AN ANALYSIS OF PRODUCTS LIABILITY

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FROM OI'S ANALYSIS

η_p = market price elasticity of demand.

Z = number of good units if X units are purchased.

X = number of risky good purchased.

Y = number of nonrisky good purchased.

π = proportion of good units of risky good X or Z/X.

P = market price of X.

P* = expected full price of X.

W = net damage costs of X.

W* = critical level of damage.

P_1 = price of risky good type one, with lower damages.

P_2 = price of risky good type two with higher damages.

r_1 = warranty price of type one.

r_2 = warranty price of type two.

From Chapter Three

U = non accident utility.

V = post accident level of utility.

Z_i = ith consumption activity.

X_{ij} = amount of i used in ith consumption activity

X_i = total consumption of i = $\sum_i X_{ij}$.

π_j = probability of no failure of one unit of j.

t_i = time used in consumption ith activity.

t_c = time allocated to work.

T = total time available.

S = nominal care provided by producer.

t_{cij} = time allocated to care in the use of the jth good in the ith activity.

P_j = price of j.

W = wage rate.

c = consumption.

C = full liability level of compensation.

P = price of consumption good.

$\gamma_{11} = \frac{\partial^2 EU}{\partial t_w}$

$\gamma_{22} = \frac{\partial^2 EU}{\partial t_c^2}$

$\gamma_{21} = \gamma_{12} = \frac{\partial}{\partial t_c} \frac{\partial EU}{\partial t_w}$

$\gamma_{1L} = \frac{\partial}{\partial L} (\frac{\partial EU}{\partial t_w})$

$\gamma_{2L} = \frac{\partial}{\partial L} (\frac{\partial EU}{\partial t_c})$

$\eta^m_{V_m}$ = elasticity of 1/m with respect to m.

$\eta^{t_w}_{1-\pi(t_c,s)\ t_w \cdot \frac{w}{p}}$ = elasticity of $1 - \pi^{t_w} \cdot \frac{w}{p}$ with respect to t_w.

M_1 = non accident income.

M_2 = post accident income.

L = burden of liability.

T_L = leisure income.

CHAPTER I

INTRODUCTION

This analysis addresses the implications of varying product liability rules for observed consumer related accidents. There are three parts to this paper. The first, chapter three, consists of a modification of the prior theoretical approach that allows for an analysis of the provision of care by consumers. The probability of being involved in a product related accident is assumed to be dependant on the amount of time spent being careful, while the severity of the accident is fixed. The model is simplified by analyzing the situation in which there is one good, consumption, which is combined with leisure time to produce utility. Expected utility theory is then used to develop a simple comparative static analysis of the consumer's response in his provision of care with a change in the consumer's burden of liability. Ceteris paribus, a reasonably strong conclusion is that care will fall as the burden of liability falls. This is an intuitively satisfying result. Intuition dictates that a fall in the benefits which results from the provision of an activity should reduce the incentive to provide the activity. Thus, as the benefits fall for the consumer's provision of care, the consumer will provide less care. Previous analysis by Spence [1973] indicate that the producer's care will rise as they try to escape the costs of liability. These results combine to yield an ambiguous result with respect to overall observed consumer

related accidents. This ambiguity is enhanced when informational and ability constraints are considered. This implies that the impact of changes in liability should vary with respect to significance across products when used as an explanatory variable of observed product related accidents. This implication is consistent with the regression results in chapter five.

Chapter four provides a discussion of the legal history of product liability and certain issues involved in the evolution of product liability tort. Chapter five contains the empirical results. The results are mixed for all coefficients except the measure of the rule of liability. The liability rule has significance for ladders, power saws, stairs and steps, televisions, bunkbeds, and lawn mowers at levels of confidence of ninety five percent or greater. The final chapter contains conclusions and discussion.

CHAPTER II

A LITERATURE REVIEW

There are two systems in the United States which address perceived problems with respect to product failures and the resultant losses. The first of these is a system of regulatory agencies (C.P.S.C., F.D.A., O.S.H.A. and others) which are responsible for meeting social objectives with respect to this perceived problem and usually thought of as increasing "safety." The second is a legal system which has evolved rules for specifying those parties which absorb losses when an accident occurs. Each system attempts to address the problem of losses which result from the use of products. In this chapter the literature addressing each system will be briefly reviewed, emphasizing recent estimates of the impact of safety regulations and the basic theoretical analysis of products liability.

Section 1: The Regulation of Product Safety

The focus in this section is on the regulatory environment and the implications of attempting to regulate the risk involved in using a product. Regulatory agencies have three available methods to reduce the risk of consumption: (1) directly regulating the characteristics of a product, (2) banning a product, and (3) disseminating information about this risk in an effort to alter consumer behavior. Of these methods, direct regulation and product bans are the most commonly

used. This is, perhaps, unfortunate, (from an economist's perspective) because with perfect information and well operating markets, the efficient solution will result without external intervention. Information dissemination may well be the most effective method of achieving the efficient level of risk.

Regulatory agencies are influenced either directly (as with the E.P.A.) or indirectly (as with the C.P.S.C.) by the political office holder of the day. The officials at the E.P.A. serve at the pleasure of the President and at the independent agencies the commissioners are appointed for fixed terms. While it would be overstating the situation to say that the system is rife with political cronyism, there is little doubt that political influences exist.

Grabowski and Vernon [1978] noted the following general characteristics of the direct regulation of products.

(1) "...Congress has strongly favored direct regulatory control..."[1]

(2) "...the decision making process at the various agencies tends to embody a strong "safety imperative."[2]

(3) "There currently exists little effort to design regulatory policies so as to complement existing market and legal incentives regarding product safety."[3]

(4) "Product safety standards and regulations can result in significant unintended side effects on the long-term competitive structure of an industry."[4]

Grabowski and Vernon go on to point out two problems with attempts at risk regulation. The first is that the regulators of products tend not to use cost-benefit analysis in deciding whether to implement a

product related regulation.[5] The second problem is the failure to use the dissemination of information in the effort to reduce accidents. As previously noted, if the problem is informational then the most effective way to resolve this problem may be to provide information.

If markets are well functioning and there are no problems with information, then the consumer will purchase and use a product so that he has the largest expected utility. If a regulation is placed on a product which makes it safer to use, consumers will revalue their provision of care (since the marginal conditions are changed) and reduce its level. As products become safer consumers become more careless. Peltzman [1975], Crandall and Graham [1984] and Viscusi [1984, 1985] have provided evidence that the imposition of safety regulations on products has not provided any meaningful reduction in the rate of accidents. The analysis of seat belts indicated that people responded to a safer situation by being less careful with no apparent total effect.[6] Viscusi [1984, 1985] analyzed the impact of requiring safety lids on nonprescription drugs. There was no apparent shift in poisoning rates and an apparent "lulling" effect for products not protected with higher observed rates of poisoning.

There are also potential anticompetitive impacts from safety regulation. By requiring a safety feature or detailed safety specification the small producer may be placed at a substantial disadvantage. If standards require substantial premarket testing of a product there could also be a disadvantage. Viscusi [1984] noted the use of bicycle regulations by the domestic bicycle industry to exclude foreign competitors. Grabowski, Vernon and Thomas [1978] indicated that the stringent controls placed on pharmaceutical firms with regard to pre-

market testing may well have increased research and development costs resulting in a substantially more concentrated market than would otherwise be the case.

From a neoclassical economic perspective there is no need for intervention into a market when all parties are informed accurately and fully and markets are competitive.[7] Yet, there has evolved a dual system to address the perceived problems of accidents involving products: the regulatory system as previously discussed and the products liability system. The remainder of this analysis will focus on the nature and impact of the system of products liability.

Section 2: Analyses of McKean [1968, 1973], Buchanan [1968] and Calabresi and Bass [1968]

In 1968, several economists and lawyers participated in a symposium on products liability at the Hoover Institute.[8] The format consisted of an extensive discussion of products liability by Professor Roland McKean [1970] and comments by several individuals, most notably Professor James Buchanan [1970] and Professor Guido Calabresi and Kenneth Bass [1970]. These participants sketched the situation with respect to products liability and brought forth, early on, the issues involved.

McKean noted that through the 1960s the trend had been for a larger share of losses involved in product failures to be placed on producers. McKean attributed this shift to greater producer liability to an expanding definition of a product, easing of the burdens of proof and a rise in the level of punitive damages. It was also noted that while the burden increased, the impact was offset by rising levels of liability insurance. With all factors considered, McKean

concluded that the rise in producer liability during the 1960s was small and consisted of a slightly larger chance of the producer being forced to compensate the injured party.

McKean also emphasized the importance of transactions costs, noting (within a Coasian framework) that in the absence of transactions costs, the liability assignment will not affect the provision of care by either party. The usual analysis was applied with negotiation and compensation occurring in order to ensure the efficient production and provision of care. This analysis was extended to the situation in which there are transaction and information costs with the conclusion that several systems of liability could be defended. McKean [1970] restates in a later summarization that with positive transactions costs different liability assignments can result in "significant" differences in resource use.

Buchanan [1970 p. 72] argued that "cavaet emptor encourages the maximum range of products geared to meet all variations in demand." When restraints are placed on quality there is a reduction in low quality goods provided with an adverse impact on the poor. His defense of "cavaet emptor" thus implies a gain with respect to both equity and efficiency. Buchanan also noted that deviation from no liability may be advisable on a selective basis, such as with third party losses, but that "some prejudice" towards no liability should be evidenced initially and departed from reluctantly. Calabresi and Bass [1968] emphasized that an ad hoc approach to matching liability rules to products is needed due to differences in the nature of risks involved and the amount of information available.

Section 3: The Analyses of Spence [1977] and Oi [1973]

Oi [1973] made two assumptions, which focused attention on a limiting case.[9] These were that the product was inherently dangerous and that all parties were fully informed. The assumption of an inherently dangerous product focused the analysis on those situations in which the only way for product safety to rise was for the producer to provide a safer product. The second assumption was criticized by Green [1974] and later relaxed by Spence [1977].

Oi started his analysis by developing a theory of demand for a risky product. The consumer was a utility maximizer who received utility from the good units of the risky good (the Z good units of the X purchased) and some other nonrisky good (Y). By allowing the nonrisky good to be stated as a residual, utility was stated as a function only of the risky good. It was noted that when the consumer regularly purchased a good, they would eventually learn that, from X units purchased, Z would, on average, be good. Π was the proportion of good units. The consumer's total cost of the procurement of Z units was the sum of their outlays plus the expected damage costs. The consumer's total cost divided by the number of units yielded the expected full price, P*. Oi then demonstrated that under the conditions specified a "basis" for the emergence of an insurance industry existed, and in the absence of an insurance market the consumer could self-insure by borrowing and saving over time. It was shown that a rise in the proportion of good units Π, holding the market price, P, constant would lead to a fall in P* and thus a rise in the demand for good units Z. The demand for the parent good, X, was shown to rise

only if the elasticity of demand for the parent unit with respect to the market price satisfies the following condition:[10]

$$-\eta_P > \frac{1}{1 + \frac{W}{P}}.$$

where η_P is the market price elasticity of demand, P is the market price and W is the net damage costs.

Oi's analysis continued with an exposition on the situation in which there were two products with different rates of failure. In deciding between the two goods, the consumer compared the full prices of the two goods and chose that which offered the lower full price. This result also allowed the calculation of a critical level of damage which was[11]

$$W^* = \frac{\hat{P}_1 - \hat{P}_2}{\gamma_2 - \gamma_1}$$

where

$$\hat{P}_1 = \frac{P_1}{\Pi_1}; \quad \hat{P}_2 = \frac{P_2}{\Pi_2}$$

which are the warranty prices, and

$$\gamma_1 = \frac{1 - \Pi_1}{\Pi_1}$$

and

$$\gamma_2 = \frac{1 - \Pi_2}{\Pi_2}$$

which were the actuarially fair insurance premiums for the goods. Consumers separated into two groups, one with damages larger than the critical level who purchase the less risky good and the other with damages less than the critical level who purchase the more risky good. It was shown that the government could place a tax on the more risky good which would raise the full price of the good, thus reducing the losses from the consumption of the risky good. If this tax were large enough, consumption of the risky good would cease and accident costs would fall. Oi emphasized that this does not mean welfare increased. Those consumers who would have been willing to purchase the more risky product were clearly on a lower indifference curve.

