Liability Rules and Insurance Markets

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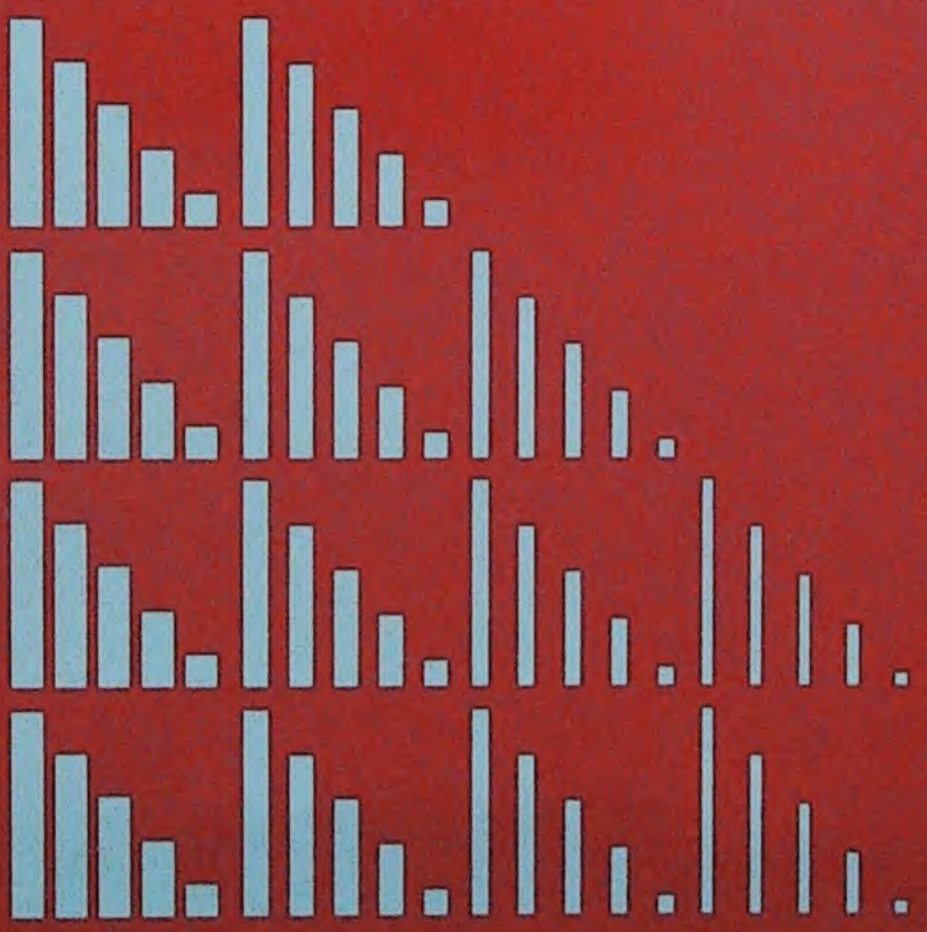

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LIABILITY RULES AND INSURANCE MARKETS

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The analysis and conclusions of this study do not necessarily reflect the views of the Department.

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FOREWORD

In most Canadian jurisdictions today, a manufacturer must be proven negligent before he will be held liable for injuries arising out of defects in his products. Many are advocating that this necessity of proving manufacturer negligence be removed and that a strict liability regime be adopted. Important questions arise though, namely, How might the imposition of strict manufacturer liability affect the ability of manufacturers to obtain liability insurance? and How would it affect the insurance rates they must pay?

Professors Halpern and Carr were invited to provide answers to these questions in the Canadian context.

While the study focusses naturally on the Canadian insurance market, the authors draw upon recent experience in the United States where a number of important states have already adopted strict product liability rules.

We believe that this study provides a useful contribution to the continuing debate.

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SUMMARY

The purpose of this study is to determine whether manufacturers of non-industrial products will be able to obtain product liability insurance if liability rules are changed from the status quo to strict liability. In addition, the study investigates whether the resulting increase in insurance premiums paid by manufacturers and ultimately passed on to consumers would be large, and its effect on the economy. Not only does this study examine product liability insurance as written currently in Canada, it also summarizes the U.S. experience and uses these findings to assess the potential impact of this change in liability rules in Canada.

Strict liability is defined here as follows: if it can be shown that a) the product caused the injury, and b) the product was defective, then the manufacturer is liable. Negligence of either party is of no concern to the court.

The study concludes that insurance markets will exist in Canada if strict liability is introduced. There will be an increase in the cost of insurance, but this should not be very large and certainly will not be inflationary. Finally, a number of the proposed remedies to alleviate the insurance "crisis" in the United States are not necessary in the Canadian context, due to differences in the size of court awards and the disincentive effect to pursue frivolous cases through the awarding of costs.

In Chapter I, a simple model of insurance is derived and the basic inputs required to set insurance rates are identified. The two major inputs necessary to determine the expected loss in the event of a claim are the size of the settlement and the probability of a successful claim (which depends on the probability of an accident). It is assumed the movement to a strict liability standard will have no effect on the size of the settlement. However, the liability standard in use will influence the component probabilities. As the standard moves from caveat emptor to strict liability, the first probability will increase since the burden of proof on the part of the claimant is reduced. In addition, since consumers' losses will be covered in the event of an accident, they may not use the product with as much care. Thus the second probability will increase. Strict liability should therefore result in an increase of insurance rates.

In Chapter II, the actual mechanics of setting insurance rates are investigated. This exercise requires

substantial data, which is not available in sufficient depth at present, and faces problems such as:

(A) Long tail

(i) The liability insurance for a given year covers accidents during the year. However, when products are durable an accident may occur on a product produced in previous years. The number of products produced in previous years and hence the risk exposure of the insurance is uncertain.

(ii) Even though an accident occurs during the policy year, it is not reported until after the conclusion of the policy year. This causes two problems for the insurance company. First, some financial reserve must be set aside for these claims even though the amount is uncertain. Second, the actual loss experience for the company is distorted if these claims are not included.

(B) Long tale

Litigation can be drawn out and extend beyond the conclusion of the policy year. This requires an estimate of the potential claim and, if the estimate is too low, there is a cash flow problem.

(C) Limitations due to size of markets

Since the market is small, products cannot be categorized into equivalent risk classes. Thus, loss data is not sufficiently accurate to set insurance rates.

(D) Jurisdiction in which products are sold

The Canadian company sells products in different provinces and countries, and the liability standards that exist in these countries where the accident occurred are the operable rules.

Despite these problems, insurance markets do exist for product liability. In addition, there is one piece of evidence which supports this paper's contention that insurance will be written in Canada. There is a different insurance rate for Canadian-manufactured products sold in

Canada and for the same products exported to the United States. The latter rate, which reflects the size of settlements and the liability standard in the United States, is greater than the rate in Canada. However, it is unlikely that the insurance rate in Canada under a strict liability standard will approach the rate charged on U.S. sales since the size of awards is expected to be much lower.

Chapter III defines five possible product liability rules:

1. Caveat Emptor
2. Negligence Standard
3. Strict Liability with Contributory Negligence
4. Strict Liability
5. Absolute Liability (Caveat Venditor)

The economic implications of each are investigated. It is shown that, in a world with perfect information, all liability rules are efficient and all of these rules would yield the identical economic results. However, in the real world, in which information is imperfect and costly, no liability rule yields the socially optimal solution. How far the actual solution, for any liability rule, deviates from the optimal solution depends on the magnitude of the information requirements under that particular rule.

Chapter IV contains a review of the American experience from which the following points emerge:

1. By 1971 and 1972 a number of important states had adopted strict product liability theories.

2. In the period from 1971 to 1976 there has been an increase in the number of product liability cases.

3. In this same period there has been an increase in damages awarded in product liability cases.

4. The cost of product liability insurance has substantially increased since 1971.

5. Most manufacturing firms have some form of product liability insurance.

6. Unavailability of product liability insurance does not appear to be a problem.

7. Product liability insurance per $1,000 of sales is more expensive for small firms than for large firms. The evidence is inconclusive that small firms have had greater increases in premiums than large firms.

8. Product liability problems do not appear to have been a direct and sole cause of business failures.

9. About one-half of all product liability cases are work-related.

10. There are no trends in the number or severity of accidents.

In Chapter V, the impact in Canada of moving from the current negligence standard to a strict liability standard is investigated. Three major questions are posed with respect to the adoption of a strict liability standard:

1. Will product liability insurance be written under a strict liability standard? -- The answer to this question is an unequivocal yes.

2. At what cost will product liability insurance be written under a strict liability standard? -- From the review of the U.S. experience, it is concluded that if Canadian jurisdictions adopted a strict product liability standard there would be an increase in both the number of product liability claims and product liability insurance premiums. However, the increase in premiums in Canada would be nowhere near the increase that occurred in the United States when strict product liability rules became prevalent.

3. How will small business be affected by a move to strict product liability? -- There do not appear to be long-run serious problems for small business resulting from the adoption of strict product liability rules. If there is a problem, it would occur for small businesses producing high-risk products.

The last chapter considers solutions proposed in the United States to the problems of the availability of product liability insurance to small business and the rising cost of this insurance. These solutions include direct federal

insurance or reinsurance, tax incentives to firms to build up reserves for contingent liabilities arising out of product liability suits, and pooling arrangements. All of the solutions impose costs on the economy and should be introduced only if the movement to strict liability in Canada precipitated a long-run market failure. Even in the United States, many of the proposals were rejected because it was felt that the "crisis" was of a short-run nature and it would be a mistake to establish a new bureaucracy which would be difficult to dismantle when the "crisis" disappeared. It is contended in this study that insurance markets will operate in Canada under a strict liability standard and that any problems encountered will be of short duration. Therefore, none of the solutions proposed in the United States are advocated here.

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CHAPTER I

A MODEL OF THE INSURANCE MARKET

The insurance industry provides a service that is important to individuals and crucial to the provision of many products. If a firm or individual faces a risk that, due to his wealth level, he is unable to bear, the insurance industry, because of its size and superior ability to diversify, is able to accept these risks, and for the payment of a premium, it promises to pay off any claims.

Insurance is a unique product in that the insurance company accepts a premium today from the individual or company and promises to pay any claims resulting from events that may occur in the future. This exposes the insurance company to the risk of unanticipated changes in the environment which may occur during the policy period and which may impact on the ultimate settlement of a claim.

This chapter describes the basic concepts of insurance and some of the problems faced by insurance companies. The discussion is based on a hypothetical insurance company writing product liability insurance in a simplified world. The analysis should not be interpreted as an exact description of rate making in an actual company. However, the concepts introduced are the basis for insurance risk reduction and rate making. In addition, the model highlights potential responses by insurance companies to a change in the legal liability rule.

The Model

Consider an insurance company that writes product liability insurance and assume that:

(i) each product can be classified correctly into a risk class.

(ii) the product liability insurance is applicable only to products manufactured during the policy year.[1]

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1. In the real world, product liability insurance covers all claims occurring in the policy year regardless of when the particular product was manufactured. This is discussed in Chapter II.

(iii) the insurance policy is written at the beginning of the year and the products are sold at the beginning of the year.

(iv) all claims occur during the policy period and are litigated and settled immediately so that the claim is paid during the policy year. (This removes the need to establish reserves for future claims.)

(v) the insurance company is able to forecast inflation exactly over the policy period. (An equivalent assumption is that there is no inflation during the policy year.)

(vi) the basic unit of risk exposure for the insurance company is the individual product unit within a particular product class. For example, the basic unit of risk exposure for product liability insurance sold to an automobile manufacturer could be the individual car. With a separate insurance policy written for each car, the insurer will be exposed to greater risk the more cars are sold.

(vii) for any individual product in risk class k there is a probability, P_k, of a successful claim over the policy period and a settlement per product of $\$S_k$.[2] This model assumes that a settlement either is made or does not take place so that the probability of not having a claim (i.e., a claim equal to zero) is $1-p_k$ which is equal to q_k.[3] Based on this assumption, the probability distribution of settlements is a binominal distribution with a mean or average value, E(S), of pS and a variance, v(S), of pqS^2, or standard deviation s.d.(S), of $S\sqrt{pq}$. Since the probability of a successful claim is likely to be very small, the resulting distribution is skewed to the right. For example, let p = .005, S = \$1000 and q = 1-p = .995. The expected claim is pS = \$5 and the standard deviation is \$70.5. However, the

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2. The insurance industry deals with claims costs per \$1000 of sales and thus has a different measure of exposure. However, given a product price, the unit of exposure could always be changed to be consistent with industry practice.

3. The remainder of this discussion deals with only one risk class and the subscript k is dropped.

insurance company faces a situation where the actual settlement cost is either $0 or $1000.

(viii) the products of risk class k are equivalent; each manufacturer of the product produces the product with the identical technology. This guarantees that the probability of a successful settlement (p) is identical whether or not the manufacturer purchases product liability insurance.[4]

The insurance company issues policies to firms producing large numbers of the same product and also issues policies across a number of different companies. Let n be the number of products insured in any individual risk class.[5] For any insurance company having n units of exposure, the total settlement cost, T, will be the sum of the individual product settlement costs over all the products insured. As the number of products insured increases, the mean and standard deviation of the binominal probability distribution of settlement costs will change.[6] The expected settlement cost is equal to the sum of the expected settlement costs on each product, that is, $E(T) = npS = nE(S)$, where n is the number of products insured and E(S) is the expected settlement cost per exposure unit (i.e., per product sold). The variance of the total settlement cost, v(T), is equal to the sum of the variances on the individual product settlement cost, v(S). That is:

$$v(T) = npqS^2 = nv(S).$$

The standard deviation of this total distribution is:

$$s.d.(T) = \sqrt{n}\sqrt{pq}.S = \sqrt{n}\ s.d.(S).$$

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4. This assumption avoids the problem that the manufacturer may alter the technology after the purchase of insurance so as to increase the probability of a defect. This is known as the moral hazard problem and is considered later in this chapter.

5. For the purpose of this paper, it does not matter whether n consists of identical products or n different products as long as all products are in the same risk class.

6. As n gets very large, the binominal distribution will approach the normal distribution.

Therefore the total settlement cost probability distribution has an expected value (mean) of nE(S) and a standard deviation of $\sqrt{n}$ s.d.(S).

There are two interesting implications of increasing the number of products insured. First, the probability distribution for the total settlement cost approaches a normal distribution as n becomes large, even though the probability distribution for settlement costs on an individual product is skewed. This is the essence of what is called in statistics the central limit theorem. Second, the resulting probability distribution becomes less risky. It is obvious that as n increases, both the expected value and standard deviation of the distribution become larger. However, the former increases directly with n whereas the latter increases with the square root of n. Thus, the probability distribution is shifting to the right as n increases. To compare the variability of this distribution to the distribution on the individual product, an adjustment must be made for the different mean values. To do this a measure of relative dispersion is required. This measure is called the coefficient of variation and it measures the standard deviation of the distribution relative to the mean. For the individual product settlement cost distribution the coefficient of variation is:

$$C(S) = \frac{\text{s.d.}(S)}{E(S)} = \frac{S\sqrt{pq}}{pS} = \frac{\sqrt{q}}{\sqrt{p}}$$

For the distribution of settlements for an insurance company insuring n products:

$$C(T) = \frac{\text{s.d.}(T)}{E(T)} = \frac{\sqrt{n}\,\text{s.d.}(S)}{n\,E(S)} = \frac{1}{\sqrt{n}}\,C(S).$$

If n = 1 then C(T) = C(S). However, as n becomes larger C(T) becomes smaller than C(S) -- the total settlement cost distribution has less relative variability than the distribution for an individual product.[7]

There is another way of illustrating the above result -- a result that is the essence of insurance. The insurance company is interested in the settlement cost per unit of

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7. It can easily be seen that, as n becomes larger, C(T) becomes smaller. As n approaches infinity, C(T) approaches 0.

exposure (i.e., per unit of product) since the company is assumed to set a premium to cover the settlement cost on each product or exposure unit. Once the coverage is provided, a number of product settlement costs occur. The actual value of settlement costs is T which equals the sum of the settlement costs on individual products. The settlement cost per product is calculated as $T/_n$. This is a random variable that has a probability distribution and the expected value of this distribution can be expressed as:

$$E\left(\frac{T}{n}\right) = \frac{1}{n}E(T) = pS.$$

The variance of this distribution can be expressed as:

$$v\left(\frac{T}{n}\right) = \frac{1}{n^2}v(T) = \frac{1}{n^2}npqS^2 = \frac{pqS^2}{n}.$$

The standard deviation is:

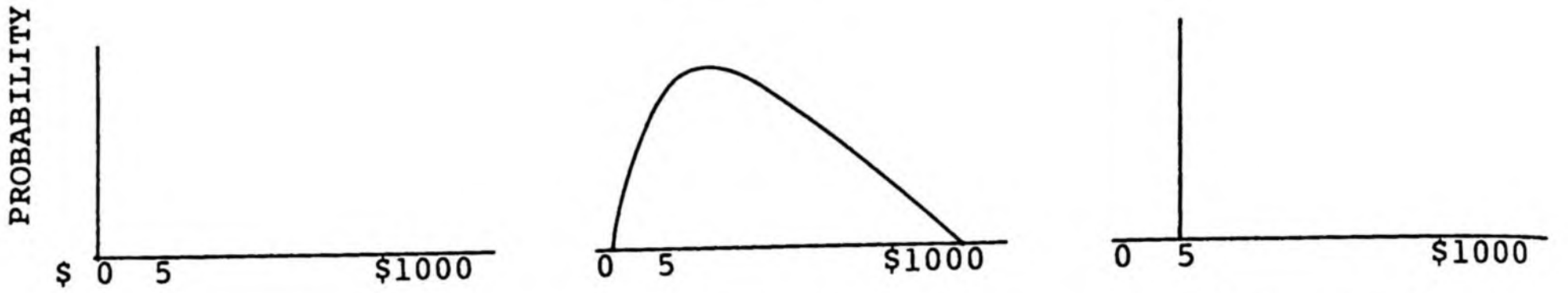
$$s.d.\left(\frac{T}{n}\right) = \frac{\sqrt{pq}\,S}{\sqrt{n}}.$$

Suppose n = 1. The mean is pS and the variance is pqS^2. This is equivalent to the original distribution. From the numerical example pS = \$5 and $v(T/n) = \$4975^2$. This is shown in Figure 1, panel (a). Suppose the insurance company insures 100 products (i.e., n = 100). The expected settlement cost per exposure unit is still pS = \$5. But the variance is:

$$\frac{pqS^2}{n} = \frac{4975}{100} = 49.75.$$

This is shown in panel (b). Finally, let n = 1000. The expected value is still \$5 but the variance is now 4.975. In fact, as n becomes very large the probability distribution degenerates into a single value of \$5 -- see panel (c).

