenues, cannot as readily be spread across purchasers.

A second deficiency of the risk-utility test is its indeterminacy. No agreed-upon technique exists for aggregating and balancing the many competing factors. Viscusi (1990) has attempted to formulate the risk-utility test in an economically consistent fashion. Any design defect test, however, demands that the courts act as regulatory agencies, requiring judges and juries to assess the risks and benefits associated with alternative product designs from the standpoint of the entire market, not just the welfare of the particular plaintiff. Although giving the courts such sweeping responsibility is clearly unrealistic and unsound, the current liability regime does precisely this.

Application of the risk-utility test and the movement to strict liability more generally have imposed higher costs on firms. What outcome should we expect? For risky products, we should expect the additional liability costs to lead to additional safety investments in the form of improved product design and hazard warnings. The cost of these improvements will cause some firms to drop products; some firms specializing in risky products may even drop out of the market altogether. The price of risky products will increase to reflect the cost of these safety improvements and the increased liability burden.

Some of these results may be desirable. If the market originally provided too little product safety, the product liability system should force some firms and products out. Similarly, medical malpractice liability should weed out incompetent physicians who are inflicting substantial injuries on their patients. Society should not cap damages and restrict product liability simply because some costs are being imposed. The
The real question is whether these costs are justified given the trade-offs that are involved. To the extent that available data permit, we will examine one important part of the answer to this question—the impact of liability on innovation.

Section II:
Sources of Increased Concern

The cost of product liability insurance has soared in recent years. General liability premiums were $6.5 billion in 1984, almost doubled to $11.5 billion in 1985, increased further to $19.4 billion in 1986, and have since remained in the $20 billion range. In addition, many firms have been unable to obtain liability coverage at all. How have these developments affected product innovation?

Most evidence on this question is anecdotal. One common feature of this anecdotal evidence is the prominence in such accounts of the pharmaceutical industry in general and vaccines in particular. Product liability costs often loom large relative to the low revenues associated with even very important vaccines. Rising liability costs during the 1980s reduced the number of firms producing vaccines for five serious childhood diseases from thirteen in 1981 to three by the end of the decade. The particularly severe impact on vaccines stems in part from their low frequency of use. A vaccine that is received once in a lifetime, or even periodically, will be administered less frequently than prescription drugs. Consequently, the liability risk per dose is high, largely because of the low number of lifetime dosages. However, vaccines represent one of the most extreme impacts of product liability rather than a bellwether product group.

If the liability costs do not lead to product withdrawals, they may generate incentives to develop safer products. Technological advances such as genetic engineering are leading pharmaceutical manufacturers to introduce safer vaccines with a smaller expected liability burden. For example, in an effort to have products with a lower liability risk, Merck and Smith-Kline Beckman have recently introduced a genetically engi-
neered hepatitis B vaccine, while Praxis is now marketing a vaccine against the bacteria that causes spinal meningitis in children.9

Another segment of the pharmaceutical industry that has been affected disproportionately consists of pregnancy related drugs. Marion Merrell Dow Pharmaceuticals suspended Bendectin, a morning sickness drug, without ever having lost a product liability case because the $18 million annual cost of legal fees and insurance approximated the $20 million in sales.10 Similarly, G. D. Searle and Company discontinued its Copper-7 contraceptive device after spending $1.5 million in one year to successfully defend itself in four different lawsuits; the prospective costs were viewed as too great compared with annual sales of only $11 million. A recent National Academy of Sciences report concluded that the United States now lags behind Europe in the development of contraceptives.11 Moreover, they viewed the incentive effects of liability as being so great that they recommended that pharmaceutical companies be shielded from the costs of tort liability lawsuits.

Anecdotal evidence also suggests that, for a variety of products, product liability has also stymied product introductions. Such evidence standing alone cannot demonstrate, however, that the effects on product innovation are economically significant.