An analysis of behavior under conditions of producer liability was also conducted. The producer was forced into a tie-in sale where a full-coverage insurance policy was offered with each unit of the risky good. Under these circumstances the consumer would disregard the potential losses and consume the good with the lowest price. Since markets were competitive, equilibrium "full supply" prices were the same. As long as producers were unable to discriminate, income was redistributed from low-loss consumers to high-loss consumers because the low-loss consumers were forced to subsidize part of the high-loss consumers' insurance costs.

Oi further demonstrated that the shift from consumer liability to producer liability could increase the demand for the risky product and result in an increase in product failure-related losses. Whether the

use of the more risky product rises or falls was shown to be dependent on the relationship of the net damage costs across all consumers, $\bar{W}$, to the critical net damage costs, W*. If $\bar{W} > W^*$ then the producers of the less risky product would gain the advantage with a lower full-supply price. The more risky product disappeared. If $\bar{W} < W^*$ then the producer of the more risky product would gain the advantage with the resultant disappearance of the less risky product. The high-loss consumers purchase the high-risk product because their losses were fully compensated by the producer. When the analysis was extended to a multiproduct market (more than two qualities being available, the range of product safety would tend to be narrower.

Oi's analysis was criticized by Goldberg [1974] primarily on the basis of Oi's assumption of full information. Goldberg pointed out that Oi's conclusions were critically dependent on the assumption of full information. Spence's [1977] analysis acted to remedy this shortcoming. Spence's assumptions were similar to those of Oi with the exception of full information. Spence extended the analysis to allow for imperfect information and damages which affect the consumer's valuation of income. The consumer maximized expected utility and, with perfectly competitive markets, a zero expected profit was assumed.

Spence started with the case of the risk-neutral consumer in which the value of income was not changed by the accident. His results indicated that, in the case of risk-neutral consumers who underestimated the probability of product failure, there will be no voluntary producer liability, and, if the perceptions of product failure are imperfectly responsive to changes in the actual rates of failure, safety

will be under supplied.[12] Spence further indicated that in the above situation, the first best outcome is attainable under producer liability, with this liability equal to the normal loss to the consumer.[13]

Spence's analysis then turned to the risk-averse consumer. His analysis indicated that when consumers underestimated the probability of failure for any given perceived probability of failure, insurance will be under supplied. The analysis further indicated that for any fixed level of insurance, perceived failures are optimally set only if the perception of failure is perfectly responsive to changes in the actual failure.[14]

With the inability to achieve the optimum when consumers are risk averse and the information is imperfect, Spence introduced a second liability of the producer. This is the producer's liability to the state. Spence demonstrated that, under the assumptions of his analysis, that two-stage liability of the producer (to consumer and to state) will allow the attainment of the global optimum. Spence has also pointed out that, as far as policy options are concerned, the information requirements are much larger in the direct regulation of safety and liability with a risk-averse consumer liability with a riskneutral consumer and informing-the-consumer options. It was noted that with variegated consumer preferences that producers tend to produce the wrong range of products and, for any given range of products, consumers tend to purchase the wrong quality of product.

The analyses of Spence [1977] and Oi [1973] provided a useful start to a quantitative analysis of products liability. Oi [1973] demonstrated that (1) the market will achieve the optimum level of safety as long as information is perfect[15] and (2) with perfect in-

formation and producer liability "safety" could rise or fall.[16] Spence [1977] showed that (1) if information is imperfect, producer liability to the consumer must be supplemented in order to attain the "global optimum"[17] and (2) that the information requirements are much more severe when liability with risk-averse consumers or direct regulation is used than when liability with risk-neutral consumers or informing consumers is used.[18]

Section 4: Extensions

The simple analyses developed by Oi and Spence have been extended to consider the importance of monopoly power (Hamada [1976], Mantell [1984], Epple and Raviv [1978], Polinsky and Rogerson [1984]), insurance (Epple and Ravis [1978]) and noncompensable damages (Grahm and Pierce [1985]).

Hamada [1976] was the first to relax the assumption of a perfectly competitive market setting. His initial analysis retained the assumptions that damages are exclusively under the control of the producer, and that consumers are risk neutral. Figure's 1 and 2 are reproductions of Hamada's figures one and two.[19] Hamada's initial methodology was to compare total surplus (consumers plus producers) under conditions of full and no liability when the producer can provide the least cost accident avoidance. DD* is the consumer's cost of avoidance and SS* is the producer's cost of avoidance. When there is no risk in the consumption of this good, total surplus will be triangle DPS with a market price of P'. When there is a risk to consumption let DD* be the cost of the accident to the consumer. If the consumer must bear

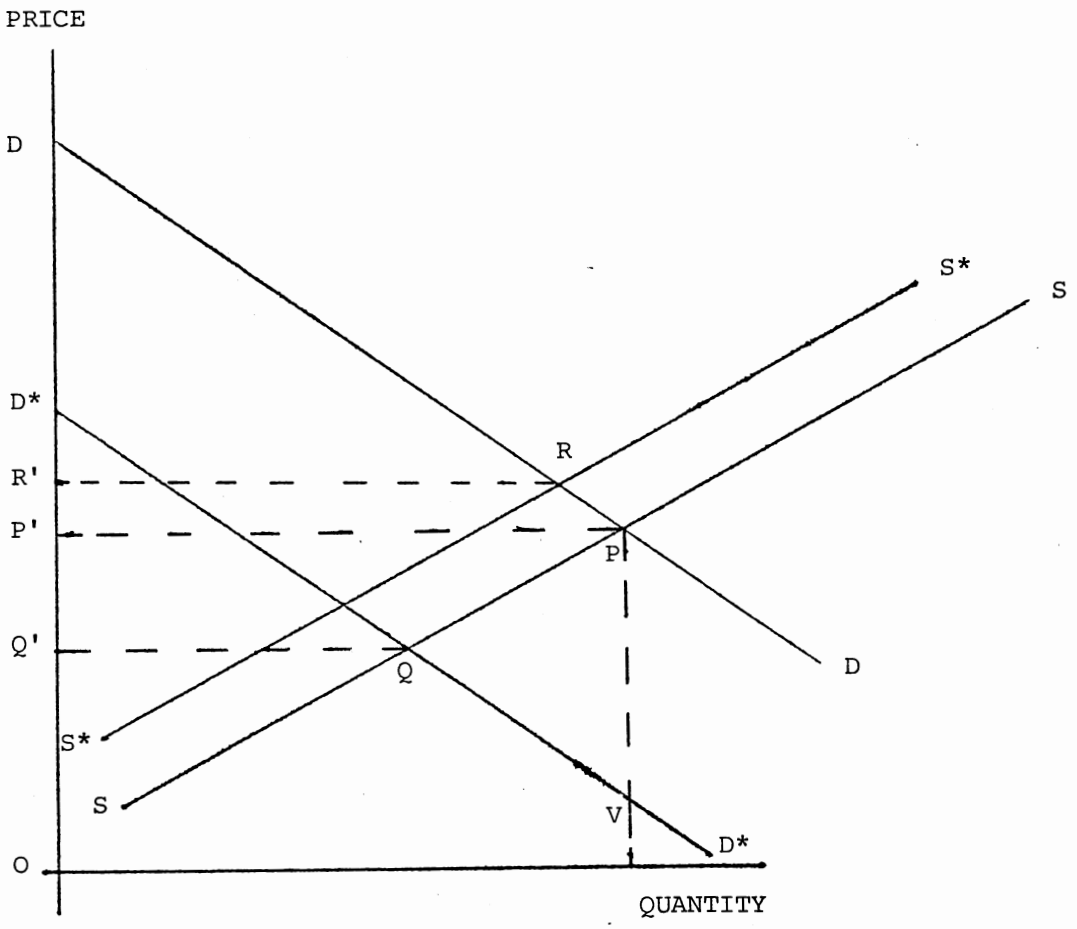

FIGURE 1

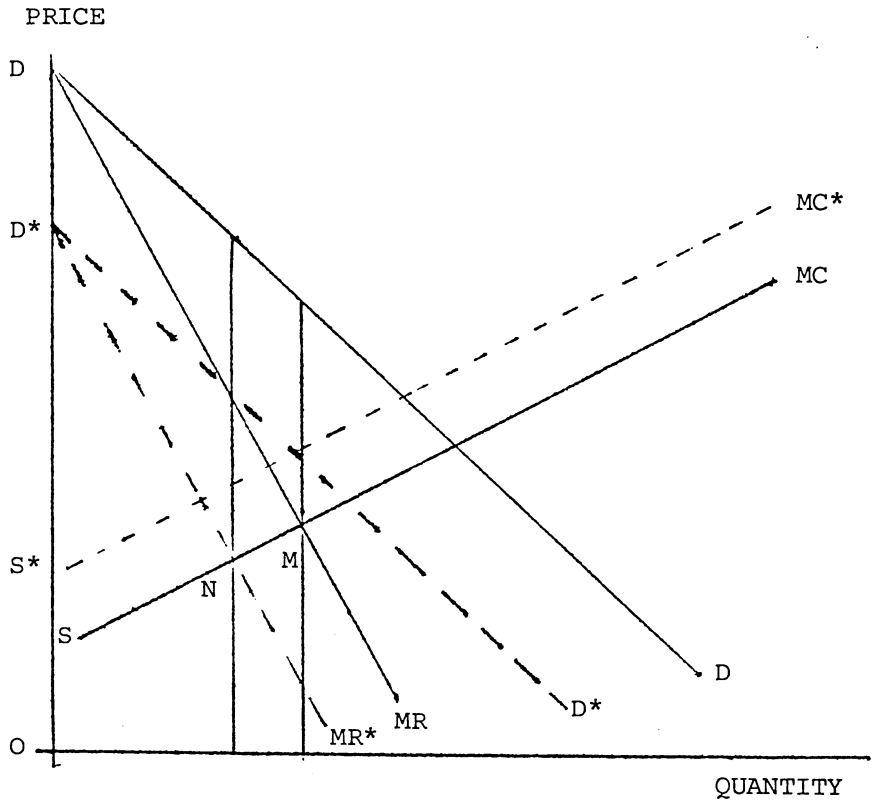

FIGURE 2

the losses, the demand curve will shift to D*D*, with equilibrium at point Q_1 and a market price of Q', and total surplus of D*Q_1S.

If the producers cost of avoidance is SS* (here less than DD*), then the largest total surplus occurred when the producer provided the care. Hamada demonstrated that this result was achieved regardless of the rule of liability. His conclusion was that neither income distribution nor resource allocation was affected by the rule of liability as long as there was full consumer information and as long as the victims were the purchasers of the product.[20] Similar results were obtained in the situation where a monopolistic seller existed; this is illustrated in Figure 2. Marginal revenue shifts down by the amount of the loss, from MR to MR*. While the total surplus remains less than its maximum level due to the existence of a monopoly, the distribution of the surplus remains unaffected by the rule of liability.

Hamada then generalized the model to allow for the provision of care by consumers and variable consumption of the good. Hamada's results indicated that under perfect competition the rules for minimizing unit social cost also maximized total social surplus and that the level of production and the distribution of surplus is unaffected by the rule of liability.[21] Hamada emphasizes that this conclusion is predicated on informed and rational consumers, and if this condition does not exist then the validity of the use of the market to provide care must come into question. Despite his reservations, the analysis of Hamada tends to reinforce the perspective that, if informational problems are relevant then they should be addressed directly and the market allowed to achieve efficiency.