Figure 1



a) n = 1 b) n = 100 c) n very large

Thus, as n increases, the risk to the insurance company decreases. For larger values of n, the probability of getting settlements different from the average settlement per claim of $5 becomes smaller. If the company does not have a large number of products, it is faced with risk since the actual settlement cost per product may differ from the expected value of $5. The smaller the number of products, the greater is this risk.

The removal of risk occurs because the products are independent random variables and acceptance of a large number of products permits the insurance company to diversify the risk. The theoretical basis for this result is referred to in the statistical literature as "the law of large numbers."

Components of the Probability of a Successful Claim

The analysis has assumed as a given parameter the probability of a successful claim, p. This probability is composed of two events: the probability of an accident occurring with the product, and the probability of a settlement. Consider two events S and A. The probability of S and A occurring, P(S, A), can be written as follows: $P(S, A) = P(S/A).P(A)$ where P(S/A) is the conditional probability of S given that A occurred. Let S be a successful claim and A be the existence of an accident; then the probability of the two events occurring, p, is equal to the probability of a

successful claim.[8] If either of these component probabilities changes, the value of p will change and this will alter both the mean and the variance of the underlying product probability distribution for a successful claim.

It will be demonstrated that this is an important ingredient in analyzing the impact of a change in liability rules. For example, assume that under a negligence rule there is a given probability of an accident, and the probability of a successful claim given an accident is not equal to unity -- the individual involved in the accident may have used the product improperly. Suppose there is a liability rule under which the existence of an accident is itself sufficient to generate a successful claim. This has been referred to as absolute liability. Assume that this rule does not alter the probability of an accident.[9] However, the conditional probability of a successful claim, given that an accident occurred, will approach unity, and the resulting probability of a successful claim, p, will increase. Under strict liability, the conditional probability may move toward unity and the resulting probability of a successful claim will become larger than it was under a negligence standard.

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8. There is an element of p which is omitted from this analysis. An accident can result from either a defect in the product or from negligence on the part of the injured individual. Therefore the measure of p should be written as:
$p = P(S, A) = p(S, D) + p(S, \overline{D})$
where:
S is a successful claim
A is the existence of an accident
D is the existence of a defect
$\overline{D}$ is the absence of a defect.

$\overline{D}$ reflects the negligent use of a product by the injured party. The form of the liability rule will have an impact on the second probability -- $p(S, D)$. In a negligence standard this probability is close to zero and is ignored. However, to determine that there was negligence requires the expenditure of resources by the insurance company. Under different liability standards, this probability would be non-zero.

9. If the probability of an accident increased as we moved towards absolute liability, this would be an example of the moral hazard problem discussed in the next section.

It should be noted that whenever p increases, the average settlement per exposure unit will increase and consequently one would expect the insurance premium to increase.

Of course, insurance companies faced with these new liability rules may reduce the probability of an accident by monitoring the production process of the firm. This is an expensive activity, however, and the cost must be captured in the premium charged.

Moral Hazard

In the previous discussion, the probability (p) of an accident followed by a successful claim was written as the product of the probability of a successful claim given there was an accident and the probability of an accident. It was assumed that the existence of insurance would not affect the probability of an accident. However, this may not be the case since the probability of an accident depends on the existence of a defect (or negligence by the manufacturer). The existence of product liability insurance may influence the behaviour of the manufacturer so as to increase the probability of a defect.

The insurance contract is written so that, contingent on a legitimate claim being made, there is a payoff to the injured party. The payoff, however, is not related to the behaviour of the manufacturer. When the policy is written, the insurance company anticipates that the manufacturer will not alter the probability of a defect. However, in an attempt to increase profits, the manufacturer may alter the production process after the insurance is written to increase the probability of a defect. This is the essence of the moral hazard problem since there is no incentive for the manufacturer to reduce the probability that the insured event occurs.

The insurance company can minimize this likelihood by monitoring the production process to ensure that quality standards are not changed. This activity will result in higher costs and hence higher premiums.

The importance of the moral hazard issue is not crucial if it is recognized that firms are interested in their long-run profitability. If the manufacturer increases the probability of a defect two events can occur. First, insurance premiums will increase, reducing the firm's

profits, or the firm may have trouble obtaining insurance. Second, any goodwill that the firm has generated in the past will be dissipated. Only if the manufacturer is interested in short-run gains will the moral hazard issue be important.

Another aspect of the moral hazard problem is unrelated to product liability insurance. The probability of an accident depends not only on the behaviour of the product manufacturer but also on the behaviour of the product user. The more negligent the user, the greater the probability of an accident. The amount of care the user exercises in his handling of a product may not be invariant to the liability rules in force. For example, with a caveat emptor standard there may be one standard of care that users exercise in dealing with a specific problem. With an absolute liability standard, product users may exercise a lower standard of care. With an absolute liability standard in place, users are fully compensated for losses regardless of how reckless they happen to be. The importance of the moral hazard problem is difficult to evaluate.

Setting a Premium

The insurance company in this idealized world must set a premium, $A, on each exposure unit. This premium must capture the expected settlement cost plus the costs of evaluating and settling claims, commissions, administrative costs and a profit element. These are represented by $C. The total premium will be set as follows:

$A = expected settlement cost + $C

= pS + $C.

In the insurance literature, the expected settlement cost is called the "pure premium." In the numerical example, the pure premium is $5. If it is assumed that other costs amount to $4 per product, the total premium is $9 per product. Note that the profit element should reflect the risk-free rate of interest since there is no risk to the insurance company in this model. The insurance company has chosen a large enough number of exposures to diversify risk.[10]

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10. The problem of investment income earned on funds set aside is ignored here.

Industry practice in setting premiums is equivalent to this technique. Firms determine the proportion of each premium dollar needed to cover administrative costs and profits. For product liability insurance this is .45, or 45 per cent. The remaining 55 per cent covers the expected settlement costs. This is called the loss ratio and is the target value. To obtain the total premium, the pure premium is divided by the loss ratio.

$$\$A = \frac{\text{pure premium}}{\text{loss ratio}} = \frac{pS}{.55} = \$\,\frac{5}{.55} = \$9.09.$$

Of course, the actual loss ratio will deviate from the expected loss ratio if the insurance company has not fully diversified.

Extension of the Model

Up to this point, it has been assumed that the company has written insurance in only one risk class and has been able to obtain enough exposure units to eliminate risk. However, this is unlikely to be the case since there are probably not enough homogeneous products within a risk class to provide full diversification. Thus, the firm is faced with risk if it writes insurance in one risk class. However, further risk reduction can be obtained if the insurance company underwrites risks in a number of risk classes.

Assume that there are m risk classes and that for each risk class there is a probability distribution for settlement costs per product, i.e.,

$$\frac{T_k}{n_k} = G_k$$

where k refers to a particular risk class.

This probability distribution has a mean, $E(G_k)$, and a variance, $v(G_k)$, since it is assumed that n_k is not large enough to remove risk. Let λ_k be the proportion of total premium dollars earned in risk class k.

The insurance firm builds a portfolio of risks by writing policies in a number of risk classes. The outcome on the portfolio is written as P. This portfolio has a probability distribution. The expected value of the portfolio is written as a weighted average of the expected values for each risk class.

$$E(P) = \sum_{k=1}^{m} \lambda_k \, E(G_k).$$

The variance of the portfolio is written as:

$$v(P) = \sum_{k=1}^{m} \lambda^2_k \, v(G_k) + \sum_{k=1}^{m} \sum_{\substack{j=1 \\ k \neq j}}^{m} \lambda_k \, \lambda_j \, \mathrm{cov}(G_k, G_j).$$

The first term is a weighted sum of the variances from each risk class. The second term reflects the interrelationship of the settlement costs per risk class over all risk classes and is called the covariance. The term $\mathrm{cov}(G_k, G_j)$ reflects the co-movement of the random variables G_k and G_j. If it is assumed that the outcomes in each risk class are independent, then $\mathrm{cov}(G_k, G_j) = 0$ and

$$v(P) = \sum_{k=1}^{m} \lambda^2_k \cdot v(G_k).$$

Assume that the insurance company writes insurance in equal proportions in each risk class so that $\lambda_k = 1/m$. If the independence of outcomes is assumed, the variance term can be written as:

$$v(P) = \frac{1}{m^2} \sum_{k=1}^{m} v(G_k).$$

Finally, let there be a maximum variance for all risk classes equal to v(G). Therefore the variance relationship on the portfolio can be rewritten as:

$$v(P) \leq \frac{1}{m^2} \cdot mv(G)$$

$$\leq \frac{v(G)}{m}.$$

As the number of risk classes increases, the variance of the portfolio will decrease. With m sufficiently large, the variance term will disappear and the insurance company will have a fully diversified portfolio. Note that the essence of diversification in this example is that a smaller proportion of premiums are written in each risk class as the number of risk classes increases.

Further risk reduction can be obtained by accepting risks in other lines of insurance. If the assumption that the settlement costs in the different lines are independent is continued, the augmented portfolio risk can be reduced. The analysis required to demonstrate this result is equivalent to that presented for different risk classes; instead of k referring to risk classes, it refers to lines of insurance.

The concept of spreading risks over many risk classes and many lines is assisted by the existence of reinsurance markets. The concept of reinsurance is discussed in some depth in Chapter II. It is sufficient in this chapter to realize that reinsurance is insurance for insurance companies. Suppose a particular insurance company writes a large number of automobile policies and this results in a poorly diversified portfolio of risk exposures. The insurance company can obtain reinsurance for the excess number of auto risks; the reinsurance company will take the auto risks and pay the insurance company the administrative costs incurred in writing the policies.

Conversely, if an individual insurance company has too few fire risks in its portfolio it can obtain additional exposures from the reinsurance industry or even from other insurance companies which have too high an exposure in the fire line.

Relaxing Some of the Assumptions

Size of settlement cost It has been assumed so far that the size of the settlement cost per product of a given risk class is given and known to all insurance companies. Suppose that the assumption that there is a unique settlement cost, S, per product for a given risk class is retained. Movement to a strict liability rule increases the settlement cost per exposure unit to S*. This increases the size of the pure premium and thus increases the cost of insurance. Note that this reaction to a change in the liability rule is purely hypothetical. The experience in the United States is used to describe the actual change in settlement costs that accompanied a change in the liability rule.

Now assume that the change to a new liability rule shifts the settlement costs per product but that the insurance company does not know the direction or magnitude of the shift. However, in the following year this information becomes available. In this instance uncertainty exists for

only one period. Insurance companies likely will not alter rates during this period and will accept any losses or gains during the transition period. If this shift in settlement costs is uncorrelated with settlement costs in other lines, some of the one-period risk can be diversified.

In the real world, however, actual settlement costs are on a continuum from zero to the maximum limits set on the policy. This introduces further uncertainty into the planning process and hence into premium setting. To the extent that the firm undertakes search costs to obtain a clearer picture of the probability distribution of actual settlements, expenses increase and, keeping the same target loss ratio, there must be an increase in the total premium. If this settlement cost risk cannot be diversified, the profit component in the expense ratio will increase and this will also increase the premiums charged.

Therefore uncertainty as to expected settlement costs will ultimately offset rates. If changes in the liability rule shift the distribution or increase the uncertainty, increased premiums must result.

Non-independence of events A crucial assumption in the analysis is that settlement costs between lines of insurance, or even between risk classes in a given line of insurance, are independent (i.e., each outcome is a random drawing from the underlying and stable probability distribution). However, this assumption may not be correct. For example, the settlement cost per product must be forecast at the beginning of the period so that premiums can be set. With no inflation, or with a given level of inflation, this is not a problem. However, if inflation is uncertain the actual settlement cost may be higher or lower than expected for all lines, due only to an unanticipated change in inflation. This is equivalent to an unexpected shift in the underlying probability distributions. Since this shift affects all products, there is dependence in the outcome and the variance of an insurance portfolio is not zero. There will still be benefits from diversification as long as there is not perfect correlation but they will be much smaller (Fama, 1976, chapters 2 and 7). This type of dependence could also arise if court awards increased unexpectedly for all lines or for all risk classes within a given line.

Dependence is not always detrimental to diversification in a portfolio. For example, suppose that the settlement cost experience in a particular line of insurance is negatively related to the experience in another

line (i.e., when the settlement cost per unit in one line is greater than the expected value, the experience in another line is less than its expected value). In this case, the negative dependence operates to reduce the risk of a portfolio of insurance composed of these two lines. In the statistical derivation in this paper, negative dependence results in a negative covariance term which reduces the variance of the portfolio below what it would have been if the covariance was zero.

A second source of dependence can occur within a risk classification. For example, for a given risk classification independence requires that the probability of a successful claim is unaffected by the existence of a previously successful claim on another product in the risk class. Consider two events A and B. Both are independent if the probability of A occurring given B has occurred is equal to the probability of A occurring (i.e., P(A/B) = P(A)) -- an example is the probability of obtaining a head given a head has just occurred is equal to the probability of obtaining a head.

In the simplified model here, it was assumed that P (successful claim/successful claim has occurred) = P (successful claim). However, due to production techniques or perhaps even to the behaviour of the courts, the probability of a successful claim on a given product, given that a successful claim has occurred, may be greater than the simple probability of a successful claim.

In this case, the law of large numbers does not operate and the property that the probability distribution for settlement cost per product collapses to a unique point does not hold. This will expose the insurance company to greater risk and thus result in a higher premium.

Summary

A model of insurance has been constructed which highlights the inputs required to set premiums. The model is based on a number of simplifying assumptions and it was shown that when some of these assumptions are relaxed, insurance premiums change. The remaining assumptions will be removed in the next chapter.

In addition, this model provides some useful insights into the mechanism by which a change in the liability rule may have an impact on the premiums charged for product liability insurance.

CHAPTER II

PRODUCT LIABILITY INSURANCE IN CANADA

This chapter discusses the institutional setting in which product liability insurance is written, and industry practice in setting rates and in dealing with a number of the unique problems encountered in writing product liability insurance.

The obvious beginning for any discussion of institutional material should be a description of the size of the product liability market within the Canadian insurance industry. Unfortunately, statistics are not prepared which isolate this size variable. This is but a symptom of a much more important problem -- the fact that the data available on product liability insurance are not very comprehensive. Statistics are presented for liability insurance excluding automobile insurance. Liability insurance provides protection for the insured for loss arising from injuries to other persons or from damage to their property. This category includes not only product liability but also the employer's legal liability for injury or death of employees while they are at work. In 1974, liability insurance was 6 per cent of the total direct premiums written by the general insurance industry. In 1977, liability insurance accounted for 6.9 per cent of the direct premiums written (Insurance Bureau of Canada, 1979).

Product liability insurance is written for one year, the policy year, and is sold in a package that provides protection to the insured for claims arising from both bodily injury (B.I.) and property damage (P.D.). The total premium paid on the policy is the sum of the premiums that would be paid on B.I. and P.D. protections if they were sold separately. When an insured purchases a product liability policy, he is purchasing both financial protection if a judgement against the insured is rendered and financial protection to cover defence costs if the insured is sued. In the United States it has been estimated that 80 per cent of the money paid out by insurance companies on product liability claims finds its way into the hands of the legal profession, and in costs (Despard, 1978-79, p. 24).

When considering the premium to be charged the insurance company investigates the operations of a potential client and any previous claims experience, and attempts to classify the company into one of the product-risk classes

found in the rating manual. If the insured fits one of the classifications, then the insurance company has a rate that can be charged for both B.I. and P.D. The premium is stated as so many dollars per $1000 of sales; thus the exposure unit used is $1000 of sales. In some situations -- for example, gasoline and fuel oil dealers -- the exposure unit is measured by output (e.g., say per 10,000 gallons).

Unfortunately, even though the product may fit one of the product classes in the rating manual, the products included in this classification are not homogeneous. For example, consider the product classification of sporting goods. Suppose there are two companies with the same value of sales; one company manufacturing skis, bindings, etc., while the other company makes footballs, basketballs and tennis rackets. It is obvious that the former company presents a larger risk exposure per $1000 of sales than the latter. In these cases, the underwriter assesses the risk of the company based on the products manufactured and sets the premium accordingly. The final premium charged could be higher than the rating manual rate for the former company and lower for the latter company. This use of judgement in setting rates is widespread. In fact, with competitive pressures the underwriters may be required to charge premiums below those set in the rating manual.

An obvious question is, Why not define the risk classes more narrowly so that all products within a given risk class will have the same risk characteristics? Although this can be done, there would not be enough products in any risk class to provide reliable information on the probability of a successful claim and on the settlements obtained. In fact, the insurance companies are willing to group together products that have some similar risk characteristics so as to obtain more historical settlement cost experience.

The rating manual provides rates per $1000 of sales for the basic coverage of $100,000 per occurrence. Due to the small amount of historical experience for many provinces, all provincial data in a product class are grouped together, and there is no provincial differential in the manual rates. In some instances insured companies will self-insure on small claims by having a deductible feature per claim, but they may pay the insurance company a fee to handle the claims settlement. Obviously, if the deductible is increased while the premium is held constant the result will be, in effect, an increase in premiums.