In an effort to assess these claims more systematically, the Conference Board conducted two national surveys regarding the impact of product liability. Although these surveys go far beyond isolated case studies, they have two potential shortcomings. There may have been a response bias since the respondents to the survey were asked questions that they knew would be used in assessing the desirability of product liability reform. More important, the questions were highly qualitative in nature. Asking individuals whether product liability has a "major" impact on cost provides no defined threshold above which cost becomes major. Nevertheless, this survey evidence can provide some insight into how product liability affects innovation and furnishes a useful backdrop to the formal statistical analysis in Section III of this chapter.
The first survey by the Conference Board (1987) questioned several hundred risk managers during the summer and fall of 1986, shortly after the insurance premium explosion. The survey results indicated that product liability had both beneficial and adverse effects. Product liability costs led over a third of the firms to either improve their product labels to make the safety instructions more explicit or to add additional warnings, while almost one-third improved the products' safety design in response to product liability. Of those firms making these improvements, one-fifth reported a decline in product related accidents. The costs of these safety improvements were reflected in price increases reported by 43 percent of the firms. Under 6 percent of all firms laid off employees for product liability reasons during the three years prior to the survey. Almost one-fourth of all respondents reported that they had discontinued manufacture of a product or provision of a service because of product liability concerns, but the lost revenues associated with these discontinuances were probably small. Under 15 percent reported that product liability caused them not to invest in a new product or service—the clearest adverse effect on innovation.

A subsequent study by the Conference Board (1988) based on a 1987 survey included a larger sample; responses came from the CEOs of 270 large manufacturing and retail firms and 280 small manufacturers.12 Despite some selection bias (responses were received from only about one-sixth of the surveyed firms, and the number of complete responses is even less), the survey offers additional detail not present in the initial Conference Board study. One new component was an effort to measure the cost increase from 1984–87 attributable to product liability. In the case of consumer durables, consumer nondurables, and industrial materials and supplies, the product liability cost was estimated at less than 5 percent of the increase in direct costs over the 1984–87 period. For industrial equipment and machinery, over half of the respondents believed that product liability contributed under 10 percent of the direct cost increase during that period. Overall, 2 percent believed that the average increase in direct costs from 1984–87
was under 1 percent, 23 percent believed that it was between 1–2 percent, 27 percent believed that it was between 3–5 percent, and 48 percent believed that it was 6 percent or more. Although liability costs are clearly not negligible, they certainly are not a dominant factor in most firms’ cost trends.

Nevertheless, even seemingly minor cost increases may have important effects. Liability costs may differ according to product type so that certain products may be hit particularly hard. For products on the margin of profitability, an increase in liability costs may be sufficient to tip the balance from a decision to market the product to a decision to abandon it.

The more recent Conference Board survey included a noteworthy addition to the original study by comparing the impact of actual product liability costs and anticipated costs. The earlier Conference Board study did not distinguish between the effects of past and expected liability costs and as a consequence captured both sets of influences. For the most part, the actual liability experiences were more consequential in terms of the adverse impacts cited by companies based on their liability experiences. A number of firms closed production plants (8 percent), laid off workers (15 percent), discontinued product lines (36 percent), decided against introducing new products (30 percent), and discontinued product research (21 percent) based on actual liability experiences. The anticipation of liability costs had a much smaller effect; the greatest impact was on discontinuation of product lines (11 percent) and decisions not to introduce new products (9 percent). It is striking that a sizable percentage of firms report substantive economic impacts of product liability even though the overall cost impact was not great in most instances. One possible explanation for these differing effects is that the distribution of costs across products is not uniform, so that some segments of the product mix may be affected more than others.

Firms’ liability experiences have also led to much more substantial actions to improve product safety. Actual experiences led to improvements in the safety of particular products (35 percent), a restructuring of the product mix to have a safer product line (33 percent), and improved product usage and
warnings (47 percent). The percentage of firms reporting safety impacts from the expectation of liability costs was much more substantial than the percentage effects on enterprise costs. Expected liability costs led to improvements in product safety (19 percent), improved product usage and warnings (21 percent), and redesign of product line (13 percent).