Mantel [1984] developed a model of a pure profit maximizing monopolist and analyzed how the firm would behave under strict liability and negligence. Mantel obtained a first order condition for profit maximization which equates marginal revenue to marginal cost plus the average expected cost of the accident. Mantel's first result was the condition under which the redistribution of income from the firm to the victim would be distributionally efficient or inefficient. If the amount of money transferred from the firm to the victims was less than the change in consumer suppliers which resulted from the rise in price and the fall in quantity, then the change in the rule of liability was distributionally inefficient.[22] A second result was that output will be larger under negligence relative to strict products liability only if the sum of the conditional probability of an accident and adverse judgement is less than one. The most interesting of Mantel's conclusions was that consumers, as a group, may suffer a net reduction in their welfare from the imposition of a rule intended for their benefit.[23]

Epple and Raviv [1978] analyze a general situation in which liability rules, market structure, information and insurance are allowed to vary. They assume that the manufacturer determines the safety features of the product, taking consumer behavior into consideration. Their conclusions are 1) that when information is perfect and insurance actuarially fair then product safety characteristics tend to be independent of market structure or the rule of liability, 2) if either information or insurance is imperfect then no liability rule is universally "acceptable," 3) a general rule is that consumer liability is preferred when consumers are able to judge the safety

characteristics with reasonable accuracy but producer liability otherwise.[24]

Polinsky and Rogerson [1984] developed a model of products liability with imperfect consumer information and variable market power. The producer determined the probability of failure, consumers were risk neutral and social welfare was the surplus to consumer's net production costs. Their results were 1) that under strict liability the "optimal" probability of an accident will be provided, 2) under negligence, if the correct standard is chosen, then the socially optimal level of care is provided and, relative to strict liability and depending on market structure, quantity rises, and 3) under no liability firms choose that level of care which minimizes perceived full costs and provide a larger quality, depending on market structure. Polinsky and Rogerson pointed out the possibly counterproductive nature of increasing producer liability in the presence of monopoly power. The distortion which results from monopoly power can be reinforced by greater producer liability resulting in a net fall in "social welfare."

Grahm and Pierce [1985] construct a model of products liability which incorporates irreplaceable losses, both producer and consumer influences on accident probabilities, insurance markets and conditional information. The desired "social optimum" is that which minimizes the total accident costs (avoidance costs and losses). Contingent damages are calculated to equate consumer utility in the past accident situation to what they expected it to be, when there is a difference between consumer perceptions and reality. The result of interest is that the "optimal" liability rule retains the appearance

of a negligence rule but derives from the Hand Rule. Contingent damages are awarded to the injured which compensate the injured only for the marginal changes in safety for which the negligence are responsible.

Section 5: Discussion

The general analysis of response curves has been excluded from this discussion of products liability.[25] When a market exists, parties are able to signal each other by varying prices and purchases in a manner which provides for their mutual benefit. If perfect competition and perfect information are present, that level of care which maximizes utility will be provided, thus, when a market transaction occurs both parties in the transaction gain. This implies that the appropriate framework is that of Oi (1973) and Spence (1977) as opposed to Brown (1973).

The analysis in this chapter does not attempt to survey the vast literature which has developed around the general issue of liability, but focuses on those analyses which address products liability specifically. The most important of these are Oi [1973] and Spence [1977]. These illustrate the main issues involved in products liability, the role of the market, information and the rule of liability. They also illustrate the largest potential weakness of the analysis to date, the failure to include the consumer's impact on potential losses. Hamada [1978] and Grahm and Pierce [1984] attempt to remedy this shortcoming. The model developed in Chapter 3 also attempts to relax this restriction, and while it is not a complete model of lia-

bility, it does illustrate the potential ambiguities involved when both the producer and consumer can influence losses.

CHAPTER II

ENDNOTES

[1]Grabowski, Henry G. and John M. Vernon, "Consumer Product Safety Regulation" The American Economic Review, 68 (May 1978) pp. 284-289.

[2]Ibid.

[3]Ibid., pp. 285.

[4]Ibid., pp. 285.

[5]Ibid.

[6]Peltzman, Sam, "The Effects of Automobile Safety Regulation" Journal of Political Economy, 83 (1975) pp. 677-725. Crandall, Robert W. and Grahm, John D., "Automobile Safety Regulation and Offsetting Behavior: Some New Empirical Estimates," The American Economic Review, 78 (1984) pp. 328-331.

[7]Coase, R.H., "The Problem of Social Costs," Journal of Law and Economics, 3 (1960) p. 1-40. Oi, Walter Y. "The Economics of Product Safety" Bell Journal of Economics, 4 (1973) pp. 3-28.

[8]Republished as Symposium on Products Liability, University of Chicago Law Review, 38 (1970) pp. 1-91.

[9]Oi, Walter Y. "The Economics of Product Safety" Bell Journal of Economics, 4 (1973) pp. 3-28.

[10]Oi, p. 13.

[11]Oi, p. 15.

[12]Spence, Michael "Consumer Misperceptions, Product Failure and Producer Liability" Review of Economic Studies, Vol. 44, (October 1977) pp. 561-572.

[13]Spence, proposition 2, p. 564.

[14]Spence, pp. 564-567.

[15]Oi, Section 2.

[16]Oi, Section 3.

[17]Spence, pp. 565.

[18]Spence, pp. 567.

[19]Hamada, Koichi, "Liability Rules and Income Distribution in Product Liability," The American Economic Review, 66 (March 1976) pp. 228-234.

[20]Hamada, proposition #1, p. 229.

[21]Hamada, see propositions 2 and 3, p. 232 and 233.

[22]Mantell, Edmund H. "Allocative and Distributive Efficiency of Products Liability Law in a Monopolistic Market" Journal of Products Liability, 7 (1984) pp. 143-52.

[23]Mantell, pp. 151-152

[24]Epple, Dennis and Arthur Raviv, "Product Safety: Liability Rules, Market Structure and Imperfect Information" The American Economic Review, 68 (1978) pp. 80-95.

[25]Brown, John Prather, "Toward An Economic Theory of Liability" The Journal of Legal Studies, 2, (1973) pp. 323-349. Assaf, George, "The Shape of the Reaction Functions and the Efficiency of Liability Rules: A Correction," 13, Journal of Legal Studies, 101 (1984) pp. 101-111. Haddock, David and Christopher Curran, "An Economic Thoery

of Comparative Negligence," The Journal of Legal Studies, XIV (1985) pp. 49-72.

CHAPTER III

A MODEL OF CONSUMER BEHAVIOR

The analysis of the impact of products liability has usually been characterized by looking at the situation in which the producer determines the risk involved in consumption. This chapter develops a simple analysis of consumer behavior when the consumer influences the risk involved in consumption. The purpose of this analysis is to provide a quantitative analysis of what would seem to be intuitively clear - that as the benefits of providing "care" fall, the provision of "care" falls. This model looks at the situation exclusively from the consumer's perspective. The analysis develops a model which allows the determination of the sign of the derivative of care with respect to the rule of liability. In this situation the most plausible result is that as the burden of liability is shifted to the producer, care by the consumer will fall. A second and unexpected result is that worktime may also fall as the burden of liability is shifted to the producer.

Section 1: A General Formulation of the Model.

The first question which must be answered in the development of a model of products liability concerns the provision of care by consumers. Specifically, what is the form and impact of the provision of care by consumers? There are, generally speaking, three forms which

this care may take: (1) nominal expenditures by the consumer in an effort to reduce risk, (2) the allocation of time to being careful, and (3) a direct allocation of utility in some form of "awareness" or "watchfulness" to the reduction of risk. Of these three the most plausible is the allocation of time to being careful. Nominal expenditures are possible, but it seems unlikely that consumers would purchase a product and then spend more to make it safe. The direct provision of utility is also possible, but the difficulties of including this in a model of consumer behavior tend to reduce its usefulness as far as model building is concerned. The focus of this analysis will thus be on the allocation of time in an effort to reduce risks.

A second question which must be addressed is what is the source of utility? Utility results from consumption, but what is consumption? Does it deal exclusively with the goods which are available? Consumption exists in the form of various activities which generate utility.[1] Each utility-generating activity requires the input of various goods and services and time allocated to consumption. Some activities can require almost exclusively time, such as exercise, while others can require various goods or services as well as time, such as dining out. The various possible consumption activities will be characterized by a vector $[Z_i]$ where Z_i is the ith consumption activity. Each Z_i re- quires input of certain goods, characterized by the vector $[X_{ij}]$ which is the amount of the jth good used in consumption activity i, and the input of time, as designated by t_i where the i designates the consumption activity i. Utility, which is a function of consumption activities, is thus

$$U = U([Z_i([X_{ij}], t_i)]). \tag{3.1}$$

For this basic framework to be extended to allow for potential product failure, each product will have a positive probability of failure. The maximization of expected utility requires the summation of each potential level of utility multiplied by its respective probability of occurrence. If π_j is the probability of no failure of one of the X_{ij}, and the total consumption of X_j is

$$X_j = \sum_{i=1}^{n} X_{ij}, \tag{3.2}$$

then the probability of successfully sampling X_j units of good j is

$$\pi_j^{[\sum_{i=1}^{n} X_{ij}]} = \pi_j(t_c,s)^{[X_j]}, \tag{3.3}$$

where t_c is time allocated to safety by the consumer and s is the allocation of money to care by the producer. Thus, the probability of being at the no accident level of utility, U, is

$$\prod_{j=1}^{m} \pi_j(t_c,s)^{[X_j]}. \tag{3.4}$$

If each failure generates the same post-accident utility function, V, such that

$$V = V([Z_i([X_{ij}], t_i)]) \tag{3.5}$$

and if repeated failures do not impact this utility function, expected utility is

$$EU = \left[\prod_{j=1}^{m} \pi_j(t_c,s)^{[X_j]}\right]U([Z_i([X_{ij}],t_i)]) + \left[1 - \prod_{j=1}^{m} \pi_j(t_c,s)^{[X_j]}\right]V([Z_i([X_{ij}],t_i)]). \quad (3.6)$$

The consumer will maximize utility subject to time and budget contraints, which are, respectively:

$$\bar{T} = t_w + \sum_{j=1}^{m}\sum_{i=1}^{n} t_{cij} + \sum_{i=1}^{n} t_i \quad (3.7)$$

and

$$\sum_{j=1}^{m} P_j X_j = t_w \cdot w, \quad (3.8)$$

where

$\bar{T}$ = total amount of time available.

t_w = time allocated to work.

t_i = time allocated to consumption in the ith activity.

t_{cij} = time allocated to care in the use of the jth good in the ith activity.

P_j = price of the jth good.

w = wage rate.

s = producer's provision of care.

The consumer will maximize expected utility across t_w, t_{cij} and t_i (and if the assumption of a perfectly competitive constant cost industry is made, also across s).[2] Without making certain simplifying assumptions the analysis becomes unwieldy with $2(m \cdot n) + n + 1$ first-order conditions.

Section 2: A Simplified Model.

The first simplifying assumption is that there is only one consumption activity. This allows the restatement of the utility functions as

$$U = U(c([X_j], t_1)) \tag{3.9}$$

and

$$V = V(c([X_j], t_1)), \tag{3.10}$$

where t_1 is time allocated to leisure.

The second simplifying assumption is that there is only one good used in the consumption activity. This alters the budget constraint so that

$$P \cdot X = t_w \cdot w \tag{3.11}$$

or

$$X = \frac{t_w \cdot w}{P} = t_w \cdot \frac{w}{P} \tag{3.12}$$

This in turn allows the specification of utility as a function of work time and leisure time. In this analysis

$$U = U(\frac{t_w \cdot w}{P}, t_1) \tag{3.13}$$

and

$$V = V(\frac{t_w \cdot w}{P}, t_1). \tag{3.14}$$

the time constraint can be restated as

$$t_1 = \bar{T} - t_w - t_c \tag{3.15}$$

and used to eliminate t_1, resulting in

$$U = U(\frac{t_w \cdot w}{P}, \bar{T} - t_w - t_c) \tag{3.16}$$

and

$$V = V(\frac{t_w \cdot w}{P}, \bar{T} - t_w - t_c). \tag{3.17}$$

When the simplifications are incorporated the probability of an accident becomes

$$\pi(t_c, s)^{[t_w \cdot \frac{w}{\bar{P}}]} \tag{3.18}$$

and thus, expected utility can be stated as a function of two variables, t_w and t_c, or as

$$EU = \pi(t_c, s)^{[t_w \cdot \frac{w}{\bar{P}}]} U(t_w \cdot \frac{w}{\bar{P}}, \bar{T} - t_c - t_w)$$

$$+ (1 - \pi(t_c, s)^{[t_w \cdot \frac{w}{\bar{P}}]}) V(t_w \cdot \frac{w}{\bar{P}}, \bar{T} - t_c - t_w). \tag{3.19}$$

Section 3: Inclusion of Liability.