Due to the uniqueness of many products, there is not sufficient historical experience on which to build manual

rates. In these cases premiums are set primarily by the judgement of the underwriter. These risks are called A-rated risks. In the United States it has been estimated that approximately 80 per cent of premiums written on product liability insurance are A-rated. In Canada this percentage is much smaller -- approximately 25 per cent of the bodily injury premiums in product liability insurance are A-rated. This difference occurs for two reasons. First, in the United States if the underwriter decides to use a premium that is different than that stated in the rating manual, the policy is considered to be A-rated. Second, in the United States the product-risk classes are narrowly defined, whereas in Canada they are not. Therefore in Canada more products would be included in the manual classification and would have a rate assigned.

Some insurers distinguish between compensatory damages and punitive damages in B.I. claims, and do not cover the latter. Thus, if a judgement explicitly states that a certain amount of the award is for punitive damages, the insurance company will not pay this part of the claim. In Canada, punitive damages are the exception. If they become more important it is likely that insurance companies will offer protection to the insured against punitive damages.

Current Legal Liability System

As noted in Chapter I, the legal liability system will have an impact on the costs of insurance and the underlying pure premiums. The existing manual rates reflect settlement experience based on the current liability system. Currently in Canada the manufacturer is liable under tort law for personal injuries and damage to property caused by a defect in the product. The test of liability is reasonable care. The defect must arise from the manufacturer's failure to exercise reasonable care in the manufacture, preparation, labelling or inspection of the product. Thus, the injured party must establish that there was a defect and that it was caused by the negligence of the supplier of the product. Some court decisions have argued that, if the existence of a defect at the time the product left the manufacturer's hands has been proven and if the injury was caused by the defect, then negligence is inferred.

Under contract law, there is strict liability between the purchaser and the seller of a product. In addition, contract law deals with the pure economic loss arising from a defective product. Since the terms of reference of this

paper deal only with the insurance problem and since insurance companies in general do not cover this loss, this problem will not be dealt with in this paper. In a sense, sellers must self-insure against pure economic loss.

Finally, court costs follow the event. The court generally awards costs against the unsuccessful party in a litigation.

Problems Faced in Writing Product Liability Insurance

This section considers a number of the problems faced by insurers under the current legal liability standard. It is assumed that a rate for basic bodily injury coverage has been determined from past experience on a particular product classification.

Long-tail problems Three separate issues are combined under the heading of long tail.

(1) The insurance contract is written to cover an accident that occurs during the policy year, and the premium charged is based on sales during that period. However, the contract does not specify that protection is provided only on products manufactured and sold during the policy period. Therefore a claim arising in the policy period may result from a product sold a number of years ago. Even though the product falls into the same product classification, it may not have been manufactured using the same technology or level of reliability. If the insurance company knew the number of products still in use during the policy period, then an adjustment could be made in the total premium charged to take this factor into consideration. However, this is unlikely to be the case. If the product is durable -- such as electrical appliances for home use -- then estimation of previously manufactured products in use during the policy period is important.

To demonstrate this problem, consider the model presented in Chapter I where p is the probability of a successful settlement and S is the known value of a settlement. It was demonstrated that, as the number of insured products increased, the probability distribution of the actual successful claims per product converged to (T/n) which was equal to the expected settlement per product.

Assume that the current policy covers n products but that there are n* products outstanding which were produced and sold in previous years. Each old product has the same

expected settlement cost per product, pS. During the policy year, the total settlement is T* which is greater than T since old products were also covered under the policy. The settlement cost per unit of exposure is $T^*/_n$. The expected value of this new random variable can be written as $E(T^*/_n)=(n^*+n)/n$ (pS). Notice that this expected value is greater than the underlying expected value of the per-product probability distribution which equals pS.

If the insurance company knew the extent of n*, then it would include this value in the units of exposure, and the settlement cost per unit of exposure would become $T^*/(n+n^*)$ which would have an expected value of pS.

In setting premiums, assume that the insurance company looks at the pure premium. With coverage of only existing products, the pure premium is (n*+n)/n (pS) and not pS. Thus, the premium per product is higher due to the existence of outstanding products. If the relationship of (n*+n)/n remains constant, then the insurance company, using historical claims settlement per product data, can set a premium that will cover all products outstanding, including products sold in a previous period.

This, however, is the crux of the problem. If the ratio (n*+n)/n changes over time, the historical experience is not an adequate guide to setting premiums, and premiums set for a given policy period provide inadequate revenues to cover the total settlements incurred.[1]

Clearly, these types of long-tail problems become more severe for more durable products.

(2) The insurance contract is written to cover any claim that results from an accident occurring during the policy period, even if the accident is reported after the policy period has expired. This can occur in a number of ways. Suppose that an insurer writes a product liability policy for a gear manufacturer whose gears are used as an input in the manufacture of airplane engines. During the

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1. In the United States an attempt has been made to set a statute of limitations to cut off the size of the tail. For example, manufacturers would have no liability for products after ten years.

policy period there is an airplane crash. However, by the time the cause of the air crash is determined and related to the gear manufacturer a number of years may have passed. When blame for the crash is finally placed on the gear manufacturer, the insurance company must settle the claim. This lag between the occurrence of the accident and the attribution of responsibility leads to two problems for the insurance company. First, there is the financial problem of setting up a reserve for these types of potential claims so that when they arise funds are available. Second, omission of these potential claims will seriously distort the loss experience of the company and affect rate-setting.

Both these problems are solved by establishing a category of loss called "incurred but not reported" (IBNR). The extent of this loss is calculated by actuarial techniques that consider the historical experience of claims arising in years subsequent to the termination of a particular policy year. In addition, estimates of the expected dollar values of these claims must be made.

(3) The third issue is not technically part of the long-tail problem but is really a problem of a long tale. This problem arises from drawn-out litigation where a claim is made during the current policy year but is not settled until after the policy year expires. The insurance company sets up a reserve for these potential settlement costs based on the judgement of the underwriters in the company. To the extent that the underwriters underestimate the extent of the ultimate settlement, there may be a cash flow problem in future years.

In cases (2) and (3) the reserves established are invested in marketable securities and earn income. Whether or not this investment income should be included in setting premiums is a subject of considerable debate. Some insurance companies argue that it is not legitimate to include these revenues. This paper does not enter the debate. However, elementary economics would say that the later in time a known claim is paid the better it is for the insurer (assuming that the administrative costs of monitoring the claim are not large), and hence interest earned on investment income would be a factor that competitive insurance companies would take into account in setting rates.

Limitations due to size of market To determine insurance rates on products, it is necessary to have the products classified correctly so that risk characteristics,

probabilities of a successful claim and size of settlements are similar. In addition, it is important that there be enough products in the classification to ensure diversification of risk and that the actual loss experience for the classification is credible. Unfortunately, the size of the Canadian market militates against homogeneity of risk classes and large numbers of exposures per risk class. In fact, it is the paucity of exposures per risk class that requires the insurance companies to build less than perfectly homogeneous risk classes.

For example, consider the product classification "beverages." In Canada this broad classification is broken down into three subclasses: beer and wines, spirits and all other (including soft drinks). The first two classifications, while appearing homogeneous, may not be. For example, beer may have different risk characteristics than wine. However, the number of product units of beer and wine sold may not permit using a separate classification for each. If the market were large enough the spirits classification class could be further subdivided. The "all other" classification exists because there is not enough evidence on the characteristics of the products in this classification to permit a separate category. To obtain any historical experience the grouping is required.

The U.S. market is larger and it is likely that the product classifications are more narrowly defined so as to obtain a more homogeneous classification. Products without sufficient volume to generate historical loss experience would then become A-rated.

Jurisdiction in which products are sold A number of Canadian manufacturers sell their products in European countries and in the United States. If there is an accident with these exported products and a Canadian insurance company has written product liability insurance for the Canadian manufacturer, the operative liability rule is the one that exists in the country or state in which the accident took place. The product liability "crisis" in the United States will be discussed in depth in Chapter IV from the points of view of both the insurance company and the insured. A similar crisis is occurring in Europe.

The crisis facing U.S. insurance companies is based on increases in the size of settlements -- called social inflation by the insurance industry -- and on the form of the liability standard.

As argued in Chapter I, the liability rule can impact on the probability of a successful claim through the components of this probability, the size of the settlements and the expenses of settling and litigating claims. In the United States there is a movement toward a strict liability rule, but interpretation of this rule by the courts is not consistent across states. In Europe, the EEC, Council of Europe and, in the United Kingdom, the Royal Commission on Civil Liability have recommended strict liability. These recommendations are, in some instances, only an attempt to codify what is already occurring in some court decisions.

To reflect the different liability standards and size of settlements in Europe and the United States as compared with Canada, the Canadian insurance company must set a higher premium on exported sales. However, these rates must reflect the loss experience in the United States and Europe. In many instances, the Canadian insurance company is not on top of the situation in foreign countries and must rely on the rates set by insurance companies in these countries. However, these foreign manual rates do not reflect the current practice of the underwriters in these countries who are using their judgement to modify the manual rates. Therefore the Canadian insurance company is exposing itself to additional risk when it writes product liability insurance on products exported to the United States or Europe.

Rating Agencies and Setting Manual Rates

A number of the problems noted in the previous section occur because individual insurance companies do not have sufficient volumes in each product classification to obtain credible loss experience and thus set manual rates. Therefore a number of the insurance companies are members of statistical organizations that pool the loss experience data of their members. This pooling improves the quality of the loss experience and results in improved manual rates for each classification.

In Canada there are two such statistical organizations: the Insurers Advisory Organization (IAO) and the Insurance Bureau of Canada (IBC). In the United States the comparable entity is the Insurance Services Office (ISO). Currently, these organizations take data from their members, apply a rate-making methodology and provide their members with suggested rates for various product classifications. These rates are not necessarily those used by the member organizations. The final rates charged reflect the

statistical organizations' suggested rates modified by judgement and by competitive pressures.

This section briefly describes the technique currently used by the IAO to generate product liability rates. As will be seen, the resulting rate is related to the probability of successful claims and to the size of the settlement. It is important to remember that most insurance rates are prospective (i.e., the rate is set to cover anticipated settlements). Therefore an important ingredient in setting rates is the forecasting of a number of crucial variables.

The current rate-making process can be summarized as a highly sophisticated actuarial technique applied to an inadequate amount of data. Since product liability insurance was not very important in the past and since losses were never very large, it was not a good investment decision on the part of the insurance industry to incur the substantial costs of gathering extensive statistics. However, the character and importance of product liability insurance has altered dramatically in the recent past, and insurance companies are now investing much time and effort to obtain improved statistical information.

This discussion is based on the rate-making technique currently used by the IAO, which is very similar to that used by the ISO. Due to inadequate record-keeping techniques, the IAO does not collect information on exposure units although they intend to rectify this deficiency. Once this is done, the IAO intends to calculate the pure premiums for product liability classifications (i.e., the expected settlement cost per unit of exposure). This information will be given to the individual members who, by applying their target loss ratio, will then be able to generate the premium to be charged on each product classification.

Policy year The IAO operates on a policy-year basis in which the losses incurred on policies written in a given twelve-month period are compared with the premiums earned on these same policies. Thus, the experience for policy year 1972 would consist of premiums and losses on all policies with effective dates from January 1, 1972 through December 31, 1972 and expiration dates from January 1, 1973 to December 31, 1973.

The definition of incurred losses generated a substantial amount of discussion in the U.S. hearings on product liability insurance. Incurred losses can be defined

as money actually paid or payable on claims, including expenses involved in handling the claims. Therefore the losses include not only actual paid settlements but also reserves set aside for settlements on reported claims still in the process of settlement or litigation. Note that incurred losses do not include reserves for the "incurred but not reported" category. However, these late-reporting cases are not ignored since they are picked up in two or three years when they become reported. This is an important ingredient in the actuarial development of losses.

The IAO technique basically considers the adequacy of current premiums. Based on historical experience of losses, the current premiums are adjusted so that the resulting premiums reflect the target loss ratio for the industry.

Loss development factor The crucial element in testing the adequacy of existing rates (or in determining rates, de novo) is the construction of loss statistics. Unfortunately, due to the length of the policy year, there is a substantial lag before loss experience becomes available. For example, suppose insurance is written during 1976. The expiry date of the policy year is December 31, 1977 (i.e., loss experience during all of 1977 must be collected and assigned properly to the policies written during 1976). The report on the 1976 policy-year loss experience is presented at the end of March 1978. This first report will include claims that have been settled, claim settlement expenses and reserves for claims reported but not settled. As time passes, new information on the resolution of claims reported during the policy year is obtained. In addition, new claims are reported which are charged to the 1976 policy year. The IAO gathers five reports, each made one year apart, for a given policy year.

To determine rates, the statistical organization needs to know the loss experience on the 1976 policy year adjusted to a fully paid, ultimate settlement basis. This is accomplished by using the loss development factor which is constructed by comparing the more mature loss reports for prior policy years with the less mature reports for the same policy year in order to ascertain a relationship. For example, the loss development from the first to the second report can be obtained by using an average of historical data. This factor is very likely to be well in excess of unity since there will be a number of newly reported claims arising in the second year. Similarly, the historical loss development for the second to third, third to fourth and fourth to fifth reports is obtained. Based on these factors,

the IAO can calculate the loss development over the five years as the product of the ratios for the one-year loss development statistics. This final ratio (which can be adjusted further to reflect development in years subsequent to the fifth) is applied to the first report for the 1976 policy year. This brings the losses up to the fully paid basis and reflects the dollars that will be required to pay for claims-related expenses that the insurance companies will face for the policy year being examined.[2]

Trend The loss development factor, when applied to a given policy year, generates an estimate only of what past losses will be when fully paid. However, for rate making an estimate of future claims is essential since the revised rates must be sufficient to cover future claims under new policies. To provide such an estimate a trend factor is required. This is obtained by estimating statistically the trend in average claims costs and this growth rate, based on past data, is assumed to continue into the future. Any trend in claim frequency must also be considered.[3]

Projection When considering the premiums that will be charged in the 1978 policy year, the loss development factor brings the 1976 policy year claims up to a fully paid, ultimate settlement basis. However, there will be an escalation in costs that must be included. This is the purpose of the projection factor which adjusts the developed losses from the mid-point of the experience period in the past policy year to that mid-point for the current policy year.

For example, consider policy year 1976. This year runs from January 1, 1976 to December 31, 1977. If an equal spacing of claims occurrence is assumed, the mid-point or

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2. The ISO loss development factor for five years is 1.876. The development factor for costs beyond the fifth year is 1.02.

3. Offsetting this increase in claims cost will be the automatic increase in premium revenue derived from increases in the price level for products. Thus, if the insured company sells the same number of products but the price level increases by 10 per cent, sales increase and the total premium will increase by 10 per cent. This increase reduces the impact of the increasing claims costs.

average loss experience date is January 1, 1977. For the 1978 policy year, the beginning date is January 1, 1978 and the termination date is December 31, 1979. If the same assumption is made concerning loss experience, the mid-point or average loss experience date is January 1, 1979. Thus there is a period of time, two years, over which the claims costs must be adjusted.

Let the annual trend factor be t. The projection factor applied to the fully developed losses is expressed as:

$$PF = (1 + t)^j$$

where:

PF is the projection factor and
j is the number of years over which the projection is made.

Setting the adjustment on rates Rate-making requires the comparison of the actual loss ratio (defined as the developed losses incurred on a particular policy year -- say 1976 -- divided by the premiums earned on the same policy year) with the target loss ratio. The losses incurred will reflect the loss development factor applied to the first report on loss experience of the 1976 policy year. The target loss ratio, approximately 55 per cent for product liability insurance, is the standard for the insurance company and reflects the number of cents per dollar of premium required to service the losses. If the target and actual loss ratios are equal, no adjustment is required. If the actual loss ratio is greater than the target, an increase in the overall premium level is required to bring the loss ratio back to target. For example, if the actual loss ratio is 60 per cent and the target 55 per cent, then the increase in the premium is .60/.55 = 1.09 (i.e., an increase in premium level of 9 per cent).

However, this only considers the impact of increased losses on the policies actually written. The trend and projection factors are then used to give the final increase in the overall level.

The indicated rate level increase is expressed as:

$$\frac{\text{Incurred Losses (first report) x Loss Development Factor x Projection Factor}}{\frac{\text{Earned Premium}}{\text{Target Loss Ratio}}}$$

$$= \frac{\text{Actual Loss Ratio}}{\text{Target Loss Ratio}} \times \text{Projection Factor.}$$

For example, assume the following values for the factors in the equation:

Actual loss ratio	=	.60
Target loss ratio	=	.55
Trend factor[4]	=	5% per annum
Projection factor	=	$(1.05)^2$ (number of years is assumed to be two)
	=	1.103

The indicated rate level adjustment is .60/.55 x 1.103

= 1.203 or 20.3% increase.

Rate change for product classification The above techniques would result in a revision of premiums charged on all risk classifications and yield the target loss ratio. There will, however, be some products with particularly bad loss experience which require a larger than average increase in premiums and some which require a lower than average increase. The technique used to determine the rate revision for each product class makes use of the indicated loss ratio for the product class. However, since the number of claims in each class may be very small, the observed loss ratio may be the result of a random fluctuation and hence have low credibility. Therefore, in addition to considering the credibility of the loss ratio for the individual product classification when determining relative premium changes, the IAO groups the products into classes of reasonable size and compares the loss ratio for this class to the overall loss ratio for all classes. From this information an index is constructed. If this index is greater than unity, a higher than average rate increase is indicated.

The rate-making technique described above appears very complicated. However, the essence is the determination of the ultimate settlement amounts in a given policy year adjusted for expected changes in claims costs and claims

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4. This trend factor is assumed to be a net figure that includes the impact of increasing product prices on total premium revenues.

frequency. The technique is based not only on application of actuarial theory but also on projections of historical experience -- such as increases in claims costs -- into the future. This second input is based on a relationship of historical claims costs over time. The use of time as an explanatory variable buries a number of relationships that have not been examined and hence could be changing. Knowledge of these underlying relationships could improve the forecasting and hence result in better rates.