Although this survey does not enable one to compare the magnitudes of different, competing effects of product liability, it is clear that product liability has both a constructive impact on product design and detrimental effects of higher costs, discontinued products, and fewer new products. But even these mixed results should be treated with caution. For some of the questions the sample size was particularly small. This raises an issue as to whether the relatively small group of respondents differed systematically from the firms that did not respond. Did the survey capture only those firms that had the worst product liability problems and were therefore most strongly motivated to fill out the questionnaire? Alternatively, were the respondents the most responsible industry leaders with well-established product liability offices? Because the direction and extent of any bias are unclear, we regard this survey evidence as only suggestive of the presence of competing effects. The survey provides no basis for assessing whether the impact of product liability on innovation is beneficial. As a result, we rely instead on a more comprehensive statistical base for our analysis.

Section III: Statistical Evidence on the Product Liability–Innovation Linkage

A more refined perspective on the relationship between product liability and innovation can be obtained by examining industry statistics for each of these parameters. For product liability costs, we utilized the product liability insurance rate-making files of the Insurance Services Office (ISO). These files include information on over 200,000 policies written over the 1980–84 period. Using the premium information for each of these policies as well as data about particular industries, we
constructed measures of the total premium level per policy by industry.

The ISO sample is the largest available database on product liability insurance coverage. Because of its comprehensive-ness, it includes the insurance experiences of the small enterprises that are often neglected in liability surveys. This database only pertains to insurance policies written by U.S. firms. Firms that self-insure or firms that purchase policies from foreign companies are not included. Very large firms and high-risk outliers consequently tend to be excluded. The database provides little coverage of the pharmaceutical manufacturers or the asbestos industry. Firms selling such products that purchase insurance will, however, be included even though the original manufacturer may not, so that the product coverage of the dataset is reasonably broad.

To measure innovation, we used information about firm characteristics in different industries. Detailed, publicly available information on innovation does not exist, but a large dataset developed by the Strategic Planning Institute at the Harvard Business School to study strategic planning in the national economy does include such information. In particular, we used information from the Profit Impact of Marketing Strategies (PIMS) database for the years 1980–88. The PIMS data include information on balance sheet and income statement items for a broad cross-section of firms in the United States. As with the Conference Board surveys, the sample consists primarily of large firms. However, the dataset is much larger than the Conference Board’s, as it includes information on thousands of firms. This reduces the potential response bias and permits greater comparability across firms.

The PIMS data, however, do not represent a random sample of the population of firms. As noted above, large firms are represented disproportionately. In addition, some of the questions are qualitative. Asking whether a business benefits “to a significant degree from patents” may elicit differing responses depending on one’s perception of what constitutes significance. The survey also includes questions of a more quantitative nature. Analyzing the responses from a variety of ques-
tions framed in different ways will provide a more comprehensive perspective and evidence regarding the robustness of the observed relationships.

The statistics to be developed focus on the linkage between the product liability costs and various measures of innovation and new product introductions. The product liability cost measure equals the ratio of product liability premiums per policy to industry sales. In each case, the ISO data were used to construct total premium levels for each three-digit industry code; examples of industries defined at the three-digit level are construction and related machinery, and household appliances. We then matched these product liability cost measures with the individual firms in the PIMS database, permitting us to analyze the relationship between average product liability burdens and various measures of product innovation.

The statistics in Table 1 focus on the relationship between product liability costs and patents. The role of patents is of particular interest, since patents reflect the research and development decisions that are the main driving force behind product innovation.

Two measures of patents are included. The first analyzes whether product patents are significant for the firm. This index is based on whether the firm answered "yes" or "no" to the question: "does your business benefit to a significant degree from patents, trade secrets, or other proprietary methods of production or operation pertaining to products or services?" The second measure concerns process patents and is identical to the product patent questions except that it ascertains whether the firm benefited "to a significant degree from patents, trade secrets, or other proprietary methods of production or operation pertaining to processes." Product patents are more closely related to the character of the products actually sold, and thus would probably be more directly involved in product liability actions aimed at design defects. In contrast, process patents would affect how the product was made and would presumably affect workplace injury claims as well as product liability actions based on claims of manufacturing defects.
### TABLE 1 Product Liability Costs and Patents

**Mean (Standard Error of Mean)**

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Figures for 1980–84 represent actual premiums/sales levels. Figures for 1985–88 are projected levels based on actual sales amounts and patent levels, coupled with projected premium amounts. Patent data by individual firm are from the PIMS data base; sales data and data on the number of firms by 3-digit industry are from the U.S. Dept of Commerce; and data on liability premiums per policy are from ISO. The PIMS and ISO databases consist of proprietary, computerized survey data.
Data on patents pertain to actual firm experiences over the sample period. Sales data are drawn from the U.S. Department of Commerce. Insurance premium values used in the calculations represent actual amounts per policy from 1980–84, and projections from 1985–88. These projections were undertaken by inflating the 1984 insurance amount for each industry by the percentage increase in general liability premiums in the country. For all actual observations, Table 1 reports the mean value and the standard error of the mean. All of the figures are statistically significant at the 5 percent level (where the null hypothesis is that the value is zero).