The liability burden, L, consists of the post-accident share of the cost of an accident. For the purpose of this analysis it shall be continuous and between zero and one, inclusive, or

$$0 \leq L \leq 1. \tag{3.20}$$

The burden of liability states the portion of the cost of the accident in nominal terms, C, to be absorbed by the producer. The cost of the accident is determined by setting C such that

$$U(t_w \frac{w}{P}, \bar{T} - t_w - t_c) = V(t_w \frac{w}{P} + \frac{C}{P}, \bar{T} - t_w - t_c). \tag{3-21}$$

This compensation is received by the consumer only in the post-accident situation. Liability is thus included only in the post-accident utility function so that V becomes

$$V = V(t_w \frac{w}{P} + L \cdot \frac{C}{P}, \bar{T} - t_w - t_c). \tag{3.22}$$

As the producer's burden of liability rises the post-accident level of utility will approach the nonaccident level of utility, or

$$\lim_{L \Rightarrow 1} V = U. \tag{3.23}$$

Thus, we know

$$\frac{\partial EU}{\partial L} > 0 \tag{3.24}$$

or

$$(1 - \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})V_m \cdot C > 0. \tag{3.25}$$

The second derivative is

$$(1 - \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})V_{mm} \cdot C^2 < 0, \tag{3.26}$$

as long as there is a diminishing marginal utility of income in the post-accident situation. The consumer's allocation of time to care can be analyzed under full producer liability by noting that when L = 1,

$$U = V; \tag{3.27}$$

thus, expected utility becomes

$$EU = \pi(t_c,s)^{[t \cdot \frac{w}{P}]} U + (1 - \pi(t_c,s)^{[t \cdot \frac{w}{P}]}) U \tag{3.28}$$

$$= (\pi(t_c,s)^{[t \cdot \frac{w}{P}]} + 1 - \pi(t_c,s)^{[t \cdot \frac{w}{P}]}) U$$

$$= U.$$

Since

$$\frac{\partial U}{\partial t_c} = \frac{\partial U}{\partial t_1} \frac{\partial t_1}{\partial t_c} = U_{t_L}(-1) < 0 \tag{3.29}$$

the consumer provides no care when the producer is fully liable.[3]

Section 4: Consumer's Response to Changes in Liability.

This section addresses the response of a consumer to a change in the burden of liability. Expected utility with a variable burden of liability is

$$EU = \pi(t_c,s))^{[t_w \cdot \frac{w}{P}]} U(t_w \cdot \frac{w}{P}, \bar{T} - t_w - t_c)$$

$$+ [1 - \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}] V(t_w \cdot \frac{w}{P} + L \cdot \frac{C}{P}, \bar{T} - t_w - t_c). \tag{3.30}$$

The consumer will maximize expected utility with respect to work time, t_w, and care time, t_c. The first-order conditions are

$$\frac{\partial EU}{\partial t_w} = \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]} \ln \pi(U-V) + \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]} (U_m \cdot \frac{w}{P} - U_T)$$

$$+ (1 - \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) (V_m \cdot \frac{w}{P} - V_T) \qquad (3.31)$$

and

$$\frac{\partial EU}{\partial t_c} = t_w \cdot \frac{w}{P} \pi(t_c,s)^{[t_w \cdot \frac{w}{P} - 1]} \pi_{t_c}(U-V) - \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]} U_T$$

$$- (1 - \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) V_T. \qquad (3.32)$$

These first-order conditions represent two equations in two unknowns, t_w and t_c. This allows the use of the implicit function theorem and Cramer's rule to acquire the responsiveness of consumers to changes in the burden of liability in the form of the derivatives dt_c/dL and dt_w/dL. Taking the total derivatives results in

$$\frac{\partial}{\partial t_w}(\frac{\partial EU}{\partial t_w})dt_w + \frac{\partial}{\partial t_c}(\frac{\partial EU}{\partial t_w})dt_c + \frac{\partial}{\partial L}(\frac{\partial EU}{\partial t_w})dL = 0 \qquad (3.33)$$

or $$\gamma_{11}dt_w + \gamma_{12}dt_c + \gamma_{1L}dL = 0, \qquad (3.34)$$

and $$\frac{\partial}{\partial t_w}(\frac{\partial EU}{\partial t_c})dt_w + \frac{\partial}{\partial t_c}(\frac{\partial EU}{\partial t_w})\partial t_c + \frac{\partial}{\partial L}(\frac{\partial EU}{\partial t_c})dL = 0 \qquad (3.35)$$

or $$\gamma_{21}dt_w + \gamma_{22}dt_c + \gamma_{2L}dL = 0. \qquad (3.36)$$

Equations 3.34 and 3.35 can be restated as

$$\begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} dt_w \\ dt_c \end{bmatrix} = \begin{bmatrix} -\gamma_{1L} \\ -\gamma_{2L} \end{bmatrix} dL. \tag{3.37}$$

Applying Cramer's rule to 3.37 yields

$$\frac{dt_w}{dL} = \frac{\begin{vmatrix} -\gamma_{1L} & \gamma_{12} \\ -\gamma_{2L} & \gamma_{22} \end{vmatrix}}{\begin{vmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{vmatrix}} = \frac{-\gamma_{1L}\,\gamma_{22} - \gamma_{12}(-\gamma_{2L})}{\gamma_{11}\,\gamma_{22} - \gamma_{21}\gamma_{12}} \tag{3.38}$$

and

$$\frac{dt_c}{dL} = \frac{\begin{vmatrix} \gamma_{11} & -\gamma_{1L} \\ \gamma_{21} & -\gamma_{2L} \end{vmatrix}}{\begin{vmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{vmatrix}} = \frac{\gamma_{11}(-\gamma_{2L}) - \gamma_{21}(-\gamma_{1L})}{\gamma_{11}\gamma_{22} - \gamma_{12}\gamma_{21}}. \tag{3.39}$$

The signs of these derivatives are the items of interest. The problems involved in signing these derivatives are reduced by noting that the second-order conditions for the maximization of expected utility are

$$\frac{\partial^2 EU}{\partial t_w^2}\ (= \gamma_{11}),\ \frac{\partial^2 EU}{\partial t_c^2}\ (= \gamma_{22}) < 0 \tag{3.40}$$

and

$$\left(\frac{\partial^2 EU}{\partial t_w^2}\right) \cdot \left(\frac{\partial^2 EU}{\partial t_c^2}\right) - \left(\frac{\partial^2 EU}{\partial t_w \partial t_c}\right)^2 > 0, \tag{3.41}$$

With symmetry[4] 3.41 becomes

$$\gamma_{11}\gamma_{22} - \gamma_{12}\gamma_{12} > 0. \tag{3.42}$$

Thus the denominator in 3.38 and 3.39 is positive. In order to determine the signs of dt_c/d_L and dt_w/d_L, the signs of γ_{1L}, γ_{2L} and, with symmetry, γ_{21} or γ_{12} must by calculated. Since

$$\gamma_{1L} = C[(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})(V_{mm} \cdot \frac{w}{P} - V_{Tm}) - \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]} \ln\pi V_m] \tag{3.43}$$

can be rewritten as

$$\gamma_{1L} = C[(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) \frac{\partial V_m}{\partial_m} + \frac{\partial(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})}{\partial t_w} V_m] \tag{3.44}$$

Thus, the sign of γ_{1L} is determined solely by

$$(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) \frac{\partial V_m}{\partial_m} + \frac{\partial 1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}}{\partial t_w} m_m. \tag{3.45}$$

If

$$\underset{(+)}{(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})} \underset{(-)}{\frac{\partial V_m}{\partial_m}} + \frac{\partial(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})}{\underset{+}{\partial t_w}} \underset{(+)}{V_m} \gtreqless 0, \tag{3.46}$$

then $\gamma_{1L} \gtreqless 0.$ (3.46a)

Rearranging 3.46 yields

$$(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) \frac{\partial V_m}{\partial_m} \gtreqless - \frac{\partial(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})}{\partial t_w} V_m. \tag{3.47}$$

Dividing both sides by $(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) \cdot V_m$ results in

$$\frac{\partial V_m | \partial_m}{V_m} \gtreqless - \frac{\partial(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) | \partial t_w}{(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})} \tag{3.48}$$

With $$(\frac{\partial V_m | \partial_m}{V_m}) \cdot (\frac{m}{m}) = (\frac{\partial V_m | V_m}{\partial_{m|m}}) \cdot \frac{1}{m} = \eta^m_{V_m} \cdot \frac{1}{m} \tag{3.49}$$

and $$- \left[\frac{\partial(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}) | (1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})}{\partial t_{w|} t_w} \right] \frac{1}{t_w} \tag{3.50}$$

$$= \left[\frac{1}{t_w} \cdot \eta^{t_w}_{(1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})} \right]$$

equation 3.48 becomes

$$\eta^m_{V_m} \frac{1}{m} \gtreqless \left[- \frac{1}{t_w} \cdot \eta^{t_w}_{1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}} \right], \tag{3.51}$$

(1) (+)

where η^Y_X refers to the elasticity of X with respect to Y. Equation 3.51 provides the technical condition for the determination of the sign of γ_{1L} but provides no basis for specifying this sign. We know from 3.31 that

$$\gamma_{1L} = \frac{\partial}{\partial L}\left(\frac{\partial EU}{\partial t_w}\right) = \frac{\partial}{\partial m_2}\left(\frac{\partial EU}{\partial t_w}\right)\frac{\partial m_2}{\partial L}, \tag{3.53}$$

or that $$\gamma_{1L} = \frac{\partial}{\partial m_2}\left(\frac{\partial EU}{\partial t_w}\right) C. \tag{3.54}$$

Equation 3.54 states that the sign of γ_{1L} depends on the impact of changing post-accident income on the expected marginal utility of increasing work time, t_w. A change in t_w affects utility in three ways: (1) by increasing income, and thus increasing expected utility, (2) by increasing the probability of an accident and thus reducing expected utility and (3) by reducing leisure time or care time and thus reducing expected utility. A change in the burden of liability affects expected utility only through the change in the post-accident level of income. If the post-accident marginal utility of income is diminishing then the marginal expected utility of income would be diminishing as well. This, in turn, implies that since the first effects impact is falling and the other two remain constant then the net impact would be negative, thus $\gamma_{1L} < 0$.

With

$$\gamma_{2L} = C[-t_w \cdot \frac{w}{P}\,\pi(t_c,s)^{[t_w \cdot \frac{w}{P} - 1]}\,\pi_{t_1} V_m - (1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})\, V_{Tm}] \tag{3.55}$$

and with all terms positive, γ_{2L} is less than zero. The last term to be determined is $\gamma_{21}(= \frac{\partial}{\partial t_c}(\frac{\partial EU}{\partial t_w}))$ or $\gamma_{12}(= \frac{\partial}{\partial t_w}(\frac{\partial EU}{\partial t_c}))$. Taking the derivative of either of the first-order conditions with respect to the other variables results in

where $M_1 = t_w \cdot w$ $\quad M_2 = t_w \cdot w + L \cdot C$

$T_L = \bar{T} - t_w - t_c$.

This gives the three ways in which work time effects utility. The first occurs as a result of increasing income. The second influences expected utility through a change in the probability of an accident. The third influences expected utility as a result of reducing leisure time. The second two have a negative impact on expected utility while the first is positive. The impact of a change in t_c on $\frac{\partial EU}{\partial t_w}$ can be analyzed by looking at each of the respective changes.