Bodily Injury Premiums for Product Liability Insurance

Table 1 presents a subset of product classifications drawn from the rating manual of the IAO and that of a major writer of product liability insurance. The entries in the columns headed "IAO and Insurer -- Rate on Canadian Sales" are not the actual premiums charged for B.I. protection. They are index values derived from the actual premiums noted in the rating manuals; the indexes have the same base. The third column of this table presents the ratio of the premium on the products of a Canadian manufacturer sold in the United States to the premium charged for the same product sold in Canada.

Even though columns 1 and 2 are indexes, the relative ranking of the premiums can be observed for each insurer and the size of the premium on the same product classification as suggested by the IAO and the insurer can be compared.

From the subset of product classifications for which the IAO has suggested manual rates (i.e., column 1) a substantial variation in the index is observed. Values are high for cosmetics (5.58) and retread tires (5.54); the lowest is for clothing (.12). The highest value of the index is for acetylene gas (12.26). The relative size of the index for each product conforms to a priori beliefs regarding the risk of a successful claim -- i.e., the probability of a defect as well as the expected settlement, given that an accident occurred.

In column 2 the index values again are substantially varied with a large value given to ladders (16.50) and a low value to clothing (.16). The fact that the relative size of the premiums is similar to that found in the IAO column for the same product classes is not surprising -- the insurer uses the IAO rates as a base.

Table 1

Index of Bodily Injury Premiums per $1000 of Sales

Product	Rate on Canadian sales		U.S. relative to Canadian
	IAO	Insurer	
	(1)	(2)	(3)
Abrasives	.32	.36	10.7
Adhesives	.42	.39	1.0
Beverages			
beer & wines	.54	.66	1.36
spirits	.28	.36	1.33
all other (incl. soft drinks)	1.40	1.70	1.36
Boots and shoes	.32	.36	2.00
Candy	.82	1.10	n.a.
Chemicals, acids & petrochemicals	.90	.66	1.85
Clothing	.12	.16	1.13
Cosmetics	5.58		
Electrical equip.			
household type	.42	.48	8.25
type for application to body	.82	1.00	5.72
Elevators	3.44		
Explosives and fireworks	3.10	2.92	1.36
Food	.82	1.00	1.10
Gases			
acetylene	12.26		
hydrogen	6.14		
liquified petroleum	3.06		
oxygen	1.30		
Insulated wire and cable	n.a.	.56	1.57
Ladders	n.a.	16.50	3.00
Machinery	.68	1.10	3.20
Orthopedic devices	n.a.	2.20	2.50
Paint or varnish	.32	.36	2.22
Playground & exercise equipment	n.a.	3.28	1.07
Soap & detergent	.32	.66	1.18
Sporting goods	n.a.	1.74	1.01
Tires and tubes			
new	.52	.46	4.78
retread	5.54	6.64	3.31
Tools, hand type			
power	n.a.	3.30	1.67
not power	n.a.	.56	1.96
Toys	.72	.66	2.67

For those product classifications common to both the IAO and the insurer's manual, the index values are different but not by a substantial amount. However, there are a number of classifications provided in the insurer's rate manual that are not given in the IAO manual (e.g., orthopedic devices, playground and exercise equipment). The insurer may have removed these products from broader product classifications in order to evaluate the risks and premiums on this new classification. In addition, the customers of the insurance company may sell in the United States as well as in Canada and to estimate the Canadian and U.S. premium requires a product category defined equivalently to the U.S. classification. In discussions with the insurance company it was pointed out that many new classifications in their rating manual were taken from the ISO manual and the premiums noted for sales of these products within Canada were the U.S. premiums. This does not mean, however, that the same premium would be charged in Canada as in the United States since Canadian underwriters need not adhere strictly to the premium in the rating manual.

The third column of Table 1 shows the premium on sales of a Canadian-manufactured product exported to the United States relative to the premium on sales of the same product in the Canadian market. From the product classifications chosen, the premium on U.S. sales is never less than the premium on Canadian sales. The largest relative difference is in the "abrasives" category where the U.S. premium is 10.7 times greater than the Canadian. This reflects the difference in the treatment of job-related accidents in the United States and Canada.[5]

The differential in rates reflects the different liability rules used in the United States and Canada and the predilection in the United States for large court awards with punitive damages.

At first blush, it appears that a movement toward strict liability in Canada would result in premiums charged in Canada that approached those rates charged on U.S. sales. This conclusion, however, is not correct. In Chapter III the data from Table 1 will be used to consider what would happen to insurance premiums in Canada if a strict liability rule was adopted.

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5. This difference is discussed in detail in Chapter V.

Reinsurance Markets

Reinsurance is a technique by which the writing company can distribute its risk by passing on all or part of the risk to another insurer, with the object of reducing the amount of its possible loss. The reinsurance company, in effect, provides insurance as the primary writer.[6] It sets a rate or premium for which it will accept the reinsurance business and then must face the problems of diversification of its risk.

This diversification is possible not only on account of the large number of exposures but also because reinsurance is accepted from various parts of the world. Just as for the underwriting company, the rates charged for the reinsurance services are based on loss experience.

There are a number of ways in which reinsurance transactions can be arranged. This discussion considers some of the more common arrangements.

Facultative reinsurance A primary insurer underwrites risks that are unique or that expose the insurer to a large risk. To reduce its risk exposure, the insurance company can attempt to obtain facultative reinsurance. The risk is submitted to the reinsurance company and is evaluated by the company's underwriters on its own merits. The reinsurance company is not automatically bound to accept the risk.

Treaty reinsurance Unlike facultative reinsurance, treaty reinsurance is a pre-arranged agreement by which there is an automatic transfer of a portion of the insurance business to the reinsurance company. Two types of treaty reinsurance are considered here.

Quota sharing is the simplest form of treaty reinsurance in which a fixed proportion of each risk that the underwriting company writes is ceded to the reinsurance company. The proportion of the risk and the insurance classes covered are noted in the treaty.

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6. Reinsurance also provides underwriting capacity to insurers. We do not consider this use of reinsurance since the thrust of our investigation is the management by underwriters of their risk exposure.

Unlike quota share, excess of loss reinsurance does not apply to every claim but only to claims exceeding a prescribed amount. For example, suppose the insurer does not want to pay out more than $20,000 per claim on a given risk but is willing to write policies that have $100,000 basic limits. The insurer will obtain excess of loss reinsurance to cover losses above $20,000 and less than or equal to $100,000. This form of reinsurance removes the peaks from the insurer's losses.

One problem with excess of loss reinsurance is that the underwriters may relax their standards if they know that any large losses will be covered by the reinsurer. However, the reinsurer will maintain surveillance of the loss experience of the policies and will alter the rates for its reinsurance services when appropriate.

CHAPTER III

PRODUCT LIABILITY RULES AND THEIR ECONOMIC IMPLICATIONS

This study refers to various types of liability rules. Unfortunately, some of the terms commonly employed have different meanings to different writers. To avoid any confusion in the terminology, this chapter defines the major categories of liability rules used in this study. In addition, the economic implications of these liability rules are examined.

Liability Rules Defined

Since product liability is of primary interest in this paper, consider the case where a manufacturer sells his product directly to a consumer and the consumer is injured by the product. There are various ways of assigning liability for the injury to the consumer. To illustrate this, five liability rules are considered. The many possible permutations and combinations of these liability rules are ignored. It should be noted that these rules are concerned only with losses arising due to physical injury to a person or property or to the consequential loss arising from the injury. Our analysis does not consider pure economic loss (i.e., loss in value of product) or the consequential loss following pure economic loss, because this study is primarily interested in insurance markets and because most standard insurance contracts do not cover pure economic loss.

Caveat emptor Under this standard, the consumer is always liable for the injury. With a caveat emptor standard no litigation ever occurs from product injuries. The consumer always bears the full cost of the injury.

Negligence standard Under a negligence standard, the manufacturer is liable if it can be shown that: (a) the product caused the injury; (b) the product was defective; and (c) the manufacturer was negligent.

The above is an example of a pure negligence standard. Currently Canada, under tort law, has something approaching a comparative negligence standard. Under this type of standard, if the consumer was negligent in the use of the product then liability is apportioned according to the relative negligence of the manufacturer and consumer.

Strict liability with contributory negligence In this case, if the product caused the injury and the product was defective, then the manufacturer is liable unless the consumer is found negligent. This standard differs from the negligence standard in two ways. If both parties act without negligence, the negligence standard makes the consumer liable, whereas strict liability with contributory negligence makes the manufacturer liable. Also, if both parties act negligently the negligence standard holds the manufacturer liable, whereas strict liability with contributory negligence holds the consumer liable.

Strict liability If it can be shown that: (a) the product caused the injury, and (b) the product was defective, then the manufacturer is liable. Strict liability lightens the burden of proof for the injured consumer over what he would have to prove under the negligence standard. Under strict liability negligence of either party is of no concern to the court.

Absolute liability (caveat venditor) As long as it can be shown that the product caused the injury, the manufacturer is liable. The difference between absolute liability and strict liability is that under absolute liability there is no need to show a defect in the product.

In fact, it should be noted that as one moves from rule 1 to rule 5 the burden of liability shifts from the consumer to the manufacturer and the burden of proof for the injured party decreases.

Economic Implications of Product Liability Rules

Liability rules attempt to allocate the costs of accidents to the parties involved. Accidents are a natural result of economic activity, and the costs of accidents are part of the costs paid for the provision and utilization of goods and services. Why should economics be concerned with liability rules? Because as liability rules are changed the manufacturers' incentives to produce "safe" products and consumers' incentives to use products safely and carefully are changed. In addition, as liability rules change, the incentives to innovate safe products are altered. Thus, as liability rules are changed, the occurrence, and hence the costs, of accidents will change. Should liability rules be set to minimize the cost of accidents? The answer provided by a number of economists and lawyers is a definitive no. Society uses up resources not only in accidents but also in

preventing them. As has been argued here, different liability rules provide different incentives to use resources to prevent accidents. Liability rules should be chosen to minimize the sum of accident costs and accident prevention costs. Liability rules that do this are said to be efficient.

Economists worry chiefly about the efficiency of the various liability rules. But these rules also have another implication. Different rules impose different burdens on individuals in society and hence have implications for the distribution of wealth. Although the distribution of wealth is an important matter, economics has very little in the way of objective analysis to say about it.[1] One could argue that product liability rules should be chosen solely on the basis of efficiency. If the resulting income distribution is socially undesirable, then the government can correct this by redistributing income. Such a two-step procedure maximizes social welfare. Because of this, the analysis here will concentrate on the efficiency properties of the various liability rules rather than on the problem of compensation for accident victims.

Operation of Liability Rules in a World of Perfect Information

To examine the incentives various liability rules give to manufacturers and consumers, certain assumptions must be made about the cost and availability of information of all kinds. The extreme example of "perfect information" will be considered first. By perfect information it is meant that consumers receive all the relevant information on the products in the market (i.e., consumers know all of the suppliers of the products, the prices of all of the products and the characteristics of all of the products -- durability, reliability, safety, etc.). In addition, all manufacturers are assumed to have perfect information. Each firm not only has, at zero cost, all the data on its inputs but also all the relevant data concerning its customers (e.g., their income, how they use products, what the expected accident costs are for each customer, etc.). With this system of perfect information, all buyers and sellers know each other.

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1. For a discussion of the problems society should worry about in choosing liability rules, see McKean, 1970 and Dunlop, 1978.

There is thus no need for brokers and all transactions can be assumed to be carried out with zero transactions costs. Under four of the five liability rules, the courts are involved in allocating liability under a particular rule (the caveat emptor rule is not included here). Perfect information is also assumed on behalf of the courts. For example, under the negligence standard this means that at zero cost the courts possess information about the causality of injuries, whether or not the product is defective and whether or not the manufacturer is negligent.[2] Finally, perfect information implies that, at zero cost, insurance companies know the riskiness of all products (in terms of the variables in Chapter I, insurance firms know the p for all products), what the resulting court awards will be if injuries occur and how each consumer uses each product.

In a world of perfect information, liability rules are irrelevant for matters of efficiency. All five rules would produce exactly the same results. First, consider caveat emptor. In this world, manufacturers would make many different products with varying degrees of quality. One aspect of quality would be safety, and products with varying degrees of safety would be produced. Since, in general, it costs more to make a safer product, the higher the degree of safety for any product the greater would be its price. It is assumed that consumers know all quality aspects of every product. They know the safety factor for each product and can choose a product with a low degree of safety at a low price or a higher degree of safety at a higher price. If they buy a product with a low degree of safety they can also purchase, if they choose, an insurance contract which insures them against the risk inherent in the product.[3] If there was one product that was accident-proof (i.e., the probability of an accident with this product equalled zero) and if another product yielded the same services but with a low degree of safety, then competitive forces in the economy would cause the price of the perfectly safe product to equal

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2. So far, the legal definitions of causation, defectiveness and negligence have not been discussed in this paper. It is assumed that the court adopts standards with respect to these three concepts and in all cases is able to decide, at zero cost, the relevant categories for each injury.

3. It should be noted that consumers will be charged a premium according to their expected accident costs.

the price of the unsafe product plus the cost of insurance. In such a situation, with full insurance, consumers would be indifferent between the two products. Now consider the efficiency incentives with caveat emptor. In general, it is argued that caveat emptor is inefficient since it does not give the manufacturer any incentive to produce safe products. In a world of perfect information this is not the case. Manufacturers have no particular incentive to produce a product with a low degree of safety. If they did so, everyone in the market would be aware of that fact and the market price of that product would be lower. Perfect information assumes that consumers know the expected accident costs associated with every product in the market. In a world of perfect information manufacturers of low-quality goods would not make any higher profit that manufacturers of high-quality goods. Caveat emptor does not give an incentive to produce low-quality goods. The distribution of quality of goods will be determined by the tastes and preferences of the consumers.

The same result would be achieved under the other extreme standard, absolute liability. The general argument made for the inefficiency of absolute liability is that this standard provides no incentive for consumers to use products with appropriate care. This is not the case with perfect information. If manufacturers had no insurance, they would sell to consumers with high expected accident costs at higher prices than they charge consumers with low expected costs. Thus, consumers would have an incentive to use products in an appropriate manner. Even if manufacturers had insurance, the situation would be unaltered. Insurance companies know the customers of the manufacturers. They would set premiums depending on the characteristics of those customers. So manufacturers would still have higher costs when dealing with customers with high expected accident costs. As such, these customers would be charged a higher price. In absolute liability, as in caveat emptor, manufacturers have incentives to produce safe products and consumers have incentives to use the products safely. The types of products and the resulting prices would be the same under each standard.

Now consider the other standards of liability in a world of perfect information. The apportionment of liability under a negligence standard or under a standard of strict liability with comparative negligence gives the correct incentives for manufacturers and consumers. Under strict liability, there is an incentive for manufacturers to operate efficiently but this incentive does not exist for consumers. However, as in the case of absolute liability, in a world of

perfect information market prices (of goods or of insurance contracts) give the consumers an incentive to handle products with the appropriate standard of care. It should be noted that liability rules 2 to 5 will yield the efficient solution only if the court "correctly" adjudicates all claims. Since the court is assumed to have perfect information, it can determine the cause of any injury, if any product is defective, if there is negligent behaviour on the part of the parties concerned and what amount of loss due to the injury, at zero cost. Since the court always adjudicates claims correctly when perfect information is assumed, liability rules 2 to 5 yield the efficient solution which minimizes the sum of accident costs and accident prevention costs.

Thus, under perfect information all rules are efficient and yield the same economic result. (It is also interesting to note that all these rules yield the same distribution of wealth. Therefore, equity grounds give no basis for choosing among them either.) Under all the rules, the types of products and the distribution of quality will be identical. It should be noted that different rules achieve identical results in different ways. Caveat emptor uses market prices (e.g., the prices of final products) to give correct incentives to manufacturers. Caveat venditor not only uses market prices of goods but also uses the price of insurance contracts to give the correct incentives to consumers. The remaining rules use market prices to impose discipline but primarily use the incentives in the liability rules themselves along with the knowledge that the rules will be correctly applied by the courts to insure optimal behaviour on the part of both manufacturers and consumers.

Operation of Liability Rules in a World of Imperfect Information[4]

In a world of imperfect information, information is available to market participants at a cost; it takes real resources to acquire information. Some information can be acquired with a minimal outlay of resources (i.e., at low cost) whereas other information may require a large outlay of resources. Some information may simply be unavailable in economic terminology; this information can be acquired only by an infinite outlay of resources. Information is assumed to be imperfect for all market participants and institutions.

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4. For a review of the economic efficiency of liability rules, see Brown (1973) and Starr (1978).

With imperfect information, how successful is each of the liability rules in minimizing the sum of accident prevention costs and the cost of accidents?[5]

First consider the caveat emptor standard. With imperfect information, will manufacturers have an inordinately large incentive to produce "low-quality" (i.e., high-risk) products? The answer to this question must be a qualified yes. The extent of the qualification depends on how imperfect information is (i.e., how costly). If, because of high information costs, consumers cannot distinguish between high-risk and low-risk products, these two sets of products will sell for the same price. Since it has been assumed that it is costly to produce low-risk products, manufacturers will have an incentive to produce high-risk products. If information about the product can be acquired by using it, consumers will eventually be able to distinguish between high- and low-risk products and low-risk products will command a premium in the marketplace. With this premium for low-risk products, incentives will exist for manufacturers to produce the correct bundle of products. Since information is still costly and consumers cannot discriminate perfectly between products of different risk levels, the incentives will not be exactly the same as the optimum incentives in the world of perfect information. How far they deviate from these optimum incentives depends on the cost of obtaining information.