Several aspects of the figures in Table 1 are of interest. For each patent type, fewer than one-fifth of the firms are substantial innovators, defined in terms of patents playing a significant role in the design of either products or processes. The average product liability costs relative to sales are a bit higher for the firms with significant product patents than for the firms for which product patents are not significant. This relationship is reversed in the case of process patents, but in each case the liability burdens are similar. Liability costs have a similar proportional impact on the innovators and on the less innovative firms.

The data for the 1980–84 period do not indicate any dramatic acceleration in the product liability burden except in the case of firms with process patents, for which the role of these costs more than doubled over that period. In contrast, firms for which product patents are significant had the least substantial increase in product liability costs, so that innovation per se does not seem to be driving the liability cost trends. There was a substantial rise in the product liability burden for firms without significant product or process patents. The results indicate a rising liability burden overall, and do not suggest that innovation has been the driving force leading to the insurance cost increase.

The impact of the product liability premium explosion from 1985–88 is also apparent. The estimated liability burden escalated dramatically in 1985 and 1986, reaching a peak in 1987. By this time the premium/sales index had more than doubled since 1980. In every case, there was roughly a tripling
of the rate of liability costs from 1984–86. In the case of both product and process patents, the liability burden in 1988 is somewhat less for the innovators, with the difference between firms with and without product patents being the most substantial.

The data on new product introductions in Table 2 provide a somewhat different perspective on the incidence of product liability costs. Although the PIMS data include a variety of measures of the frequency of product change, the results are most clear-cut for the well-defined frequency measures—firms with no regular product changes and new products as a percentage of product sales. The first measure considered in Table 2 relates to whether the firm refrained from making any product changes. Firms are placed in the “yes” category with respect to this measure if the firm and its competitors had no regular or periodic pattern of product change for the line of products or services offered. The firms responding “no” indicated that they and their competitors had an annual, seasonal, or periodic pattern of product change; they might be regarded as the more innovative firms in their industry. Based on this measure, the more innovative segment captures three-fourths of the market.

The product liability burden begins at a somewhat higher level for the innovative segment (the “no” response group), but it rises less steeply for them. The general pattern is similar to the trends in the patent case in Table 1 where the innovators had a higher initial burden, but a less steeply increasing burden. Since product patents and product changes should be related, the similarity in the patterns provides a consistency check.

A more detailed perspective on the relationship of the liability burden to new product introductions is provided by the data at the bottom of Table 2, which characterize firms based on the percentage of sales accounted for by products introduced during the previous three years. The data indicate that firms in markets where new product introductions play a negligible role initially had a lower product liability burden than firms in markets where there are more new product introductions. The product liability burden is lowest in industries
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<td>23.72</td>
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<td></td>
<td>(0.39)</td>
<td>(0.54)</td>
<td>(0.63)</td>
<td>(0.73)</td>
<td>(1.07)</td>
<td>(2.10)</td>
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<td>10–20</td>
<td>11.99</td>
<td>7.02</td>
<td>5.78</td>
<td>6.70</td>
<td>7.18</td>
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<td>13.00</td>
<td>22.56</td>
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<td>(0.96)</td>
<td>(1.57)</td>
<td>(1.62)</td>
<td>(2.30)</td>
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<td>20–70</td>
<td>9.42</td>
<td>6.92</td>
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<td></td>
<td>(1.42)</td>
<td>(2.31)</td>
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<td>(0.58)</td>
<td>(5.96)</td>
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</table>

Figures for 1980–1984 represent actual premiums/sales levels. Figures for 1985–1988 are projected levels based on actual sales amounts and patent levels, coupled with projected premium amounts. Patent data by individual firm are from the PIMS database; sales data and data on the number of firms by 3-digit industry are from the U.S. Dept. of Commerce; and data on liability premiums per policy are from ISO. The PIMS and ISO databases consist of proprietary, computerized survey data.
whose share of the firm’s sales devoted to new products is in the 0–10 percent range. Since over three-fourths of the firms are in the category of having a market consisting of 0–10 percent new product introductions, these results indicate that the product liability burden falls much more heavily on the more innovative firms and industries.