An increase in t_c reduces the probability of an accident, ceteris paribus. This results in a decrease in the importance of the post accident level of utility and since this is a negative influence, $\frac{\partial EU}{\partial t_w}$ would be expected to rise. Since everything else is constant the other two factors would not be influenced. As t_c rises the probability of an accident falls and expected utility will approach the no-accident level of utility. This also implies that the marginal expected utility of income will approach the non-accident level of marginal utility of income. As long as the post-accident marginal utility of income is smaller than the non-accident level of marginal utility of income, $\gamma_{21} > 0$. The signs of the derivatives can now be specified. With

$$\gamma_{11},\ \gamma_{22} < 0,$$

$$\gamma_{11}\gamma_{22} - \gamma_{21}\gamma_{12} > 0,$$

$$\gamma_{1L} < 0,$$

$$\gamma_{2L} < 0,$$

and if

$$\gamma_{21} = \gamma_{12} = [\frac{w}{P}\,\pi(t_c,s)^{[t_w \cdot \frac{w}{P} - 1]}\,\pi_{t_c}$$

$$+ t_w \cdot \frac{w}{P}\,(\pi(t_c,s)^{[t_w \cdot \frac{w}{P} - 1]})\,\pi_{t_c} \ln\pi](U-V)$$

$$+ t_w \cdot \frac{w}{P}\,\pi(t_c,s)^{[(t_w \cdot \frac{w}{P} - 1)]}\,\pi_{t_c}[w(U_m - V_m) + (V_T - U_T)]$$

$$- \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]} \ln \pi(U_T - V_T) - (1-\pi(t_c,s)^{[t_w \cdot \frac{w}{P}]})(V_{Tm} \cdot \frac{w}{P} - V_{TT})$$

$$+ \pi(t_c,s)^{[t_w \cdot \frac{w}{P}]}(-U_{mT} \cdot \frac{w}{P} + U_{TT}). \qquad (3.56)$$

Equation 3.57 clearly illustrates that γ_{21} is dependent on the changes in post-accident marginal utilities, changes in probability and changes in marginal utilities. In general terms

$$\gamma_{12} = \frac{\partial}{\partial t_c}(\frac{\partial EU}{\partial t_w}). \qquad (3.57)$$

Expected utility can be stated as a function of three functions of t_w. Thus

$$EU = f(\pi,\ U,\ V), \qquad (3.58)$$

while two of these are each functions of two functions of t_w which yields

$$EU = f(\pi(t_w),\ U(M_1(t_w),\ T_L(t_w)),\ V(M_2(t_w),\ T_L(t))) \qquad (3.59)$$

$$\gamma_{12} = \gamma_{21} > 0,$$

then
$$\frac{dt_w}{dL} = \frac{-\gamma_{L1}\gamma_{22} - \gamma_{12}(-\gamma_{2L})}{\gamma_{11}\gamma_{22} - \gamma_{12}\gamma_{21}} < 0 \tag{3.60}$$

and

$$\frac{dt_c}{dL} = \frac{\gamma_{11}(-\gamma_{22}) - \gamma_{21}(-\gamma_{1L})}{\gamma_{11}\gamma_{22} - \gamma_{21}\gamma_{12}} < 0. \tag{3.61}$$

As the burden of liability is shifted from the consumer to the producer the provision of care and the time worked will tend to fall. The result with respect to the time allocated to care is intuitively clear, as liability shifts to the producer the benefit from the additional unit of care tends to fall, thus reducing the incentive to provide care. The result with respect to the provision of work time is neither intuitively clear nor readily acceptable without further analysis.

Despite the strong intuitive appeal of $\gamma_{21} > 0$, and the equally appealing result that $\frac{dt_c}{dL} < 0$, a more detailed consideration must be given to the structural relationships yielded by equations 3.38 and 3.39:

$$\frac{dt_w}{dL} = \frac{-\gamma_{1L}\gamma_{22} - \gamma_{21}(-\gamma_{2L})}{\gamma_{11}\gamma_{22} - (\gamma_{21})^2} \tag{3.62}$$
$$\tag{3.38}$$

$$\frac{dt_c}{dL} = \frac{\gamma_{11}(-\gamma_{2L}) - \gamma_{21}(-\gamma_{1L})}{\gamma_{11}\gamma_{22} - (\gamma_{21})^2}. \tag{3.63}$$
$$\tag{3.39}$$

Since γ_{21} has an ambiguous sign, each equation will, in turn, be ana-

lyzed with respect to changes in γ_{21}. Equation 3.38 can be restated as

$$\frac{-\gamma_{1L}\gamma_{22}}{\gamma_{11}\gamma_{22} - (\gamma_{21})^2} - \frac{(-\gamma_{2L})}{\gamma_{11}\gamma_{22} - (\gamma_{21})^2}\,\gamma_{21} = \frac{dt_w}{dL}. \tag{3.64}$$

First, let $\gamma_{21} = 0$. This renders the point where

$$\gamma_{21} = 0, \text{ and } \frac{dt_w}{dL} = \frac{-\gamma_{1L}\gamma_{22}}{\gamma_{11}\gamma_{22}} = \frac{-\gamma_{1L}}{\gamma_{11}} < 0 \tag{3.65}$$

and a slope at this point of

$$\text{slope} = \frac{\gamma_{1L}}{\gamma_{11}\gamma_{22}} < 0. \tag{3.66}$$

Thus when $\gamma_{21} = 0$ there is a negative slope. A second point can be acquired by analyzing the value of γ_{21} which sets $\frac{dt_w}{dL} = 0$. This yields

$$-\gamma_{1L}\gamma_{22} - \gamma_{21}\,(-\gamma_{2L}) = 0$$

or

$$\frac{-\gamma_{1L}\gamma_{22}}{-\gamma_{2L}} = \gamma_{21} < 0. \tag{3.67}$$

The final relationship that allows the specification of the general slope of equation 3.65 is the second-order condition which is (as noted in 3.42)

$$\gamma_{11}\gamma_{22} - (\gamma_{21})^2 > 0.$$

This gives the upper and lower bound of γ_{21} as

$$+\sqrt{\gamma_{11}\gamma_{22}} > +\gamma_{21}$$

and

$$-\sqrt{\gamma_{11}\gamma_{22}} < -\gamma_{21}.$$

The limit of the denominator of either the intercept or the slope of 3.65 approaches zero at either extreme. For

$$\gamma_{21} > 0$$

the

$$\lim_{\gamma_{21} \to \sqrt{\gamma_{11}\gamma_{22}}} \left[\frac{-\gamma_{1L}\gamma_{22}}{\gamma_{11}\gamma_{22} - \gamma_{21}^2} - \frac{(-\gamma_{2L})}{\gamma_{11}\gamma_{22} - \gamma_{21}^2}\gamma_{21} \right] = -\infty. \qquad (3.68)$$

For

$$\gamma_{21} < 0$$

$$\lim_{\gamma_{21} \to \sqrt{\gamma_{11}\gamma_{22}}} \left[\frac{-\gamma_{1L}\gamma_{22}}{\gamma_{11}\gamma_{22} - \gamma_{21}^2} - \frac{(-\gamma_{2L})}{\gamma_{11}\gamma_{22} - \gamma_{21}^2}\gamma_{21} \right] = +\infty \qquad (3.69)$$

if a negative γ_{21} is large enough to change the overall sign of the second term. This is illustrated in Figure 3.

The main relationship of interest is the impact of a change in liability on care time. This relationship has been stated as

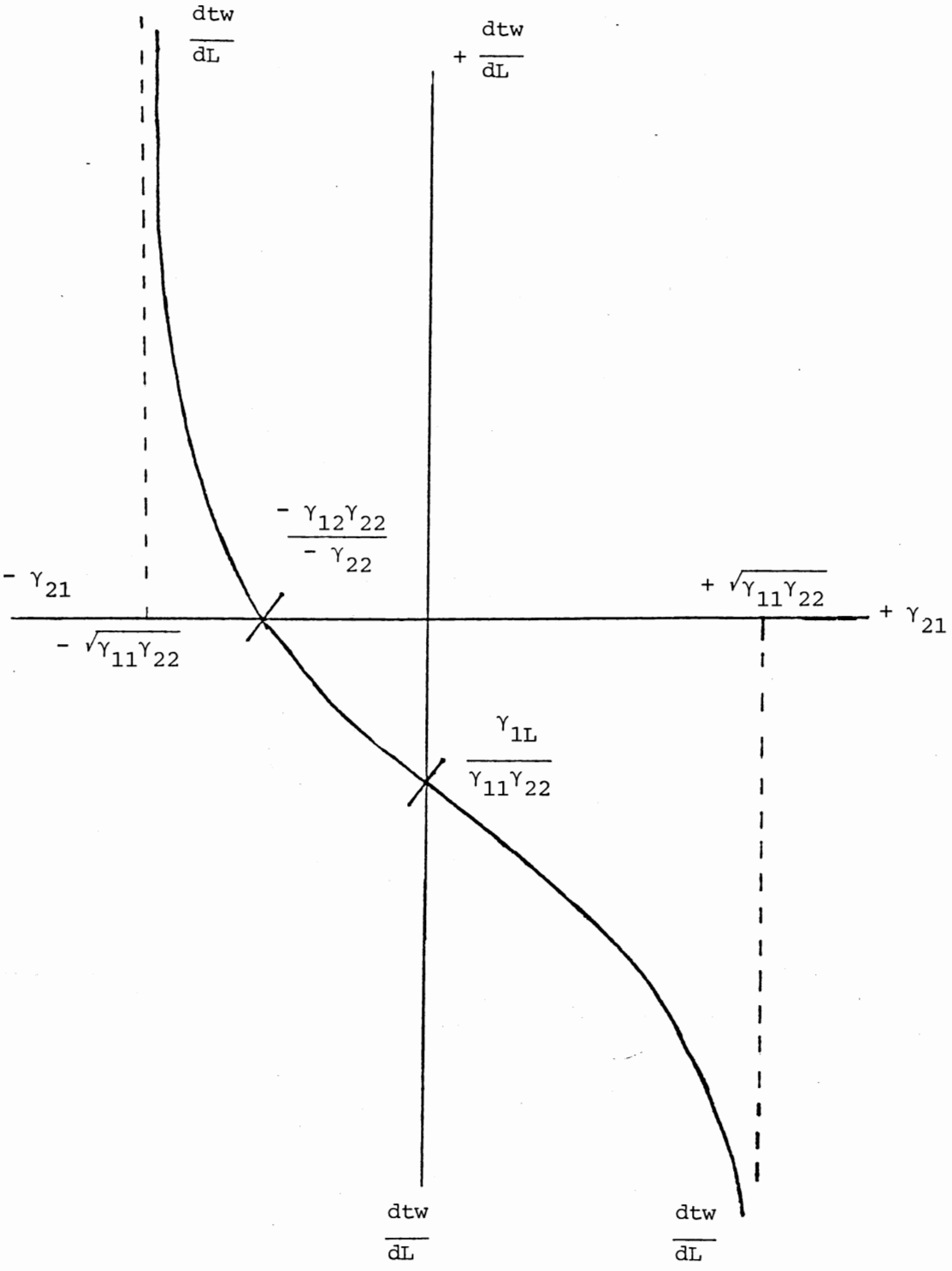
dtw/dL
+ dtw/dL
- γ21
- √(γ11γ22)
- γ12γ22 / - γ22
+ √(γ11γ22)
+ γ21
γ1L / γ11γ22
dtw/dL
dtw/dL

FIGURE 3

$$\frac{dt_c}{dL} = \frac{\gamma_{11}(-\gamma_{2L})}{\gamma_{11}\gamma_{22} - (\gamma_{21})^2} - \frac{(-\gamma_{1L})}{\gamma_{11}\gamma_{22} - (\gamma_{21})^2}\,\gamma_{21}.$$

If $\gamma_{21} = 0$ then $\frac{dt_c}{dL} = \frac{-\gamma_{2L}}{\gamma_{22}} < 0$ with a slope of $-\frac{(-\gamma_{2L})}{\gamma_{11}\gamma_{22}} < 0$. Likewise if $\frac{dt_c}{dL} = 0$ then $\gamma_{11}(-\gamma_{2L}) - (-\gamma_{1L})\gamma_{21} = 0$ which yields

$$\gamma_{11}\left[\frac{-\gamma_{2L}}{-\gamma_{1L}}\right] = \gamma_{21}.$$

The limits are the same for $\frac{dt_w}{dL}$ and are determined by the second-order condition, thus

$$\lim_{\gamma_{21} \to +\sqrt{\gamma_{11}\gamma_{22}}} \left(\frac{dt_c}{dL}\right) = -\infty$$

and

$$\lim_{\gamma_{21} \to -\sqrt{\gamma_{11}\gamma_{22}}} \left(\frac{dt_c}{dL}\right) = +\infty.$$

The relationship between $\frac{dt_c}{dL}$ and γ_{21} is illustrated in Figure 4.