Information about product quality is not the only problem for caveat emptor. For caveat emptor to be efficient insurance markets must exist to insure consumers against product risks. An insurance market is needed that can discriminate between high-risk and low-risk consumers (as well as between high-risk and low-risk goods). In a world of imperfect information, insurance companies may not be able to discriminate between high- and low-risk consumers. If this

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5. In a real sense, in a world of imperfect information, the above should no longer be the appropriate social goal. Since information takes real resources and each liability rule requires different amounts of information to operate, the optimal rule should minimize the sum of accident prevention costs, the cost of accidents and information costs. Since this is somewhat unconventional, the discussion will take place with the conventional objective. However, the importance of information costs will not be neglected.

is the case, different consumers will not face premium rates reflecting their different risks and consequently the optimal level of incentives to consumers will not be achieved. Again the significance of this point depends on the cost of information gathering. If insurance companies can, at a reasonable cost, keep accident records for different consumers and then adjust rates according to actual experience, the optimal solution will not be achieved but the situation may not be far away from it. Also, in our world of imperfect information, insurance markets for some risks may not even exist if the moral hazard problem is severe. As mentioned earlier, the moral hazard problem arises from the fact that the probability of an accident may be affected by the existence of insurance. If this problem is severe, then for some risks there may be no insurance market. Hence there would not be a socially optimal level of insurance.

Other arguments have been advanced to explain why the socially optimal level of insurance might not be reached in a world of imperfect information. These arguments are given as additional reasons why caveat emptor does not result in the socially optimal solution. With imperfect information, consumers have difficulty evaluating the risks inherent in any product. It is sometimes claimed that consumers consistently underestimate these risks.[6] If this is the case, consumers will have too little insurance. The argument is also made that, in an uncertain world, consumers do not know what is in their own best interest. This argument is a rationale for government decision-making for consumers. In this case it implies that consumers will not purchase the correct amount of insurance, that someone else knows what is best for the individual rather than the individual himself. Finally an argument is made that an economic approach to the problem is incorrect. In questions of safety, it is said, consumers do not respond to pecuniary incentives. The possibility of personal injury itself is a sufficient deterrent and therefore consumers will use products with the appropriate standard of care. This problem cannot be settled from a theoretical point of view but only from an empirical one. We all have anecdotal evidence of trading safety for other resources (pecuniary or other). How many of us cross streets in the middle of the road rather than at intersections with traffic lights, implicitly accepting the higher risk to save time? Occupational choices are made

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6. Consumers may consistently underestimate the cost of accidents as well.

among jobs with varying degrees of risk. In general, a higher-risk job is accepted provided that it pays a higher wage. For example, Thaler and Rosen estimated the amount of income required to induce workers to accept higher-risk jobs (i.e., jobs with higher probability of accidental death on the job). They found that the higher the risk of the job, the greater will be the wage. If P is the added annual probability of death due to the job, then every increment in P of .001 required an increment in income of about $200 per year in 1967 U.S. dollars (Thaler and Rosen, 1973).

In summary, costly information causes the caveat emptor standard to deviate from the optimal solution. In general, the size of this deviation varies directly with the cost of information.

For a caveat venditor (absolute liability) standard to be efficient, manufacturers would have to be able to discriminate between high- and low-risk customers (and high and low accident-cost customers) and would have to be able to charge different consumers different prices. In a world of imperfect information where a manufacturer has a large number of customers and a large turnover, one can see that it would be very costly to acquire customer information. Thus, manufacturers would not be able to discriminate sufficiently among their customers and hence could not charge a price for their product according to the risk level of the user. Without differentiated prices, the consumer does not have the incentive to use the product with the appropriate standard of care.

Another way of viewing absolute liability is that it forces manufacturers to a tie-in sale; with every unit of product they sell they must also sell a full-coverage insurance policy indemnifying consumers against all losses due to injury with the product. Inefficiencies result since all consumers, regardless of the standard of care they exercise, pay the same price for insurance. Some writers have argued that this forced tie-in sale will drive out the risky and less expensive products. Even if the manufacturer could discriminate among customers his problems would not be over. There are legal restrictions against charging different prices to consumers. In Canada a manufacturer must make his product available on the same terms to all customers. Even if price discrimination were legal, the manufacturer would still have the problem of separating low-risk customers from high-risk customers. What would stop low-risk customers from buying the product at a low price and selling it at a profit to high-risk customers (at a price

below which the manufacturer would sell to them directly)? Here again one sees that costly information causes the absolute liability standard to have a solution that deviates from the socially optimal solution.

Since both caveat emptor and caveat venditor result in non-optimal solutions, one might ask why most economists, if presented with a choice between the two standards, would pick caveat emptor. The reasons for this choice can be seen in considering the operation of these two standards in the real world where consumers do not have perfect information about all products. As they experience products, they gain information about them. Also, the number of manufacturers in the real world is small relative to the number of consumers, and manufacturers tend to be relatively long lived. Consumers gain information about products not only from their own experience but from that of others. Since manufacturers tend to be long lived and to deal with consumers on a repetitive basis, consumers acquire information about manufacturers (i.e., manufacturers develop "brand names" and some become known as high-quality manufacturers and others as low-quality manufacturers). Thus, when consumers buy a new product for which they have little information, they rely on the brand name of the manufacturer. (In some cases, they rely on the brand name of the seller if the seller is different from the manufacturer.) So, under caveat emptor with a relatively small number of long-lived manufacturers, information is acquired about manufacturers and their products. This information is not perfect and is not acquired at zero cost. There is a belief, however, that the cost of the information is not prohibitive. Under caveat venditor, the small number of manufacturers have to acquire information on a large number of customers. In addition, there may be a substantial turnover of customers. Economists tend to believe that information costs in this situation would be large and perhaps prohibitive. Thus, they argue that caveat venditor requires substantially more information than caveat emptor because firms acquire brand names but consumers do not. As such, the operation of a caveat emptor standard comes closer to the optimum than the operation of a caveat venditor standard. (Another way of stating this is to say that the sum of accident costs and the cost of accident avoidance and information costs is lower under caveat emptor than under caveat venditor.)

Now consider standards 2 and 3: negligence and strict liability with contributory negligence. It has been

argued that both of these standards lead to the socially optimal solution, that both provide incentives to manufacturers and to consumers to take the appropriate care in the manufacture and use of the product. These will be the "correct" incentives only if the court is able to make the "correct" decisions. If the court has perfect information this will be the case. So, in effect, those who argue that caveat emptor or caveat venditor does not lead to the socially optimum solution whereas negligence or strict liability with contributory negligence does, are implicitly making the assumption that manufacturers and consumers do not possess perfect information but that the courts do. Given the nature of the problem that the court faces, it is highly unlikely that this is true. The court has to determine the cause of any injury, an extremely difficult proposition to establish. Walter Oi makes the argument that "some auto accidents are surely 'caused' by the failure to keep one's eyes on the road. After the crash, we can examine the wreckage and the road, or we may even get eye witness accounts of movements of other cars. But, if we are unable to observe whether or not the driver kept his eyes on the road, how can we attribute the blame to this unobserved event" (Oi, 1978). The court also has to decide whether the product is defective. Not infrequently, products are almost completely destroyed in accidents. In such circumstances ascertaining a defect is next to impossible. In addition, the court has to decide on negligence. Under comparative negligence the court has to decide on negligence of the manufacturer and the consumer. It also has to determine the costs of the injury independent of the status of the defendant. (Some lawyers have argued that court awards are larger, the larger the wealth of the defendant.) All these questions require a considerable amount of information, some of which is unavailable at any cost. As such, it would seem reasonable to conclude that courts do not have perfect information. This means that negligent defendants will sometimes not have any costs imposed on them and sometimes manufacturers of defective products will not have any costs imposed on them. Consequently, the incentives that exist under either a negligence standard or a strict liability with contributory negligence standard will not be of the correct order of magnitude, and thus results will deviate from the social optimum. The extent of this deviation will depend on the magnitude of the costs to the court of acquiring the information necessary to apportion liability.

The last standard to consider is that of strict liability. Under this standard, with imperfect information

to manufacturers and consumers but with perfect information to the courts, the social optimum is not achieved. Under strict liability, producers have an incentive to manufacture products with the appropriate degree of safety. However, since it is assumed that consumers are fully compensated for any injury, they do not have the incentive to use the product with the appropriate standard of care. Consequently, the social optimum is not achieved. A fortiori, once the assumption of perfect information on behalf of the courts is dropped, the social optimum becomes more distant and manufacturers again will not have the appropriate incentives.

Canada currently has a system of comparative negligence and there are proposals to move to a system of strict liability. Compare these two liability systems under the assumption of imperfect information. If imperfect information is restricted to manufacturers and consumers with perfect information available to the courts, then comparative negligence is clearly superior to strict liability (on grounds of efficiency). However, with imperfect information existing in the court system, the comparison of the two liability rules is not so clearcut. Comparative negligence requires much more information for the courts than does strict liability. For comparative negligence, the court has to measure the negligence of each party before liability can be apportioned. For strict liability, negligence is not an issue. It is conceivable that information costs under comparative negligence are so great and that courts have such a difficult time deciding on negligence that the resulting court decisions modify the incentives in such a way that the strict liability standard comes closer to the social optimum than the comparative negligence standard. In fact, it has been argued that the courts in Canada today are applying something close to a strict liability standard (Waddams, 1974). It may be that in the day-to-day operation of the courts, judges have found it very difficult to determine negligence so that, as a practical matter, strict liability rules are used. In any case, in a world of imperfect information, the superiority of a negligence standard over a strict liability standard cannot be decided on theoretical grounds.

In a world of imperfect information, no liability rule yields the socially optimal solution obtained in a world of perfect information. How far the actual solution lies from the optimum solution depends on the information costs. Liability rules such as caveat emptor, which rely on market mechanisms to approach the optimal solution, are particularly

sensitive to the costs of market information. On the other hand, liability rules such as negligence standards, which depend on the court to apportion liability, are particularly sensitive to the cost of courtroom information. If information costs to courts were much greater than information costs to markets then market solutions (i.e., caveat emptor) would likely be more efficient. In fact, those who believe in the superiority of the market believe that the market can acquire its information with far fewer resources than the court. Similarly, those who believe that courts can acquire the needed information with fewer resources than the market will favour liability rules that rely more heavily on the courts. Which of the court-intensive rules one would choose depends on the exact tradeoff between incentives provided and information required for the efficient operation of each rule.

In summary, with perfect information all liability rules yield the social optimum and with imperfect information none of them reach the social optimum. In the world of imperfect information, how close any liability rule comes to yielding the social optimum depends on the costs of acquiring information.

Liability Rules and Insurance Premiums

Insurance companies are not concerned with the problem of how close a particular liability rule approaches the social optimum. Their main concern is setting premiums; this requires information on the probability, p, of an accident and a successful claim and on the amount of the settlement, S. From a theoretical point of view, the amount of the settlement should be invariant to the liability rule imposed. However, p will depend on the liability rule in force, and the insurance company must learn to live with this rule.

This paper is concerned with the impact on the insurance industry of a change in the liability rule. It will be demonstrated in this section that the insurance premium is related to the liability rule since p will change. However, in setting premiums, the insurance company must rely on historical information on claim frequency and size of awards. Thus, the imposition of a new liability standard introduces a short-run problem -- a paucity of information under the new standard. In the long run this is not a problem. Therefore the impact on premiums in the long run based on different liability rules will be investigated.

This section breaks down the joint probability of a successful claim and an accident into its component parts and determines the impact of the liability rule on these components.

The model The following symbols are used:

S: successful claim
A: accident occurs
$\underline{D}$: defect exists
$\overline{D}$: no defect exists.

The joint probability of a successful claim and an accident, $p = P(S, A)$, is written as the product of two factors: (i) the probability of a successful claim given an accident occurred, $P(S/A)$; and (ii) the probability of an accident, $P(A)$,

$$\text{i.e.,} \quad p = P(S,A) = P(S/A).P(A) \qquad \text{(Equation 1)}$$

However, the probability of an accident can be further broken down:

$$P(A) = P(A,\underline{D}) + P(A,\overline{D}) \qquad \text{(Equation 2)}$$

where $P(A, \underline{D})$ is the joint probability of an accident when a defect exists and $P(A, \overline{D})$ is the joint probability of an accident when there is no defect in the product.

These joint probabilities can be broken down further into their elements in a manner similar to equation (1). The final expression, given in equation (3), is obtained by substituting the elements from equation (2) into equation (1),

$$\text{i.e.,} \quad p = P(S,A) = P(S,A)\ [P(A/\underline{D})\ P(\underline{D}) + P(A/\overline{D})\ P(\overline{D})] \qquad \text{(Equation 3)}$$

where:

$P(\underline{D})$ = probability that a defect exists
$P(\overline{D})$ = probability that a defect does not exist
$P(A/\underline{D})$ = probability that an accident occurs given that there was a defect in the product
$P(A/\overline{D})$ = probability that an accident occurs given that there was not a defect in the product.

Application of the model to liability rules The incentives to manufacturers and consumers under different liability rules as well as the burden of proof required to obtain a successful claim were investigated earlier in this chapter. This section looks at how these factors affect the probability values in the model and ultimately the insurance premium for bodily injury coverage.

Consider first the caveat emptor rule under which manufacturers are never liable. Even though manufacturers may produce goods with high probabilities of defect (P(D)) the probability of a successful claim in the case of an accident is zero, $P(S/A) = 0$, and thus $P(S,A) = 0$. Under a caveat emptor rule the consumer bears the costs of an accident and thus there is no incentive to use the product carelessly or to litigate an accident that was not caused by a defect. The former implies that P(A/D) will be low and the latter implies that $P(A/\overline{D})$ will be even lower. Although these two terms have no bearing on P(S/A) under the caveat emptor rule, they will become important under different liability rules.

Now consider the negligence standard. Here there is the potential for successful suits if the product was defective, caused the accident and if the manufacturer was negligent. Therefore P(S/A) becomes positive. Under this rule there are incentives for both manufacturers and consumers to be careful in the production and use of the product. Since P(S/A)is positive and all other terms are non-zero, insurance premiums under this standard will be positive.

The third rule, strict liability with contributory negligence, is very similar to the negligence standard. Hence premium rates under this standard should be very similar to rates under the negligence standard.

The fourth standard is strict liability under which proof of a defect-related accident is required. Proof of negligence on the part of the manufacturer is not needed and negligence by the consumer is irrelevant. In this case the burden of proof is lessened as compared with a negligence standard and P(S/A) increases. In addition, the incentives to consumers to use products carefully is removed if full compensation for injuries is assumed. Therefore P(A/D) will increase. Since it is still necessary to show that a defect in the product existed, $P(A/\overline{D})$ will not increase substantially -- or it may increase but the manufacturer will be able to demonstrate that the product was not defective.

Since P(S/A) has increased and P(A/D) has increased, higher premiums can be expected than under a negligence standard.

The final rule is absolute liability. All that the injured consumer must show is that the product caused the accident. Thus, the probability of a successful claim will be very high -- close to unity. The only defence the manufacturer has is that the product did not cause the accident. The incentive to consumers for the careful use of the product is approximately the same as under strict liability. However, there will be an increase in the probability of an accident given that no defect was present in the product. Therefore $P(A/\bar{D})$ and P(S/A) will increase and this increases P(S,A).

In general, from rule 1, caveat emptor, to rule 5, absolute liability, the probability of a successful claim given that an accident occurred, P(S/A), increases. This, by itself, increases the size of the pure premium and hence the insurance rates. Partially offsetting this increase in rates is the fact that claims-settlement costs will fall since the manufacturers' defences in a suit become more limited. From rule 2 to rule 5, the incentive for the careful use of a product diminishes and this increases P(A/D). In addition, the absolute liability rule will induce consumers to litigate based on accidents not caused by a defective product -- thus $P(A/\bar{D})$ will increase. These two effects increase the overall probability and hence insurance premiums. Therefore, moving from a caveat emptor to an absolute liability standard should bring an increase in both the pure premiums and the frequency of claims.

Throughout this analysis, it has been assumed that the moral hazard issue resulting from manufacturers' actions is not crucial[7] (i.e., with full insurance, manufacturers do not increase the probability of a defect since they will

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7. Insurance industry representatives told the authors that the moral hazard issue was not important in product liability insurance.

attempt to maintain the product quality consistent with their brand name).[8]

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8. It has also been assumed that the probability of a defect will not fall significantly from a negligence to an absolute liability standard. Under rules 2 to 5, manufacturers are motivated to produce "safe" products. It is true, however, that the incentive increases from rule 2 to rule 5, and it may be in the manufacturer's best interest to reduce the probability of a defect. It has implicitly been assumed that this incentive never increases enough to reduce P(D) so that P(S,A), and hence insurance premiums, fall.

CHAPTER IV

REVIEW OF AMERICAN EXPERIENCE

By the mid-1960s strict product liability became an important principle in U.S. law. By the early 1970s a number of important states had adopted strict product liability theories. This chapter examines what happened in the United States when the law moved to strict product liability and, in particular, the effect of this move on the availability and cost of product liability insurance and the economic effects on the operation of small business. The prime reason for looking at the U.S. experience is to see what can be learned about what might happen if Canada moved to strict product liability rules. The next chapter assesses the applicability of the U.S. experience to the Canadian setting.

No original empirical work was done with the U.S. data for this paper. Fortunately, in recent years a large amount of empirical work has been done in the United States. By the mid-1970s a number of U.S. manufacturers complained about either the cost or the availability of product liability insurance. This became known as the product liability problem or crisis. In response to these complaints, a number of U.S. government agencies investigated. Under the direction of the Department of Commerce, a U.S. federal government Interagency Task Force on Product Liability was established in April 1976 and commissioned a legal study, an industry study and an insurance study. The results of these three studies are summarized here. In addition, the Task Force commissioned a number of papers by lawyers, economists and experts in insurance and held a symposium of experts in the field. Meanwhile, hearings took place on the impact of product liability before the Senate Select Committee on Small Business; on product liability insurance before the Subcommittee for Consumers of the Committee on Commerce, Science and Transportation, U.S. Senate; and on product liability insurance before the Subcommittee on Capital, Investment and Business Opportunities of the Committee on Small Business, House of Representatives. At these hearings the results from surveys of over 20 industry groups were presented. The results from the Task Force and from these private industry surveys are summarized here.