The projected patterns in Table 2 reflect the impact of the liability crisis on all market segments. Although there was an escalation in the liability burden from 1985–88 for the noninnovative firms with 0–10 percent new products, the estimates in Table 2 indicate that in 1988 the liability cost ratio remained higher for the more innovative segment of the market with 10–20 percent new products. The results for firms with 20–70 percent new products are more uneven since the expansion in sales in the early 1980s reduced the liability/sales index.

The overall implication of Tables 1 and 2 is mixed. The average level of the liability burden is greater for the more innovative firms in three of the four instances, but by 1984 two measures showed a higher burden on innovation, and two showed a lower burden. At best, there is weak evidence of a positive product liability–innovation relationship.

A fundamental policy issue raised by these results is the direction of the causality in the product liability–innovation linkage. Two scenarios are possible. First, product liability could foster innovation. High liability costs for a product class will boost firms’ incentives to introduce safety improvements and other modifications designed to reduce its product liability costs. Alternatively, innovative products could be the causal factor in raising a firm’s product liability burden. Thus, even if we believe that there is a positive correlation between product liability and innovation, we do not know whether liability has led to safety-enhancing innovations or whether risky innovations have driven up the liability costs.

Sorting out these effects requires more formal statistical analysis than the crosstabulations presented here. Our econometric analyses reported elsewhere attempt to address the causality issue, leading to the finding that product liability has a positive net effect on innovation.15 In particular, product
liability cost correlates positively with a variety of measures of innovation, controlling for other economic factors. This effect is not uniform and may reverse once the liability costs become too great. At low product liability cost levels, increases in liability costs foster innovation. Extremely high liability costs depress innovation once the disincentive effect on new product introductions becomes dominant. For industries with extremely large liability costs, such as the manufacture of nuts, bolts, and pins, the net effect of product liability is to depress innovation, whereas for the great majority of firms with lower liability costs, it has a positive effect.

In thinking about the relationship between product liability and innovation, an important distinction should be kept in mind. To say that liability has a positive effect on innovation does not imply that this effect is necessarily beneficial. The fact that liability may have caused the introduction of new product changes or safety designs does not mean that those innovations necessarily have social benefits in excess of their costs.

Firms will only invest in product safety to the extent that the costs do not exceed the liability cost reduction and other benefits, such as the greater marketability of the product. This outcome will be socially efficient if one assumes that liability rules are efficient. If there were general acceptance of tort liability efficiency, however, there would be no liability reform debate.

The statistical evidence indicates that the relationships are much more complex than is generally believed. By most measures we have examined, innovators bear a larger share of the product liability burden. On the other hand, there is no evidence that their share is escalating dramatically. Moreover, product liability has increased incentives for introducing product design changes that outweigh liability's depressing effect on the introduction of products with new attributes other than those relating to safety. Although perceived inadequacies in the structure of liability may indicate a need for liability reform, our assessment of the product liability–innovation linkage indicates that product liability also serves a constructive role.
Section IV: Policy Proposals

The existing product liability system imposes substantial costs affecting innovation. For reasons explained above, the legal definition of manufacturing defects is not central to the product liability–innovation relationship, but the definition of design defect is. The current design defect definition assumes a degree of risk-spreading ability on the part of producers that is simply not feasible, and the design defect doctrine is not well specified.

To alleviate these problems, we propose that the current risk-utility test be revised for design defects. The possible risk-spreading role of producers should not be considered by the courts; insurance is not generally feasible for design defects, which by their very nature extend across a product line and impose substantial costs. Moreover, if the level of safety chosen is efficient, firms should not be placed in the role of insurer simply because they have a “deep pocket.” If insurance were our objective irrespective of the efficiency of the level of safety, the ultimate result will be an enormously expensive product related accident insurance scheme. Automakers would, for example, reimburse car accident victims irrespective of causality.