There are two possible results which are of interest, each of which deals with the horizontal intercepts. The first is

$$\gamma_{22}\left[\frac{-\gamma_{1L}}{-\gamma_{2L}}\right] < \gamma_{11}\left[\frac{-\gamma_{2L}}{-\gamma_{1L}}\right].$$

This is illustrated in Figure V. Where this is the situation, $\frac{dt_w}{dL}$ and $\frac{dt_c}{dc}$ both will initially be positive and falling as γ_{21} rises. $\frac{dt_w}{dc}$

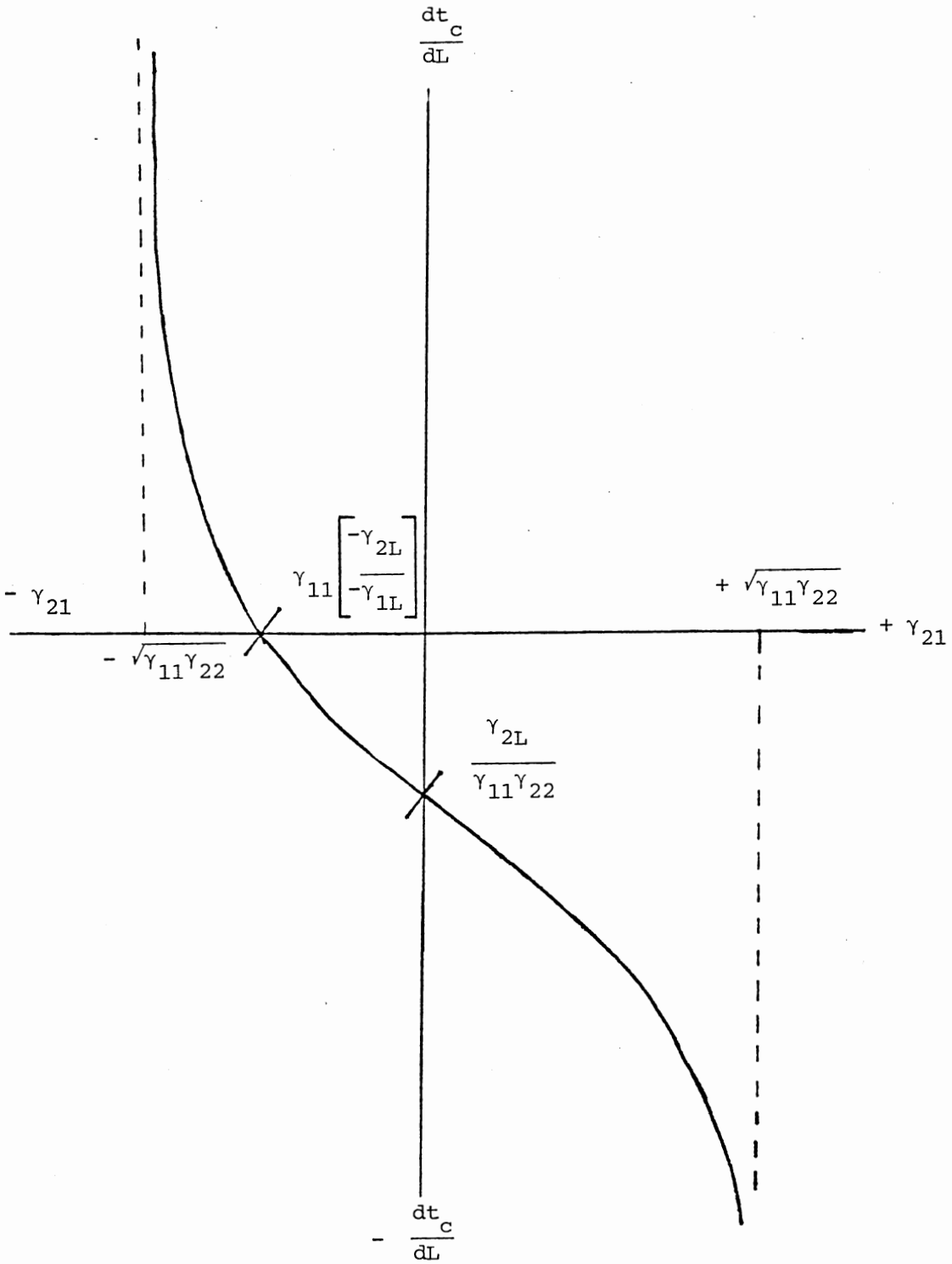
$\frac{dt_c}{dL}$
$-\gamma_{21}$
$\gamma_{11}\begin{bmatrix}-\gamma_{2L}\\-\gamma_{1L}\end{bmatrix}$
$+\sqrt{\gamma_{11}\gamma_{22}}$
$+\gamma_{21}$
$-\sqrt{\gamma_{11}\gamma_{22}}$
$\frac{\gamma_{2L}}{\gamma_{11}\gamma_{22}}$
$-\frac{dt_c}{dL}$

FIGURE 4

will be negative and $\frac{dt_c}{dc}$ positive over the range AB in Figure 3. Both will be negative for $\gamma_{21} > B$. The results are summarized in Table I.

Figure 4 illustrates the situation in which

$$\gamma_{11}\left[\frac{-\gamma_{2L}}{-\gamma_{1L}}\right] < \gamma_{22}\left[\frac{-\gamma_{1L}}{-\gamma_{2L}}\right].$$

These results are summarized in Table II. The information in Tables I and II indicates that work time and care time could be seen as being both positive or negative or as having different signs with respect to liability.

Section 5: Discussion

When expected losses depend on the provision of care by the consumer, a shift of the burden of liability to the producer will result in the reduction of care by the consumer. This result is intuitively attractive. As the gains from any activity are reduced, participation in the activity would be expected to fall; thus as the potential benefit from the provision of care falls the consumer will provide less care.

The model in this chapter was developed with the intention of illustrating the complexity of the decision making process. To complete the analysis, each activity, good and use of time must be specified, as well as a distribution of accidents which might occur for each product in each activity. The inclusion of information distortion and deviations from the competitive norm as an explicit specification of producer behavior must be included to give accurate, quanti-

TABLE I

SIGNS OF DERIVATIVES WITH A > B.

IF	THEN
$\gamma_{21} < \gamma_{22}\left[\frac{-\gamma_{1L}}{-\gamma_{2L}}\right]$	$\frac{dt_w}{dL}$; $\frac{dt_c}{dL} > 0$
$\gamma_{22}\left[\frac{-\gamma_{1L}}{-\gamma_{2L}}\right] < \gamma_{21} < \gamma_{11}\left[\frac{-\gamma_{2L}}{-\gamma_{1L}}\right]$	$\frac{dt_w}{dL} < 0$; $\frac{dt_c}{dL} > 0$
$\gamma_{11}\left[\frac{-\gamma_{2L}}{-\gamma_{1L}}\right] < \gamma_{21}$	$\frac{dt_w}{dL}$; $\frac{dt_c}{dL} < 0$

TABLE II

SIGNS OF DERIVATIVES WITH B > A.

IF	THEN
$\gamma_{21} < \gamma_{11}\left[\frac{-\gamma_{2L}}{-\gamma_{1L}}\right]$	$\frac{dt_w}{dL}$; $\frac{dt_c}{dL} > 0$
$\gamma_{11}\left[\frac{-\gamma_{2L}}{-\gamma_{1L}}\right] < \gamma_{21} < \gamma_{22}\left[\frac{-\gamma_{1L}}{-\gamma_{2L}}\right]$	$\frac{dt_c}{dL} < 0$; $\frac{dt_w}{dL} > 0$
$\gamma_{22}\left[\frac{-\gamma_{1L}}{-\gamma_{2L}}\right] < 121$	$\frac{dt_c}{dL}$; $\frac{dt_w}{dL} < 0$

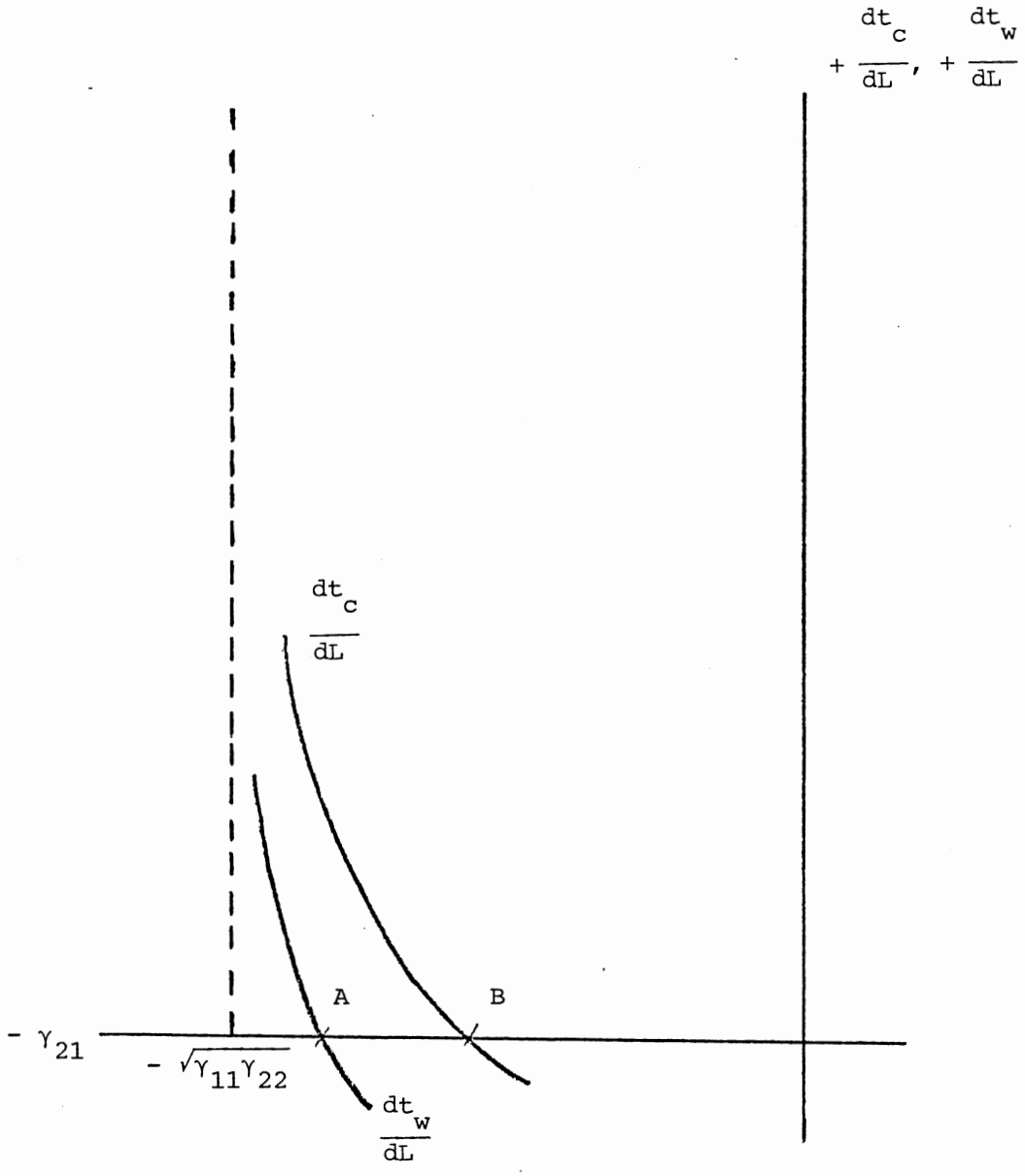
$+\frac{dt_c}{dL}, +\frac{dt_w}{dL}$
$\frac{dt_c}{dL}$
A
B
$-\gamma_{21}$
$-\sqrt{\gamma_{11}\gamma_{22}}$
$\frac{dt_w}{dL}$