Review of Legal Studies

Tort-litigation system in the United States The U.S. legal situation started to change when the Supreme Court of New Jersey announced its decision in Henningsen v. Bloomfield Motors (32 N.J. 358, 161A. 2d 69, 1960). In this case the court held the manufacturer and dealer of a defective automobile liable for a breach of implied warranty without the necessity of showing negligence and without privity of contract. The significance of this action was not so much that it imposed a doctrine of strict liability but rather that it caused the fall of the "citadel" (the elimination of the privity of contract). The Henningsen decision was based on contract law. In Greenman v. Yuba Power Products Inc. (59 Cal. 2d 57, 377P., 2d 897, 1963), a 1963 California Supreme Court decision, the strict liability principle of Henningsen was applied. While the Henningsen decision was based on contract law, the Greenman decision was based on tort liability and introduced the theory of strict tort liability. This theory holds that plaintiffs no longer have to prove negligence on behalf of the manufacturers; instead they have to prove that the product was defective. In subsequent decisions, the rationale of these cases was extended to retailers and distributors and to situations where property damage had occurred.

It should be pointed out that in the United States, as in Canada, product liability law is not a federal matter. Consequently, different jurisdictions have different liability rules. Even among states that claim they follow strict liability theories there are substantial differences in the application of the basic principles. For example, under strict liability the major fact that the plaintiff has to show is that a defective product caused the injury. However, there is no satisfactory definition of what a defect is. In some jurisdictions, the fact that the accident occurred at all is evidence of a defect (in these jurisdictions strict liability is, in reality, absolute liability). In other jurisdictions, proving that a defect exists is almost equivalent to showing negligence. In these states, strict liability is really no different from a negligence standard. In New York, contributory negligence is an allowable defence in a strict liability action and in both New Hampshire and Wisconsin the principles of comparative fault have been applied to strict liability actions.

Strict liability is now the watchword in most U.S. court-houses, but there are still substantial differences in its application. In fact these differences from state to

state and even within a state at different times have created confusion and uncertainty in the U.S. tort-litigation system. Another reason for this uncertainty is that the courts have not decided whether tort law should be a compensation system for accident victims or a means of apportioning liability. This uncertainty has added to the problems of insurance companies in rate setting. In addition, this uncertainty may have increased settlement costs, thus resulting in increased premiums. The Task Force argued that this "instability in product liability law appears to have increased defense and investigation costs." Because of this uncertainty there have been recommendations for U.S. federal government involvement in the tort-litigation system or for the federal government, with the cooperation of the state governments, to draft model legislation for adoption by individual states.

From the viewpoint of an outside observer it is important to recognize that no one theory of product liability is being applied in the United States. In practice, there is considerable variation among different states in the application of product liability theories.

Product liability data from the U.S. legal system In general, U.S. courts do not categorize cases under the heading of product liability. As such, there is no readily available nationwide data base with which to analyze product liability cases. What data there is, is limited to individual American states and is limited in time. The principal sources of data are:

(i) data pertaining to product liability cases filed in the U.S. District Courts from 1974 to 1976;
(ii) product liability cases for the State of Connecticut from 1974 to 1976;
(iii) a survey of product liability cases in the greater Kansas City Area conducted by the Kansas City Trial Lawyers Association;
(iv) data from the Cook County Illinois Jury Verdict Survey of product liability from 1970 to 1975; and
(v) a survey of 655 reported product liability appellate cases in eight representative states. This survey was conducted by the legal contractor for the Task Force.

Unfortunately, the data from the U.S. District Courts cover only three years. This limited period does show, however, a substantial increase in the number of product

liability cases. From Table 2 it can be seen that the number of total product liability cases increased from 1579 in 1974 to 2886 in fiscal 1975 (an increase of 83 per cent over 1974) and to 3696 in fiscal 1976 (an increase of 28 per cent over 1975). This increase is large even when compared to the total increase in civil cases. Table 3 shows that product liability cases represented only 1.5 per cent of total civil cases in 1974 but 2.8 per cent of civil cases in 1976. Although product liability cases were rising much faster than total civil cases, by 1976 they still represented a small fraction of total civil cases. Table 4 shows that product liability claims increased from 1975 to 1976, but total personal injury torts showed almost no change. At the beginning of 1976 the Administrative Office of the U.S. District Court started to collect data on alleged damages in product liability suits. In the first three months of 1976, 713 product liability cases were filed in which damages were alleged. The average claim for damages was $849,000.

Data from Connecticut were also for a limited time period but confirmed the general increase in the number of product liability cases. Product liability cases filed in Superior Court increased by 58 per cent in 1976 over 1974. During this same period, the total torts caseload increased by 23 per cent and the total civil caseload by only 11 per cent.

Data on product liability cases for the Kansas City Area, although dealing with a more limited space, cover a longer time period, from 1967 to 1975. Over this nine-year period, product liability cases comprised only three per cent of all civil cases before a jury. In addition, this percentage remained relatively stable over the whole period. The plaintiff was successful in eight out of 22 cases and awards averaged $9850 per verdict. It is, however, difficult to generalize these results.

The Cook County survey from 1970 to 1975 revealed that plaintiffs were successful in 103 of 290 cases and that the average jury award in these cases was $247,764. Awards in Cook County were clearly higher than awards in Kansas City. Again it is difficult to know how applicable these results are to the total U.S. situation.

The data base chosen by the legal contractor for the Task Force consisted almost entirely of appellate cases. There is no evidence from which to determine whether this is representative of all cases. The data base consisted of 655

Table 2

Federal District Courts Product Liability Cases

	1974	1975	1976
Contract actions	-	278	363
Torts to land	-	42	46
Torts to personal injury	-	173	271
Personal injury by airline	-	301	160
Personal injury by marine	-	46	140
Personal injury by motor vehicle	-	438	385
Personal injury - all other	-	1 608	2 331
Total product liability cases	1 579	2 886	3 696

Source: Final Report of the Interagency Task Force on Product Liability

Note: years are fiscal years

Table 3

Federal District Courts Product Liability Cases: Comparison to Total Civil Cases

	1974	1975	1976
Total product liability cases commenced	1 579	2 886	3 696
Total civil cases commenced	103 530	117 320	130 597
Product liability percentage	1.5	2.5	2.8

Source: Final Report of the Interagency Task Force on Product Liability

Note: years are fiscal years

Table 4

Federal District Courts Product Liability Cases: Personal Injury Torts

	1975	1976	Percentage change
Total personal injury torts	21 221	21 202	-0.1
Product liability total	2 393	3 016	+26.0
Percentage	11.3	14.2	-

Source: Final Report of the Interagency Task Force on Product Liability

Note: years are fiscal years

reported product liability appellate cases in Arizona, California, Illinois, New Jersey, New York, Pennsylvania, Texas and Wisconsin. The results of the study of interest here are that:

(i) roughly half of the product liability cases involved work-related injuries. Work-related cases accounted for 46 per cent of the cases in the 1965-1970 period and just over 50 per cent in the 1971-1976 period.

(ii) of the cases that were decided on the merits, the plaintiff was successful in 51 per cent and the defendant in 49 per cent.

(iii) damage data were taken only from cases in which the plaintiff was ultimately successful. There is no separate breakdown of damages (e.g., for pain and suffering). The average damage award for all cases was $181,401. Broken down by period the average damage award was $104,202 for 1965-1970 and $221,514 for 1971-1976.

(iv) in the period from 1965 to 1970, 242 cases were reported and from 1971 to 1976 there were 413 reported cases. (This represents a 71 per cent increase.)

Although there are severe data limitations, these studies show a general increase in the number of product liability cases and a general increase in the damages awarded in product liability cases.

Review of Industry Studies

In the latter half of the 1970s a large number of industry surveys were made to ascertain the scope and nature of the product liability problem. About 20 national industry associations conducted surveys. Various surveys were conducted for the hearings taking place in Congress. Numerous letters and representations were received by the Congressional hearings. In addition, the Task Force commissioned its own surveys. This summary of the U.S. experience will concentrate on three data sources:

(i) the survey of 337 firms in the nine product lines selected by the Task Force. This survey was carried out by the industry contractor for the Task Force.

(ii) the Machinery and Allied Products Institute (MAPI) survey of 210 member firms.

(iii) the National Federation of Independent Business (NFIB) survey of 1296 of its members.

The most comprehensive industry survey was conducted by the industry contractor for the Task Force study. The contractor surveyed 337 firms, equally divided among small, medium and large firms. The firms were manufacturers of nine product categories selected by the Task Force. The product categories with workplace impact were industrial machinery, industrial grinding wheels, ferrous and nonferrous metal castings and industrial chemicals. The product categories with consumer impact were aircraft components, automotive components, medical devices, pharmaceuticals and power lawnmowers. Tables 5, 6 and 7 present the major statistical results of the study.

(1) Most manufacturing firms have some form of product liability insurance. About 86 per cent of all firms are insured. This breaks down as follows: 71 per cent of small firms are insured and over 97 per cent of large firms carry insurance.

(2) Unavailability of product liability insurance does not appear to be a problem. Only a little over 1 per cent (4 firms) reported that insurance could not be obtained at any cost.

(3) The cost of product liability insurance has increased substantially since 1971: by 1976 it had increased 280 per cent. In the two years from 1974 to 1976 alone, insurance costs increased 210 per cent. It should be noted that there are a number of problems with this cost data. Over 80 per cent of the firms in this sample purchase product liability insurance as part of a comprehensive general liability (CGL) package. As such, they generally do not know exactly what they are paying for product liability insurance. In most cases this figure is estimated. In addition, the product liability insurance rates are quoted per $1000 of sales of the firm. The rest of the terms of the insurance contract are not stated. For example, the average deductible level or the limits of liability are not stated. From Table 5 it can be seen that average deductible levels increased from $51,100 in 1971 to $232,600 in 1976. This

Table 5

Comparative Analysis of Leading Indicators for Small, Medium and Large Firms: Product Liability Industry Telephone Survey

	Under $2.5 million	$2.5 million–$100 million	Over $100 million	Total
Comprehensive general liability cost ($) per $1,000 sales				
1971	2.87	1.25	0.67	1.17
1975	4.86	2.36	0.89	2.32
1976+	7.42	3.88	1.24	3.59
Estimated product liability insurance cost ($) per $1,000 sales				
1971	1.10	.93	0.54	0.74
1975	2.58	1.47	0.78	1.40
1976+	5.32	3.23	1.09	2.81
Percentage change				
1971–1976+	383	247	102	280
1975–1976+	106	120	39	101
Average deductible or risk retention level ($000)				
1971	13.2	57.3	54.3	51.0
1975	8.9	33.6	207.4	138.3
1976+	7.4	120.4	334.5	232.6
Percentage of firms reporting claims, 1971-1976				
1971-1976+	18	50	96	56
Average number of pending claims per firm				
1971	.01	.58	13.79	3.4
1975	.06	3.18	46.82	14.0
1976+	.08	3.46	65.01	18.9
Percentage change				
1971–1976+	700	496	371	456
1975–1976+	33	9	39	35
Average number of new claims per firm				
1971	.02	.9	16.1	4.3
1973	.06	1.2	39.0	11.1
1975	.08	1.6	38.2	11.4
1976+	.07	1.3	33.4	9.9
Average amount of damage sought in new claims per firm ($000)				
1971	1.1	130.8	1 978	476
1975	8.1	843.9	2 470	888
1976+	4.3	178.1	7 496	1 711
Average settlement amounts per firm ($)				
1971	900	1 400	45 400	12 100
1973	600	3 200	96 200	28 200
1975	100	6 100	70 200	22 200
1976+	100	7 500	92 120	27 800

Source: Final Report of the Industry Study, Interagency Task Force on Product Liability

+Note: figures for 1976 are for the first nine months only

Table 6

Extent of Current Product Liability Coverage
(by size category as of December 31, 1976)

Size of firms	Percentage		Number of firms	
	Yes	No	Yes	No
Less than $2.5 million	71.3	28.7	72	29
$2.5 to $100 million	87.4	12.6	104	15
$100 million and over	97.3	2.7	110	3
All size categories	85.9	14.1	286	47

Source: Final Report of the Industry Study, Interagency Task Force on Product Liability

Table 7

Reasons for not Carrying Product Liability Insurance: Percentage of Total Responses by Size Category

	Less than $2.5 million		$2.5 to $100 million		$100 million and over		All firms	
	%	No.+	%	No.+	%	No.+	%	No.+
Too expensive	11.7	12	4.2	5	1.8	2	5.6	19
Don't think they need coverage	10.7	11	3.4	4	-	0	4.5	15
Can't obtain coverage at any cost	2.9	3	0.8	1	-	0	1.2	4
Previous coverage recently cancelled	-	0	0.8	1	-	0	.3	1
Preferred to be self-insured	1.0	1	-	0	0.0	1	.6	2
Other	2.9	3	3.4	4	-	0	2.1	7

Source: Final Report of the Industry Study, Interagency Task Force on Product Liability

Note: + indicates the number of firms responding

means that effective premium increases are greater than is indicated by the numbers in the table. The industry contractor also discovered that the overall average limits of liability for bodily injury, or combined bodily injury and property damage, did not change significantly from 1971 to 1976. During this period the average limit for combined bodily injury and property damage per occurrence for small firms is about one-third as large as the limit for medium-sized firms and less than one-sixth as large as that for large firms.

(4) The cost of product liability insurance per $1000 of sales in 1976 is $5.32 for small firms and $1.09 for large firms. This data, by itself, indicates a much higher cost for small firms. However, the numbers have to be modified because the other terms of the product liability insurance contract are different for small vis-à-vis large firms. In 1976 the average deductible level for small firms was $7400 whereas for large firms this was $334,500. To some extent this explains the difference in cost. However, small firms have much lower limits of liability than large firms. For combined property damage and bodily injury in 1976, small firms had limits of liability per occurrence averaging $610,000 whereas large firms had limits averaging $4,154,000. This fact would argue that the true difference in insurance costs for small and large firms is underestimated in Table 5. Another possible reason for this difference is the fixed costs inherent in any insurance contract. The cost of underwriting, inspecting and examining a plant are about the same for both small and large firms. Table 5 also shows that the cost of insurance for small firms has increased by 383 per cent from 1971 to 1976, whereas the cost of insurance for large firms has increased 280 per cent over the same period. This may be due solely to the reduction in deductible levels for small firms over the period and the four-fold increase in deductible levels for large firms (and, at the same time, there was no change in the limits of liability for either small or large firms). As such, there is no strong evidence supporting the conclusion of

larger effective increases in premiums for small firms vis-à-vis large firms.

(5) The high cost of insurance does not appear to be a significant factor in deterring firms from acquiring it. Less than 7 per cent of firms indicated that they did not carry product liability insurance either because it was too expensive or because it was unavailable at any cost.

(6) Over the period from 1971 to 1976 there appear to have been significant increases in the number of product liability claims filed and the amount of damages sought. The average number of new claims per firm increased from 4.3 in 1971 to 11.4 in 1975. The average amount of damages sought in new claims per firm increased from $476,227 in 1971 to $887,700 in 1975.

(7) The data on average settlements (which includes damage awards and out-of-court settlements) does not show clear trends. In 1971 the average settlement per firm was $12,100. In 1972 this rose dramatically to $28,800. Since then the figures exhibit no significant trend. In 1976 the average settlement per firm was $27,800.

(8) The industry contractor analyzed the accident-reporting systems of the State Worker's Compensation Board, the Consumer Product Safety Commission and the Federal Aviation Administration. They found "no apparent trend in either the relative frequency or severity of injuries among product categories selected by the Task Force for analysis. Therefore the increase in product liability claims and litigation against manufacturers does not appear to result from any increase in product-related accidents" (Final Report of the Industry Study, III-2). It should be noted that this finding for workplace products was on the basis of limited data for the period from 1966 to 1972. Also, it is more strongly supported with regard to workplace products than consumer products.

(9) Eight per cent of the firms surveyed stated that they had delayed or cancelled the introduction of new products because of product liability

problems. The industry contractor also attempted to analyze the product liability problem specifically with respect to small business to assess the economic effects of the premium increases already noted on small business. Were the increases so high that small businesses were forced to go without product liability insurance coverage? Did they slow small businesses' introduction of new products? Did the increases force any small businesses into bankruptcy? In general, data to answer most of these questions were unavailable. Most of the data were anecdotal and were obtained from letters from or representations by various small businesses before the Task Force. From these casual data sources and the survey of 337 firms, which included small business, the Task Force drew the following conclusions:

(i) Although availability of insurance is more of a problem for small business than for large, this does not appear to be a significant problem for small business.

(ii) Although product liability insurance rates are high for small business, in most cases the average cost of product liability insurance is less than 1 per cent of sales.

(iii) Product liability problems in some high-risk industries may have slowed new product development.

(iv) Product liability problems do not appear to have been a direct or sole cause of business failure.

The MAPI study, conducted in August 1976, surveyed 210 firms over a broad range of industries, concentrating on the capital goods industry. These industries produce primarily workplace products. The results of this survey generally confirm the results obtained by the industry contractor for the Task Force. The MAPI survey showed a large increase in both the number and dollar amount of product liability claims during the last ten years. Almost all (over 95 per cent) respondents indicated that they carried primary product liability insurance. Over half the companies indicated that product liability insurance costs were in the range of 0.1 to 0.9 per cent of total sales.