The liability test should be simply whether the firm has provided an efficient degree of product safety. In effect, we advocate a more tightly specified version of the risk-utility test for design defects. In place of the current strict liability standard, we would substitute an elaborate negligence test defined in economic terms.

Another deficiency of present liability doctrine is that there is considerable potential overlap with the role of regulatory agencies, which have been delegated primary responsibility for societal product design decisions. At the present time, the extent of the overlap between regulatory agencies and the courts may not be substantial. In 1977, for example, only 19 percent of all product liability claims involving consumer products involved instances in which a regulatory violation was alleged, and in 28 percent of the product liability claims
arising from injuries incurred on the job there were allegations of regulatory violations. In addition, regulations may have been pertinent in a number of other instances, but a violation may not necessarily have been related to the accident. Moreover, one would expect, because of the increased role of government regulations beginning in the 1970s and continuing thereafter, that the interaction between regulation and product liability has increased since these statistics were gathered. In all likelihood the interaction with regulatory policies will continue to increase in the future.

A mechanism is needed to allocate responsibility for risk control between courts and agencies. We propose (as others have done)\textsuperscript{18} that if firms can demonstrate compliance with regulations that specifically relate to the design issue involved in the case, this compliance should exculpate them from tort liability. General compliance with regulations should not be a sufficient defense since there may be no pertinent government regulations, or this regulation may be quite broad in scope. However, compliance with technology based or other specific standards should be deemed evidence that the firm has provided an appropriate level of safety. A government regulation agency is better suited to making a society-wide judgment regarding whether a product design is satisfactory, and the courts should take advantage of its expertise whenever possible.

These proposals would modify the liability regime, rather than return to the earlier negligence era or scale down the product liability burden in more sweeping ways. Incremental reforms would coordinate product liability with other social institutions in providing incentives for safety.

Although our data indicate that product liability places relatively high burdens on the more innovative firms, these costs are not a dominant component of firms' product costs. No economic catastrophe is imminent, but the costs of product liability may have a marginal influence on a variety of product decisions. The product liability system needs to strike a more appropriate balance between the competing objectives of risk reduction and technological advance.
Notes

1 The leading commentator on the product liability-innovation linkage has been Huber (1988).
3 The role of increased societal affluence and the demand for greater safety is a principal theme of chapter 2 of Viscusi (1983). More recently, Wildavsky (1988) has articulated this relationship in substantial detail.
4 A comprehensive discussion of pharmaceutical regulation, focusing particularly on the trade-offs between risk regulation and innovation, is provided by Grabowski and Vernon (1983).
5 The general procedure used to address value-of-life concerns is discussed by the U.S. Office of Management and Budget (1988). See especially their discussion on pages 34, 570–571.
6 This estimate is based on the labor market estimates of the value of life obtained by Moore and Viscusi (1990) using the new death risk data developed by the National Institute of Occupational Safety and Health for the National Traumatic Occupational Fatalities Project.
7 Wade (1973).
8 These data are based on information from the Insurance Information Institute (1989).
10 See the Conference Board (1988), p. 3.
12 The sample for any particular question varies. No more than 264 companies responded to any of the liability questions discussed below.
13 More specifically, the sales data are based on the 1982 value of shipments (in $ millions) defined at the three-digit level from the U.S. Department of Commerce, U.S. Bureau of the Census, *Census of Manufacturers*. The number of firms is also drawn from that publication and is defined on the same basis.
14 The general liability data were from the Insurance Information Institute (1989), p. 27.
15 See Viscusi and Moore (1989). This study consists of an econometric analysis of the determinants of a variety of measures of innovation, controlling for characteristics of the firm and the industry, including: market concentration, market share, industry growth, capacity utilization, and several other factors.
16 This formulation is a much abbreviated version of the proposal in Viscusi (1990).
17 The source of the subsequent statistics on the overlap between product liability and innovation is Viscusi (1988).
18 See, for example, Schuck (1987).