FIGURE 5

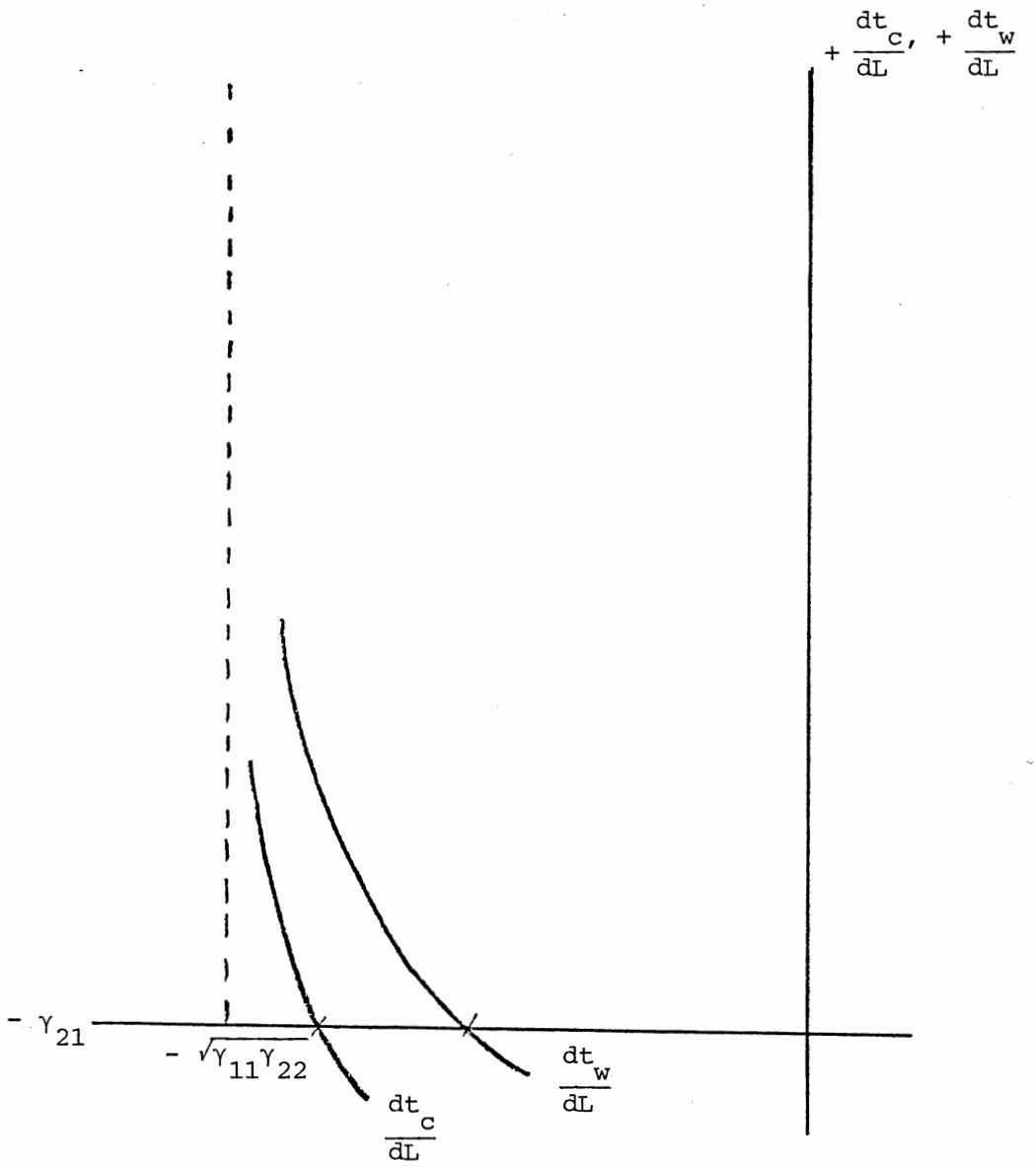

FIGURE 6

fiable results. A casual merging of the model in this chapter and previous analyses is, however, possible.

The first issue is that of information imperfections. If the consumer sees no risk to consumption, he would not, rationally, provide care. If the distortion is not complete then he may still provide care, but at a lower level than if he were fully informed. The consumer may also overestimate the risk. If this is the situation then the consumer could well provide more care than under full information.

Spence [1977] has indicated that there are also potential distortions in the marginal conditions. If the consumer sees the risk higher than is the case and underestimates his productivity of care, he could provide more or less care than the full information level. When the producer is included the same types of ambiguities that existed in Spence's analysis could occur. As the burden of liability is shifted to the producer and as long as the consumer sees this as reducing his potential loss, the consumer will provide less care. The producer's costs rise by the increased compensation and thus producer care would be expected to rise. Will products be more or less safe? This is unknown and will depend on the productivity of care by producers and consumers and the changes in their level of care. In the general situation in which both producers and consumers influence accidents, a change in liability from no liability will have an ambiguous result.

Monopoly would be expected to introduce another distortion into the analysis. In addition to the provision of a smaller quantity, the monopolist might attempt to discriminate on the basis of information,

risk preferences and potential losses. Different levels of care could be provided with the monopolist setting price and attempting to segment the market on the basis of these different levels of care.

An analysis of the impact of varying liability rules is the purpose of this research. The analysis in this chapter indicates that the impact of these changes cannot be specified without consideration of a number of factors tangentially related to the consideration of products liability. The total impact is ambiguous. A final point is that while consumers are "best" off under absolute liability, as far as their losses from accidents are concerned, their expected utility would fall. This occurs as a result of the market relationship which exists between the producer and the consumer. If the consumer can increase his expected utility by purchasing care from the producer, he will do so. Thus, for the producer to increase care beyond the no-liability level, the implication is that the nominal value of the rise in expected utility is less than the expenditure on care by the producer. For the "optimum" to be achieved both the producer and consumer must provide those levels of care which maximize expected utility. If the consumer is misinformed, he will not provide the appropriate level of care, thus no remedy which is based solely on adjusting the incentives of the producer to provide care will achieve this "optimum," because it will not bring forth the correct level of consumer care. The estimation of the impact variations in liability on product-related accidents will be presented in Chapter 5.

CHAPTER III

ENDNOTES

[1]Gary S. Becker, "A Theory of the Allocation of Time" Economic Journal Vol. 74, No. 295 (September 1965), pp 493-517.

[2]The assumption of perfect competition is made by both Oi and Spence. For a specification of the norms of perfect competition see P.R.G. Layred and A.A. Walters. Microeconomic Theory. McGraw Hill Book Company, New York, New York, 1978.

[3]This result is intuitively clear. If the consumer only loses as a result of providing care, he will not provide care. The implication with respect to the provision of work time is not as intuitively clear. The consumer is in the process of maximizing expected utility, thus, the marginal utility of time is the same across uses. The shift of the burden of liability shifts the marginal utilities of both care time and work time, thus altering both uses.

[4]Layred and Walters, Chapter 5.

CHAPTER IV

THE LEGAL STRUCTURE OF LIABILITY

The purpose of this analysis is to test the impact of liability rules on product-related accidents. In order to accomplish this the changes in the rule of liability which occurred must be specified. This chapter maps the historical progression of products liability with emphasis on the changing rule of liability. Liability has passed through four phases.[1] These phases, while distinct within a state, do not occur simultaneously in all states. These phases will be generally identified in this chapter, with the state by state specification left to table I. Table I identifies the statutes or cases which mark the shift from one rule of liability to another. The dates in this table form the basis of the primary independent variable which is of interest.

Section 1: Privity

The first phase of products liability was defined by the Winterbottom v. Wright[2] decision. This case clearly established the need for privity in contract as a prerequisite for the collection of damages. With privity the producer was responsible only to the immediate buyer of the product, and was thus insulated from any consumer who purchased the product from an intermediary to which the product was sold. This prevented a producer who sold a product to an intermediary

from being responsible for damages to the consumer which resulted from the failure of the product.

Changes in tort are often seen as reversals of previously held doctrine. This is not necessarily the case in the area of products liability.[3] While Wright v. Winterbottom established the general ambience for products liability prior to MacPherson v. Buick Motor Co.,[4] its erosion had started as early as 1837. The erosion of Wright v. Winterbottom can be seen most clearly through a series of exceptions to the privity requirement. The first exception was established by Longridge v. Levy[5] in 1837. This case dealt with the sale of a gun to the plaintiff for use by his son. The producer of the gun was intentionally incorrectly identified by the seller of the gun. The gun exploded resulting in the loss of the son's hand. This case established that a person could recover damages if a product which is known to be imminently dangerous is delivered without notice of its qualities. Epstein [1980] has noted two "implicit limitations" to the rule as established in Longridge v. Levy. The first was that it applied only to the "real party in interest," in this situation, the son. If the gun had been used by anyone else the rule would fail. The second implicit limitation was that "only fraud would carry the day for the plaintiff."[6] Epstein [1980] pointed out that this knowledge requirement was particularly harsh and was substantially eroded by the time of MacPherson v. Buick Motor Co.

The second exception was stated most accurately by Thomas v. Winchester.[7] This case concerned the purchase of belladonna which had been mislabeled as dandelion extract. The producer's employee mislabeled the belladonna which was sold to a druggist. The belladonna

was then purchased by the plaintiff's husband and used by the plaintiff. Clearly privity did not exist. The court overcame this by noting that "the sale of the substance in its original container created an 'imminent danger' only to the ultimate user of the product."[8] In this situation the danger came from placing a product which is inherently dangerous, here belladonna, into the stream of commerce. The factor which distinguishes this from the first exclusion is that there was no knowledge on the part of the producer involved that the belladonna had been mislabeled, and thus no fraud was involved.

The third exclusion to the privity rule was established by Devlin v. Smith,[9] in 1882. This involved the collapse of scaffolding which was deemed unable to support the required weight. The scaffolding was supplied by Stevenson to Smith for use by Smith's employees. With no relationship between the employee, Devlin, and Stevenson the privity limitation was in effect. The situation in Devlin v. Smith and Thomas v. Winchester are, in causal terms, very similar. Epstein [1980] points out that the only meaningful difference is that belladonna operates on the internal chemistry of the individual while the defective scaffolding causes injury by allowing the individual to fall from great heights.

These exceptions were summarized in Huset v. J.I. Case Threshing Co. as:

> The first is that an act of negligence of a manufacturer or vendor which is imminently dangerous to the life or health of mankind, and which is committed in the preparation or sale of an article intended to preserve, destroy, or affect human life, is actionable by third parties who suffer from the negligence.

> The second exception is that an owner's act of negligence which causes injury to one who is invited by him to use his defective appliance upon the owner's premises may form the basis of an action against the owner.
>
> The third exception to the rule is that one who sells or delivers an article which he knows to be imminently dangerous to life or limb to another without notice of its qualities is liable to any person who suffers an injury therefrom which might have been reasonably anticipated, whether there were any contractual relations between the parties or not.[10]

It is clear from the above that elements of negligence had crept into products liability prior to MacPherson v. Buick Motor Co.. Indeed, Judge Sarborn stated the first two exceptions explicitly in terms of negligence, while the third sounds like a failure to warn. The shift from privity to negligence is best thought of as having been a gradual shift with several small shifts in the form of a series of exceptions followed by a somewhat larger shift in MacPherson, which finally established the rule of negligence.