Table 8

Product Liability Insurance Costs as a Percentage of Sales

Percentage range	Number of firms
Less than .01	19
.01 - .09	29
.1 - .9	105
1.0 - 1.9	17
2.0 - 2.9	4
3 and above	3
Total	177

Source: Final Report, Task Force on Product Liability

The NFIB study was conducted in October 1976. It obtained responses from 1296 small independent manufacturing firms. This survey showed a larger percentage of firms going "bare" (i.e., without product liability insurance). Only 58 per cent reported carrying product liability insurance. Of the smallest firms (those with sales less than $50,000) only 28 per cent carried product liability insurance, and of the large firms (those with sales over $1,000,000) 78 per cent carried some form of product liability insurance. About 9 per cent of the firms stated that they could not afford to carry product liability insurance. Nonetheless, less than 1 per cent stated that they could not obtain insurance at any price. The survey indicated substantial increases in product liability insurance rates, in product liability claims filed against responding firms and in paid damages arising from product liability claims. Claims per firm in 1976 were 2.5 times the number filed in 1972 and, in the first nine months of 1976, the amount of damages paid was 2.5 times the amount paid for the full year of 1972. About one in eight firms reported that a new product was not introduced because of product liability problems.

Review of Insurance Studies

There are two major studies of the U.S. insurance industry which will be examined here. The first is the contractor study of the insurance industry prepared for the

Task Force. It consisted of 141 personal interviews with members of the insurance industry and a review of about 3000 underwriting files on product liability cases for six insurance companies (these six companies are among the largest writers of product liability insurance). The second is a closed claim survey undertaken by the Insurance Services Office (ISO). Neither of these studies generated specific enough data to shed any light on the insurance aspect of the product liability problem. As mentioned earlier, in the United States as in Canada, product liability insurance is written as part of a comprehensive general liability package. Insurance companies do not keep separate data with respect to product liability insurance. As such, the Task Force soon discovered that "comprehensive data are not available on product liability claims costs, payments, reserving practices, amounts of product liability coverage provided by reinsurers, and other indicators of product liability procedures used by the industry" (Final Report of Task Force, V-4). Because of the growing importance of product liability insurance the ISO (the industry's major statistical and rate-making organization) is now starting to keep separate data for product liability insurance.[1] As a result preliminary data on product liability insurance are now available, but all of this data is current and there is little in the way of historical information.

The contractor study of the insurance industry concentrated largely on a description of product liability insurance, the industry and its underwriting practices, and premium setting for product liability insurance. Since the institutional arrangements are very similar in Canada and the United States and since the Canadian insurance market was discussed in detail in Chapter II, the U.S. product liability insurance market will not be discussed here. Because of data problems there were few empirical results from this study. It did discover rate increases for product liability insurance occurring in 1975 and 1976. However, these increases were in the published manual rates and only between 10 to 15 per cent of all product liability insurance is manually rated. Hence, substantial rate increases could have occurred prior to 1976 without any changes in the manual rates. In addition, due to competitive reasons manual rates can increase and this will not necessarily be reflected in premium costs. The insurance contractor applied the manual rate increases on 1976 to each

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1. On June 1, 1977 the ISO modified its statistical plan on data collection of premiums and experience data on product liability insurance.

of the nine product classifications of the industry study, where applicable. In addition, current A-rates were applied where applicable and changes in limits of liability were taken into account. This computation yielded an average increase in premiums of over 100 per cent. There are a number of data problems with this result but in general it is consistent with the 1975 to 1976 increase in product liability premiums estimated from the industry study. The study also found that about half the premium dollar is used to pay claim settlements and jury awards. Assuming an average contingent fee rate of 33 1/3 per cent for plaintiffs' attorneys, this means claimants receive 33 per cent of total premiums. About 20 per cent of total premiums is used for expenses in handling claims, mostly legal defence costs, and about 25 per cent of total premiums is used to pay expenses of underwriting and administering the business.

The ISO study was started in 1976. Data were collected on all product liability claims of 23 member firms (about 7800 claims) closed between July 1, 1976 and November 1, 1976. The main results of this study of interest here concern the distribution of claims closed at various stages of the legal system. These results can be seen from Table 9. It shows 1085 bodily injury claims, with 788 receiving some payment and 297 receiving no payment (over 70 per cent of the claims were settled with non-zero payments to the claimants). Of the 1085 claims, 165 went to a court verdict (over 15 per cent). Of those going to a final court verdict the plaintiff won in over 75 per cent of the cases. If the unsuccessful verdicts for the plaintiff are taken into account, the average cost per claim of claims going to a court verdict would be $11,473 in payments and $7441 in allocated loss adjustment expenses, for a total of $18,914 per claim.

Since the publication of the Task Force report, the final report of the ISO survey has been made covering over 24,000 closed claims for the period from July 1, 1976 to March 15, 1977. The report indicated, with untrended data, that the average payment per bodily injury claim was $3592 and the average paid per successful claim was $5443. In the final report of the ISO less than 4 per cent of all claims went to verdict, with the insurer winning approximately 75 per cent of these. In addition, it was found that for every dollar of claim paid, 35 cents was paid for claim administration expenses. It should be noted that it is difficult to tell how representative the ISO claims are of the industry in total.

Table 9

Product Liability Closed Claim Costs
by Stage of Legal System (Untrended)

Stage of legal system	Number with payment	Average of non-zero payments ($)	Number of claims	Average allocated loss adjustment expenses ($)
		Bodily injury		
Binding arbitration	2	2 082	3	734
No suit filed	56	1 829	88	305
Suit filed but settlement reached before trial	655	14 358	789	4 552
Settlement during trial but before court verdict	36	32 961	40	12 136
Court verdict	39	48 538	165	7 441
Total	788	15 978	1 085	4 916
		Property damage		
Binding arbitration	1	1 481	1	435
No suit filed	33	3 908	42	290
Suit filed but settlement reached before trial	169	8 417	205	3 104
Settlement during trial but before court verdict	9	8 095	12	5 198
Court verdict	21	15 530	53	9 167
Total	233	8 377	313	3 825

Source: Insurance Services Office, 1976 Product Liability Closed Claim Survey, Preliminary Analysis of Survey Results, December 1976

Summary of U.S. Experience

(1) By 1971 and 1972 a number of important states had adopted strict product liability theories.

(2) In the period from 1971 to 1976 the number of product liability cases increased.

(3) In this same period there was an increase in the damages awarded in product liability cases.

(4) The cost of product liability insurance has substantially increased since 1971.

(5) The large majority of manufacturing firms have some form of product liability insurance.

(6) Unavailability of product liability insurance does not appear to be a problem.

(7) Product liability insurance per $1000 of sales is more expensive for small firms than for large. The evidence is inconclusive that small firms have had greater increases in premiums than large firms.

(8) Product liability problems do not appear to have been a direct or sole cause of business failures.

(9) About one-half of all product liability cases are work related.

(10) There are no trends in the number or severity of accidents.

These results all came from studies hampered by severe data limitations. If the data limitations are ignored and it is assumed that these results can be applied in general, then they yield some insight into the product liability problem (i.e., the problem of large increases in product liability insurance rates). The data show an increase in the number of product liability claims, an increase in damages awarded and no increase in the number or severity of accidents. These facts have important implications for the variables discussed in Chapter I. No increase in accidents indicates that the probability of an accident, P(A), has not changed. The increases in claims and average awards indicate that the probability of a successful claim given an accident, P(S/A), has increased. Since p, the joint probability of a successful claim and an accident is defined as

$$p = P(S,A) = P(S/A) \cdot P(A)$$

and since P(S/A) has increased, then p will have increased. In addition, the amount of the average award, S, has increased. The expected payment per exposure unit for the insurance firm is pS. Since both p and S have increased, expected payouts of insurance firms have increased. More claims and larger awards are responsible for increased premiums. The crucial question is to what extent these two phenomena are the result of the adoption of strict liability rules. In Chapter III it was argued that the change from a negligence standard to a strict liability standard would increase p. The U.S. experience offers some empirical support to that proposition. The key is to what extent the rise in product liability insurance premiums is due to the adoption of strict liability. This will be examined for the Canadian situation in the next chapter.

CHAPTER V

IMPACT OF CHANGES IN PRODUCT LIABILITY RULES

This chapter investigates the impact in Canada of moving from the current negligence standard to a strict liability standard. The focus here is on the product liability of manufacturers; the retailer is not considered. Under contract law in Canada, the retailer is already strictly liable to all parties privy to the sales contract. In general, therefore, retailers are already strictly liable to the consumer. Therefore this chapter deals only with the impact of changes in tort law and the impact of an extension of contractual strict liability to manufacturers. The analysis is concentrated in the following three areas: the existence of product liability insurance markets in Canada; the cost of product liability insurance; and the impact on small business of a move to strict product liability.

Will Product Liability Insurance be Written under a Strict Liability Standard?

The following quotation is from a report by a leading insurance company: "The courts appear to abandon all contact with life, placing insurance in a position to which it almost ceases to be insurance and is made to function as some kind of social welfare institution." This was used by the insurer to argue that liability insurance is something that the insurance markets cannot handle. The report was written over 25 years ago in 1953 and was concerned with motor vehicle liability insurance not product liability insurance (Kaletsky, 1978). In 1953 insurers apparently were concerned that motor vehicle insurance markets would not be formed because of the inherent problems in this type of liability insurance. Now there is a thriving insurance market for motor vehicles.

In recent times similar sentiments have been expressed with respect to product liability insurance. Some doubt that insurance markets can handle product liability insurance. This attitude tends to be strengthened when insurance markets are operated under strict product liability. We have no doubt that insurance markets <u>will</u> exist under strict product liability rules and that product liability insurance will be available to the vast majority of manufacturers, wholesalers and retailers. This conclusion is based on the following:

(i) From a theoretical point of view, there are no compelling reasons why product liability

insurance would not be written under any of the five liability rules considered in this study. If the moral hazard problem was severe there might be reasons for insurance markets not to exist. However, the nature of the moral hazard problem is similar under a negligence standard and a strict liability standard. Currently, product liability insurance is written under negligence standards, which would indicate that moral hazard problems are not severe. In addition, from our conversations with insurance industry representatives it is evident that the industry does not see moral hazard as a significant problem as far as product liability insurance is concerned for the reasons discussed in Chapter III. Because firms carry insurance, it will not pay them to reduce the safety level of their product. The discipline of the marketplace would make it unprofitable for firms to alter their behaviour when they acquire product liability insurance. In theory, therefore, there are no obstacles to the formation of product liability insurance markets under a strict liability standard.

(ii) In the United States, strict liability rules are the most common tort liability standards. The Task Force examining the U.S. situation concluded that "there is no widespread problem of product liability insurance being unavailable" (Final Report, p. xxxv). Its survey showed that over 86 per cent of the reporting firms carried some form of product liability insurance. In the Task Force survey, the NFIB survey of small business and most of the independent industry surveys, only about 1 per cent of the firms stated that product liability insurance was unavailable at any cost. The U.S. evidence shows clearly that product liability insurance markets exist and operate under a regime of strict product liability.

(iii) Chapter II dealt with the Canadian product liability insurance market. Many of the insured companies export their products to the United States and require product liability insurance for both their Canadian sales and their U.S. sales. Their U.S. sales are subjected to product liability risks that will generally be

adjudicated using strict product liability rules. Canadian insurers are currently writing product liability insurance covering both domestic and foreign sales and they are operating to some extent under strict tort liability rules.

(iv) Conversations with insurance industry representatives have indicated that product liability insurance would be written under a regime of strict liability.

For these reasons it seems fair to conclude that insurance markets for product liability insurance would exist under strict product liability rules. There may be some short-run problems when a change is made from a negligence standard to a strict liability standard. It will take some time for insurance companies to collect data on claims frequency under the new standard. Also, time will be required to see the size of awards that courts make under the new standard. In the short run, insurers will be subject to increased uncertainty and this will be reflected in the premium charged. In the longer run, insurers will have the data they need and this should make for a smoothly operating product liability insurance market.

Cost of Product Liability Insurance under a Strict Liability Standard

Some researchers have concluded that affordability rather than availability is the key problem with respect to product liability insurance. It is very difficult to anticipate what premium rates would be in Canada if strict liability is adopted, although there is some evidence to estimate this. Strict product liability was adopted by major states in the United States by the early 1970s and the first five or six years of the 1970s saw very substantial increases in product liability insurance premiums. The first question is to what extent the rise in product liability insurance premiums in the United States is due to the adoption of strict product liability rules.

Given the difficulty of the question and the paucity of U.S. data on product liability, it is impossible to answer in detail. Nonetheless, some general comments can be made. From a theoretical point of view, it was argued in Chapter III that with a move from a negligence standard to a strict liability standard, product liability insurance premiums should increase. This increase was expected primarily

because strict liability lessened the burden of proof for plaintiffs. Hence, it was concluded that strict product liability would increase insurance premiums because it increased the probability of a successful claim given that an accident occurred (i.e., P(S/A) increased). The increase in P(S/A) would cause p, the joint probability of a successful claim and an accident, to increase. Theoretically, there is no reason why a movement to strict product liability should increase the average amount of awards and settlements, S.

From the review of U.S. experience in Chapter IV, evidence was presented of increasing values for p and S during the 1970s. It is difficult to know how much of the increase in p was caused by a shift to strict liability. However, it is hard to relate the increase in S to the movement to strict product liability.[1] This means that, of the two major factors responsible for increases in product liability insurance premiums, only one is directly connected to the adoption of strict product liability. Hence, only part of the increase in product liability insurance premiums in the United States can be blamed on the movement to strict liability. The difficulty comes in quantifying the extent of this impact. To some observers of the U.S. scene, the movement to strict liability explains a large part of the premium increase. To others, the movement to strict liability explains only a small part of the premium increase. When Dennis R. Connolly, representing the American Insurance Association (AIA), appeared before the Subcommittee on Capital, Investment and Business Opportunities he was asked what effect the AIA proposals would have on product liability insurance premiums. These proposals included abbreviating the Statute of Limitations, making the state of the art an absolute defence and making prior modifications and alterations of the product an absolute defence. He responded to this question by saying that such proposals "would not result in vast savings over current product liability premiums" (Hearings before Subcommittee on Capital, Investment and Business Opportunities of the Committee on Small Business, House of Representatives, 1977).

The second question is to what extent the U.S. experience is relevant to Canada. To answer this, the relevant differences in the U.S. and Canadian environments must be examined.

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1. Despite data problems, there is a general feeling that awards in the United States are increasing due to greater awards for pain and suffering and for punitive damages.

Treatment of workplace-related injuries Recovery for workplace-related injuries is different in Canada than in the United States. A system of workmen's compensation is common to both countries which prevents employees from suing employers with respect to workplace-related accidents. But there is, in general, nothing in the U.S. system to prevent injured employees from suing manufacturers of defective workplace products. In fact such suits represent a significant portion of total suits. The legal study for the Task Force concluded that one-half of all product liability cases arose from work-related injuries. The final report from the ISO survey indicated that workers injured on the job are involved in 11 per cent of product liability incidents, but these incidents account for 42 per cent of total bodily injury payments. In Canada the situation is vastly different. It is hard to find a single case of an employee suing a manufacturer of defective workplace equipment. The Ontario law requires that a worker either collect workmen's compensation or sue the manufacturer. The worker cannot do both.[2] There is little or no risk in collecting workmen's compensation; however, lawsuits involve outlays of money to pay for legal costs and one can never be sure of the results. Because of this it is very rare for a worker in Canada to sue a manufacturer with respect to a workplace-related injury.

Because of the importance of workplace-related injuries and because of the differences in the law of the two countries (i.e., primarily the Workmen's Compensation Act), insurance premiums on products that are involved in workplace injuries in the United States are substantially higher than premiums on the same products in Canada. Consider the data in Table 1 which lists the ratio of premiums charged on U.S. sales to premiums charged on Canadian sales of identical products made in Canada. A casual look at that table shows that the difference in premiums tends to be higher for work-related products than for consumer products. The biggest difference is for abrasives, for which the premium is 10.7 times larger for U.S. sales than for Canadian sales. Table 1 shows that premium rates are consistently higher for U.S. sales than for Canadian sales. This fact has been worrisome to the Canadian Manufacturers' Association (CMA). They have argued that for premium increases "the greatest hardship is being felt by companies exporting to the U.S.

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2. For a discussion of these issues and a few fine points of the Workmen's Compensation Law in Ontario, see R. Hasson, undated.

where there is exposure to the dramatically high and accelerating loss experience in that country" (CMA, 1977, p. 1). As a result, the CMA has conducted a survey showing that a number of firms exporting to the United States or to Western Europe have experienced increases in product liability insurance premiums.

Awards for pain and suffering and punitive damages There are no reliable U.S. data indicating the extent of awards for pain and suffering and for punitive damages. The general feeling is that in the last ten years there have been substantial increases in both types of awards. Illinois became concerned about the pain and suffering awards it was handing out and now limits these awards to $500,000. A total damage award of this size would be considered large by Canada's standards! It should be noted that a review of the legal studies showed Illinois to be a very typical state. Although there are no good Canadian data on this point, the legal profession here believes that awards for pain and suffering in Canada are substantially less than those in the United States. In addition, punitive damage awards are not generally made in Canada. Although the evidence is mostly casual, awards in Canada for pain and suffering and for punitive damages appear to be substantially less than those in the United States. This is another reason for lower product liability insurance premiums in Canada.

Attorneys' fees: basis of billings In the United States it is common for attorneys to work on a contingency fee basis; such fees are not usually allowed in Canada. In the United States a plaintiff needs almost no funds to finance a lawsuit. The plaintiff's lawyer will bear the legal costs of an unsuccessful suit. In addition, in the United States it would generally be highly unlikely for the courts to make unsuccessful plaintiffs pay defence legal costs. As such, plaintiffs bear little financial loss from unsuccessful lawsuits whereas in Canada unsuccessful plaintiffs run the risk of bearing both their own and the defendant's legal costs. Hence lawsuits are much riskier for plaintiffs in Canada. As such, for any given industry, there would likely be far fewer product liability lawsuits in Canada than in the United States. The lower number of lawsuits may lower p, the joint probability of a successful lawsuit and an accident given the liability standard, since the high costs of litigation in Canada will deter valid claims for small amounts. For this reason, p will be lower in Canada than in the United States. This is just one more reason for lower

product liability insurance premiums in Canada. In addition, fewer lawsuits in Canada will result in lower defence costs for insurance companies and hence lower premiums for product liability insurance.

From this analysis, it can be concluded that the environment in Canada is significantly different from that in the United States. It is because of these environmental differences that product liability insurance premiums on identical products are lower in Canada than in the United States. However, the primary interest here is not the level of premiums in Canada vis-à-vis the United States but what will happen to product liability insurance premiums if a strict product liability rule is adopted. By how much will premiums increase? Again the differences in environment in Canada and the United States can be used to help answer these questions. Will premiums in Canada increase to the same extent under strict product liability that they did in the United States when it moved to strict product liability? Because of the environmental differences, the answer is no. When the United States moved to strict product liability the number of product liability cases increased significantly. With a movement to strict product liability in Canada, the increase in the number of product liability cases would probably not be anywhere near what it was in the United States. In Canada, potential plaintiffs would find that the costs of fighting lawsuits were higher than those of their U.S. counterparts and they could also expect lower awards. As such, the incentives to engage in lawsuits would be substantially less in Canada. In addition, when the United States moved to strict liability, workers injured in workplace-related accidents found that the probability of a successful lawsuit had increased; this encouraged lawsuits. In Canada, if strict liability was adopted, there would be no increase in workplace-related suits since, in general, there are great disincentives imposed by the various workmen's compensation acts.

This smaller expected increase in product liability claims would result in a smaller increase in product liability insurance premiums in Canada than in the United States. There are two other reasons to expect smaller increases in Canadian insurance premiums. In the United States today there is substantial uncertainty as to the exact product liability rules. Liability rules as enforced by the courts vary from state to state, and within a state they sometimes vary from case to case. This uncertainty results in higher insurance premiums. Presumably if strict liability is adopted in Canada, it will be a result of the various

provinces adopting consistent model legislation that they worked out jointly with the federal government. This will reduce uncertainty concerning the liability rules and will help to moderate the increase in product liability insurance premiums. In fact such a model legislation proposal is currently being considered by the U.S. government. This analysis has assumed that all provinces would adopt the same product liability rules.

One might ask what the results would be if only one province adopted strict product liability theories. Analysis of this situation becomes greatly complicated. If the province where the manufacturer resides was different from that where the accident occurred it would be up to the courts to decide which province's product liability laws should be applied. This uncertainty may cause insurance premiums to increase by more than they would have otherwise. In addition, if one province moved to strict product liability and all others did not, this might influence the manufacturers' decisions in locating new plants or new head offices. This potential effect might deter one province from going it alone. For both reasons, strict liability is the appropriate standard and it would be preferable if it were adopted on a uniform basis throughout Canada.

There is a second reason to expect a smaller increase in insurance premiums here in Canada. According to Romero (1978) strict liability doctrines are already applied in a large number of product liability cases. The purchaser of a defective product can sue a seller for any damages resulting from the defective product. The seller can then sue the manufacturer. These suits would not take place under tort law but under contract law. With these suits a doctrine of strict liability would be imposed. Hasson argues that the current system is more expensive for the manufacturer (because of this sequence of suits) than strict tort liability. If this is the case, this fact alone would tend to decrease settlement costs and hence decrease insurance premiums with the move to strict tort liability. In addition, Hasson claims that although the courts purport to apply a negligence standard, they apply in effect a strict liability standard. In practice if it can be shown that a product is defective, then this is sufficient evidence to demonstrate negligence on the part of the manufacturer. If Hasson is correct in his belief, and we are currently very close to a strict product liability standard, then there should be very little change in insurance premiums if a formal rule of strict liability were adopted.

Some commentators have claimed that the movement to strict product liability would have an inflationary effect on the Canadian economy. They argue that it would result in firms paying higher rates for product liability insurance and that some of this increased cost would be passed on to the consumer through higher prices. The movement to strict product liability would indeed result in some increase in insurance rates and some increase in product prices, although the empirical data indicate that this increase would be very small. However, a strong case can be made that this would not be inflationary. If the price of butter increases by ten per cent, the price of a Chevrolet increases by ten per cent and so on for all other products, then this is an inflationary situation. However, if one pays more for a product whose quality has improved then this is not an "economic price increase." It is simply payment of a different price for a different product. The latter is the case for price increases due to a movement to strict product liability. As mentioned earlier, with strict product liability all products are sold with full insurance coverage. With strict product liability you buy not only the good but the insurance coverage. You pay a higher price for a good that is essentially different (i.e., it now has built-in insurance coverage). Would the following situation be inflationary? Initially shoes and shoelaces are sold separately. The price of shoes increases but included in one's shoe purchase are shoelaces. Clearly such a situation is not necessarily inflationary. The same is the case with the introduction of strict product liability. (Also the introduction of strict product liability would change relative prices and not the absolute price level.)

In summary:

(i) In the U.S. experience not all of the increase in product liability insurance premiums was due to the adoption of strict product liability.

(ii) Due to legal differences between the two countries, the effect on product liability insurance premiums in Canada of adopting strict liability cannot be inferred from the U.S. experience.

(iii) If Canada adopts strict product liability, the number of product liability claims would probably increase and product liability insurance premiums would also rise. This increase in premiums would be nowhere near the increase that occurred in the

United States when strict product liability rules became prevalent.

The Effect on Small Business of a Move to Strict Product Liability

The major empirical evidence on this point comes from the U.S. experience, which indicates that the availability of product liability insurance was not as severe a problem as was first thought. In the industry study of 337 firms, only 3 small businesses indicated that product liability insurance was unavailable at any cost. In the NFIB study of small business, less than 1 per cent of the firms indicated that product liability insurance was unavailable at any cost. The main problem for small business was the affordability of product liability insurance. For small business the industry study showed that product liability insurance increased 383 per cent over the period from 1971 to 1976 and just about doubled in the period from 1975 to 1976. Although this increase was large, by 1976 product liability insurance premiums still averaged less than 1 per cent of sales for small businesses. Nonetheless, one would expect that this large increase in insurance premiums would have economic effects on small business.

The first thing to note about this large premium increase is that there is no reason in theory why the increase (in percentage terms) should be greater for small business than for large business. Because of fixed underwriting and inspection costs, higher premium costs for product liability insurance should be expected for small business vis-à-vis large business. However, there is no reason to expect a greater percentage increase for small businesses. In fact there is no empirical evidence to indicate greater rate increases for small business. If this is the case, the large premium increases would not affect the competitive position of small business. Both would have to adjust to the new insurance situation. For competitive industries, if costs increase identically for all firms then the major economic effect in the long run will be higher prices charged for their products. In the short run there will be disruptions for both small and large firms.

The U.S. industry study concluded that product liability problems do not appear to have been a direct and sole cause of business failures. Product liability problems did, however, appear to delay the introduction of new products. The U.S. evidence indicates that increases in

product liability insurance did produce dislocations for small business but that these dislocations did not have serious long-run implications.

If the problems of small business are not severe in the United States, they are expected to be less so here upon the adoption of strict liability. It has already been argued in this paper that the increase in product liability insurance premiums would be lower in Canada than it was in the United States. In addition, it has been argued that from a theoretical point of view there is no reason to believe that small business premiums would increase by a larger percentage rate than large business premiums. This being the case there do not appear to be serious long-run problems for small business with the adoption of strict product liability rules. If there is a problem it will occur for small businesses producing high-risk products. With strict liability the premiums of these firms should increase by a greater amount than those of the average firm, and it is possible that premiums for these firms could increase to such an extent that these high-risk products will no longer be manufactured. Large manufacturers of high-risk products would also experience difficulty.

CHAPTER VI

ALTERNATIVE SOLUTIONS

Based on the analysis in the previous chapters, it has been concluded that a change in the liability rule to one of strict liability would not have a major impact on the writing of primary product liability insurance or reinsurance. This conclusion is based on the recognition that a change to strict liability from the current negligence standard is not very severe. In addition, this change does not increase the moral hazard problem -- a significant increase in moral hazard would be one justification for a reduction in the amount of product liability insurance written. Finally it is expected that the uncertainty surrounding the interpretation of strict liability will be ameliorated since there will be consistency in the legislation from province to province; this consistency across different jurisdictions is one of the objectives for future action in the United States.

Of course, there will be short-run adjustment problems as the insurance companies learn to live with the new liability rules and start to collect the historical data necessary to evaluate premiums. Whether or not the insurance companies hold back on an immediate revision of premium rates when the new liability standard is introduced is a subject for conjecture. At least one major primary writer of product liability insurance has suggested that they will not alter their premiums until they evaluate some claims experience under the new liability regime. Unfortunately for the insurance companies, there is little evidence to guide them in the short run in setting premiums. Although they have access to premiums charged on comparable products sold in the United States, the U.S. experience, and hence the premiums charged, are not strictly applicable in Canada.

There have been a number of solutions proposed in the United States to the product liability crisis. These solutions have attacked two elements of the crisis -- the availability of product liability insurance to small business and the rising cost of this insurance. It is not useful to generalize the solutions to the first problem to Canada since it is not likely to be a serious concern here. However, an appreciation of the costs and benefits of some of the solutions is useful.

The proposed solutions to the second problem range from the improvement of designs, quality control,

instructions and labelling (i.e., loss prevention) to changes in the tort-litigation system and limitations on the size of awards. These proposals would affect the probability of a successful claim, given that an accident occurred, and the size of the expected loss. Canada is fortunate in being able to benefit from a number of the legal problems found in the U.S. interpretation of strict liability. These problems are essential inputs in the drafting of good legislation for Canada but are not important in answering the question of whether insurance markets will exist. Therefore the solutions proposed to reform the tort-litigation system will not be considered here.

Provisions to Improve Availability and Affordability

Direct federal insurance or reinsurance In their report the consultants (McKinsey and Co. Inc., 1977) proposed a federal government reinsurance scheme that would be established for a short time -- three years. Since it was anticipated that any availability problems would be of a short duration, the necessity of this reinsurance scheme would be evaluated after three years. The consultants rejected the concept of federal insurance since it would disrupt the existing market and would require the government to enter into an area in which its expertise is limited. The reinsurance scheme was a federal and not a state responsibility due to the widespread use of products across the various states in the United States and the widespread manufacture of products.

Both the insurance and reinsurance plans have serious disadvantages. They would expose the government, and hence the taxpayer, to open-ended liability. In addition, there would be the problem of adverse selection -- the federal insurance or reinsurance would end up covering those companies which are of high risk.

There are some advantages to the formation of a federal reinsurance facility. Although it would not solve the availability problem, it would certainly ameliorate it for small or medium-sized businesses since it would permit writers to reduce their liability. However, this is only important if the private reinsurance market is not performing its function for product liability insurance. In addition, the reinsurance option is the least disruptive to the private insurance market.

A serious problem with a government reinsurance plan is that it would be expected to reduce rates since there

would be no profit or tax element in the premium. The Commission argued that this would affect the cost of insurance without requiring a subsidy. However, no matter what they tried to call it, the reduction in premiums is possible only through a subsidy. The basic assumption for the existence of a federal reinsurance scheme is that primary writers will find it profitable to underwrite the risk in the first instance even if the major part of the risk can be reinsured. One potential problem in this regard is that the primary writer may reinsure such a large part of the risk that the federal reinsurance agency is effectively writing primary insurance.

A further problem concerns the definition of the entity requiring assistance. For example, it was suggested that one criterion could be those businesses with product liability insurance costs in excess of two per cent of revenues. Consider two companies with the same level of sales producing the same product, but one firm uses high-quality control standards and the other does not. The former firm has insurance rates less than the two per cent value whereas the latter has insurance rates in excess of two per cent and thus is eligible for the insurance subsidy. In this example there is no incentive for the latter firm to improve its quality control if the subsidized insurance is less than a market-determined rate. Thus the scheme would result in subsidization of a very hazardous product.

A related problem is that with market-determined insurance premiums, some small firms producing hazardous products might be unable to find insurance and would go out of business. A subsidization scheme would permit these firms (and products) to exist even though, from an efficiency point of view, it may be preferable for these products to be removed from the marketplace.

In summary federal government intervention in the insurance market poses a number of possible problems with only a promise of any benefits. In Canada it is unlikely that availability would be a major problem under a strict liability standard. The increases in the cost of insurance would reflect the increased claims frequency, and thus the provision of government subsidization schemes would result in a distortion of resource allocation if the premiums charged were less than market-determined rates.

Tax incentives One recommendation made by the House of Representatives Subcommittee on Small Business was a

modification of the income tax laws to facilitate self-insurance by manufacturers. This would be accomplished by permitting firms to set aside funds to build up reserves for contingent liabilities arising from product liability claims. The amounts contributed to the reserves would be tax deductible and the interest earned on the reserves would be tax free. The funds in the reserves could be used only for payment of claims.

It is obvious even to someone without tax law expertise that this type of tax incentive could be a vehicle for tax avoidance. Firms may set up reserves that are much too large to defer income tax. In addition, this device could be a channel by which funds could be kept in the business. To prevent this, the Subcommittee's recommendation permitted a tax deduction equal to the size of the insurance premium that would have been paid if insurance were available. However, tax authorities would have to determine the size of the premium that would have been paid. In addition, the funds generated by these deductions might not be large enough to meet potential claims and specific rules for the management of the fund would have to be formulated.

The Internal Revenue Service rejected the concept of establishing a reserve for self-insurance. On July 20, 1978, the Secretary of Commerce announced that the Carter Administration proposed to amend the Internal Revenue Code to permit businesses to carry back net operating losses attributable to product liability losses and costs for ten years. This is an increase from the current three-year carry-back limitation. In addition, the Administration was to consider an amendment to the Code to extend the loss carry-forward provision. These tax reform provisions would result in an immediate refund of taxes paid so as to assist in the payment of a claim. In addition, these provisions would permit manufacturers to take a larger deductible in the product liability policy and hence have lower premiums (or ameliorate the increase in premiums).

The three-year loss carry-back provision was deemed to be generally appropriate since it provided adequate protection against fluctuations in profitability normally experienced by most U.S. taxpayers. However, departure from the three-year provision for losses generated by product liability claims was rationalized by recognizing that these losses can be both large and sporadic.

This tax incentive proposal is an interesting technique for assisting manufacturers. Whether the losses from product liability claims are sufficiently large to require tax relief in Canada is questionable. Currently, claims costs are a tax-deductible expense and losses can be carried back one year and forward five years. The movement to strict liability would increase the frequency of claims and hence the potential claims costs for firms that self-insure. However, since it is anticipated that the insurance market would function under strict liability, the tax incentive scheme should be held in reserve. There is no need to provide an incentive for firms to self-insure. If product liability problems become serious, the tax rules could always be changed later.

Pooling arrangements The purpose of pooling arrangements is to provide insurance to companies that are unable to find it or to reduce the costs of insurance in a particular line. The justification for pooling is to obtain economies of scale in underwriting and claims settlements and to spread risk over a large number of companies included in the pool. The former purpose is best achieved if the products insured are homogeneous. There are two ways that pooling arrangements can be introduced -- voluntary and mandated.

Under voluntary pooling arrangements, a number of insurance companies join together to underwrite risks in a particular line. To be viable, the pool must contain the largest firms in the industry. Each company in the pool agrees to take a pre-arranged portion of the risk. In most instances all risks of a specific nature are included in the pool. This prevents the members of the pool from putting only the high risks in the pool. Each risk would have a rate assigned by an underwriter from one of the members of the pool, but the rate must be accepted by all members. The initiating underwriter would continue to service this risk.

Although this pooling arrangement would be useful in reducing the cost of insurance and perhaps increasing its availability, it is unlikely that voluntary pools would be formed in Canada. In the United States the most notable voluntary pool is the United States Aircraft Insurance Group (USAIG) which provides the principal market for aviation insurance. This pool has been successful in reducing premiums. However, the risks are of a homogeneous nature. Since product liability risks are each very different, the homogeneity property is not met and this will militate against voluntary arrangements. In addition, the costs of product liability insurance and the risks are not sufficiently large in Canada to induce a voluntary effort.

Mandatory pooling techniques are very similar to those for voluntary pools except that all insurance companies writing in a particular state are required to join the pool (sometimes called "Joint Underwriting Association (JUA)"). All members bear a portion of the operating expenses and losses if and when obtained. All risks are underwritten, not just those that cannot find insurance coverage. This forced pooling requires insurance companies to accept risks that they would normally decline to write. One major problem of pooling is that the pool can face massive losses for its members since the premiums charged for high risks are constrained to be less than the amount that would be charged if the mandatory pools were not in operation. Thus, there can be a distortion in the relationship of premiums charged relative to the risk incurred.

In the United States there are a number of examples of mandated pools, such as automobile joint underwriting associations and medical malpractice joint underwriting associations. Although medical malpractice and product liability insurance bear some similarities, there are enough differences to negate a generalization of the malpractice experience to product liability insurance ("Comparison of the Products Liability and Medical Malpractice Problems," 1978, pp. 886-910).

In summary, voluntary pooling will arise when there is a perceived need. In the product liability field the diverse types of products make the evolution of these pools questionable. Mandated pooling organizations are a solution to the availability problem for product liability insurance, but the costs are substantial. These include a distortion in insurance premiums for high risks and the potential for substantial losses.

Conclusions

This chapter has reviewed a number of the non-legal reforms recommended in the United States as a result of hearings and reports on the product liability crisis. If a movement to strict liability precipitated a market failure such that insurance would not be provided, then many of these remedies are useful. However, this paper contends that insurance markets will operate and that any problems encountered will be of short duration.

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