Section 2: Negligence

The rejection of the privity requirement was completed in MacPherson v.Buick Motor Co., which established negligence as a rule for recovery. The MacPherson case involved the collapse of a wheel while the automobile was in motion. The plaintiff was thrown from the car and injured. Judge Cardoza escaped the requirement of privity by noting two issues of "immediate and paramount importance." The first was whether the vendor knew that the product would be used by the plaintiff even though he was not the immediate purchaser. The second issue was whether the product was dangerous. On the basis of these two issues the rule of negligence was established.

The rule of negligence was adopted in every state by 1966.[11] Keeton et al., [1984] list three general ways a producer can be negligent. These are:

(1) "Negligent in creating or failing to discover a flaw."[12]

(2) "Negligent in failing to warn or failing to adequately warn."[13]

(3) "Negligent in the sale of a defectively designed product."[14]

Negligence is defined more generally as, "... doing of something that a person of ordinary prudence would not have done in the same or similar circumstances or a failure to do something that the person of ordinary prudence would have done in the same circumstances."[15] While negligence is typically still available as a theory of recovery, it has been generally supplanted by the theory of strict liability in tort. Brown [1973], in a general analysis of liability, stated the negligence rule as

$$L_X(X,Y) = \begin{cases} 0 & \text{if } X > X^* \\ 1 & \text{if } X < X^* \end{cases} \qquad L_Y(X,Y) \begin{cases} 1 & \text{if } X > X^* \\ 0 & \text{if } X < X^* \end{cases}$$

where L_X is the liability of the producer, (injurer), L_Y the liability of the "victim," with X and Y the levels of care by the producer and "victim," respectively. X* is the due-care standard for the producer. With the adoption of a generally applicable rule of negligence, the liability burden of producers would be expected to rise. This, in and of itself, may not have much effect on the provision of care. With a system as described in chapter two where the risk involved in the consumption of a good influences the demand and supply of a good, the system may already be at something very much resembling

a "Coasian" equilibrium with the exact characteristics of a good with respect to risky consumption determined through a market process with consumers maximizing utility and producers maximizing profit.[16]

There are two parameters to any behavior-specific system of products liability. The first is the rule of liability, such as negligence, strict liability or comparative liability. Once the rule of liability is established the due-care standard must be determined. Under a rule of negligence the producer is required to provide care of a specified level in order to escape liability; this is the due-care standard for the producer. As this standard becomes higher, the negligence rule will converge with strict liability. As this due-care standard falls, the rule will approach no liability. The courts can specify care standards on an ad hoc basis for different products in a manner which could result in some products covered approximately by strict liability, while the coverage of others approximates no liability.

The evolution of products liability from negligence to strict liability has illustrated this situation. Epstein [1980] points out that the changes in liability with respect to food evolved in this manner. It was, and is, held by the courts that producers of food should provide the highest possible level of care. The use of a highest possible care standard can come precariously close to strict liability in tort.[17] The removal of industry custom as setting the benchmark for care also hastened the erosion of the negligence standard.[18]

A second method by which the rule of negligence converged with strict products liability concerned the evidentiary rule of <u>res ipsa loquitor</u>. This doctrine applies to situations where no direct evi-

dence of negligence is shown but where an unusual accident occurred which would probably not have occurred if proper care had been provided by the defendant. In this situation the defendant is negligent under the doctrine of res ipsa loquitor. Keeton et al. [1984] state four conditions[19] for its application:

> (1) "The event must be of the kind which would ordinarily not occur in the absence of someone's negligence."[20]
> (2) "It must be caused by an agency or instrumentality within exclusive control of the defendant."[21]
> (3) "It must not have been due to any voluntary action or contribution on the part of the plaintiff."[22]
> (4) "That evidence as to the true explanation of the event must be more readily accessible to the defendant than the plaintiff."[23]

Epstein [1980] used Richenbacker v. California Packing Corporation[24] to illustrate the inclusion of res ipsa loquitor products liability. This case involved the presence of a large piece of glass in canned spinach. The plaintiff demonstrated that it could not have been introduced as a result of their failure to provide due care. It was decided that even though there was no specific evidence of the defendant's negligence, the glass could not have been introduced except while the defendant was in control; thus the defendant was liable. The presence of the defect is sufficient, with proof that the plaintiff was not contributorily negligent, to establish the defendant's negligence. Prosser and Keeton [1984] indicated that this doctrine can also be probabilistically used if it seems more probable that the defendant was negligent.

The movement of negligence towards strict products liability is shown clearly in Escola v. Coca-Cola Bottling Co.[25] Despite extensive evidence by the defendant that due care was provided, the plaintiff was successful.[26] The doctrine of res ipsa loquitor was evidently a

controlling factor in the decision. The conditions for the use of res ipsa loquitor, as given to the jury, were that (1) "the defendant had exclusive control of the thing causing the injury and (2) the accident is of such a nature that it ordinarily would not occur in the absence of negligence by the defendant."[27] Noel and Phillips [1981] pointed out that exclusive control can be demonstrated by showing "proper handling" after the product leaves the defendant's control.[28] In Escola v. Coca-Cola Bottling Co.,[29] Justice Traynor stated that this brings the rule of negligence to a close approximation of strict products liability. Thus, under the doctrine of res ipsa loquitor and in the absence of negligence by the plaintiff, it would appear that as long as the accident would not ordinarily occur without the defendant's negligence, and with no positive proof of that negligence, the defendant would be negligent. This second phase in the evolution of the structure of products liability consisted of the period of time from MacPherson, in 1916, to the mid-1960s and the adoption of strict products liability.

Section Three: Strict Products Liability

The doctrine of strict products liability allows recovery for damages caused by a product which is in a "defective condition unreasonably dangerous to the user or consumer."[30] The doctrine was first stated in Justice Traynor's concurring opinion in Escola v. Coca-Cola., and explicitly adopted first in Greenman v. Yuba Power Products Co.[31] in 1963. Greenman and the acceptance of strict products liability by the American Law Institute in the Second Restatement of Torts heralded the broad acceptance of strict products liabil-

ity. Strict products liability, either section 402A of the Second Restatement of Torts or a rule very similar to section 402A, was accepted by forty-five states as of 1984,[32] with five others relying on warranty.[33] There are four generally accepted reasons for the use of strict products liability;[34] these are:

> (1) that it reduces the number and severity of accidents.
> (2) that some parties are "ill prepared" to meet the "over whelming" consequences of injuries.
> (3) that the producer can acquire insurance more readily than the consumer and pass it on in the form of higher prices.
> (4) that it simplifies the administration of products liability actions.

The first contention is that strict products liability will result in "safer" products. A necessary prerequisite for this is that the control of product safety be within the exclusive control of the producer. There are few products which meet this general rule. As long as product safety is a jointly produced good with inputs from both users and manufacturers, each of whom receive benefit from their provision of care, any alteration in the benefit they receive from their own activity will reduce their incentive to participate in that activity. A change in the burden of liability from the consumer to the producer alters the gains to the parties involved. Specifically, while the producer would be expected to provide more care in an effort to reduce his liability burden, the consumer will provide less care because he receives no benefit due to the producer's liability. As pointed out in chapter two, the overall implications of the impact on product safety tends to be ambiguous, with the potential, depending on the exact nature of the production of care, for the frequency and severity of product-related accidents to either rise or fall.

The second contention is, essentially, that producers are better able to absorb the large personal losses which occur as a result of these accidents. The firm's "pockets" are assumed to be "deeper" than the consumers. The third contention involves risk spreading. The producer is able to encompass the cost of procuring insurance in the price of the good and thus spread the risk among the consumers. As long as the producer is the sole determinant of accident frequency and severity, these arguments may be acceptable. Unfortunately, these same two arguments can be used to rationalize absolute liability for all accidents involving all products. They provide no rationale to limit liability to defective products.

The final contention is that it would simplify the administration of products liability claims. The ability to prove any party liable under strict products liability is more secure than under a negligence. All that must be shown is that a defect was present and basically responsible for the accident. While this simplifies the court process, it may well encourage more suits due to the greater ease of proving the producer liable. The uneven adaptation of strict products liability provides the opportunity to compare the impact of its adoption by using cross sectional observations of product-related accidents.

Section 4: Comparative negligence

The final phase in the development of products liability legal structure essentially began with Daly v. General Motors Co.[35] in 1978. In this case the California Supreme Court applied the principle of comparative negligence to strict liability in tort, thus merging

the two concepts. Strict liability with comparative negligence still holds the manufacturer liable for the damages but reduces the amount by the proportion of fault of the plaintiff. Courts have often followed the lead of the state legislature in use of comparative fault since many states had replaced negligence by adapting a comparative negligence statute.[36] While California provided the meaningful start of the widespread adoption of comparative negligence in strict liability cases, it was not the first to adopt this modification. Wisconsin,[37] New Hampshire,[38] Alaska,[39] Idaho,[40] Mississippi[41] and Nebraska[42] had all previously adopted comparative negligence. Comparative negligence has been applied to strict liability in tort in twenty-six states.[43] Table III lists the relevant cases, statutes and dates.

Comparative negligence involves the division of losses on the basis of the relative "responsibility" of the two parties. There are three generally used methods of separating these losses.[44] First, is the pure form of comparative negligence under which a party is required to bear the losses of the accident in accordance to the "relative percentage" of his fault.[45] The second allows recovery only if the plaintiff's negligence was less than the defendant's.[46] This second rule is modified in some states by allowing recovery if both parties are equally negligent. The third, as adopted by Nebraska[47] and South Dakota,[48] allows the plaintiff to recover if his negligence is "slight" while that of the defendant is "gross." The case for the adoption of comparative negligence is stated by Justice Spears in Duncan v. Cessna Aircraft Co.[49] as

> ...on the one hand that strict products liability is not absolute liability - that is, product suppliers are not insurers of the safety of their products. On the other hand 'all or nothing,'strict liability defenses are outmoded and undesirable doctrinal throwbacks resulting in unfairness to plaintiffs, to defendants, and to other product purchasers who ultimately absorb the loss through price setting. ...in the absence of apportionment, some manufacturers bear the total expense of accidents for which others are partly to blame, while other manufacturers totally escape liability even though they have sold defective products. Either result is unacceptable. ...
>
> Unfairness, however, is not the only serious flaw of virtually ignoring plaintiff and third party misconduct in strict products liability actions. The failure to allocate accident costs in proportion to the parties' relative abilities to prevent or to reduce those costs is economically inefficient. Special Project. Supra, at 485-86. An ideal tort system should impose responsibility on the parties according to their abilities to prevent the harm. Existing law, however, encourages manufacturers to make safety improvements that are not cost justified while failing to deter the substandard conduct of the tort-feasors...Id.... Thus, equitable and rational risk distribution, a fundamental policy underlying the imposition of strict product's liability, logically depends on the existence of some system for comparing causation in cases involving plaintiff or third party misconduct.[50]

It is interesting to note that the court states the arguments in favor of comparative negligence in terms of equity and efficiency, both of which economists at least recognize. There are two implications with respect to the efficiency contention. The first is that a more efficient production of safety could lead to improvements in product safety. This, of course, may or may not be the case, depending on the exact nature of the production of safety. The second, and more obtuse, is that court costs may rise. With a comparative fault rule the range over which the plaintiff can collect at least partial damages will rise. Likewise, the range over which producers will opt to settle as opposed to going to court will shrink as they try to reduce their damage payments by the amount of the plaintiff's negligence.

While there may be fewer and less damaging accidents, more litigation would be anticipated.

The legal structure of liability is the independent variable of interest to this analysis. The impact of changes in the structure of liability on observed accidents involving products is the subject of the analysis; thus, the legal structure of liability must be quantified. The change to be analyzed are the establishment of strict liability as the rule of liability.

Section 5: The Defective Product[51]

A product can be defective in three ways: (1) manufacture or construction, (2) design and, (3) inadequate warning. A defect in the manufacture or construction of a product consists of a situation where a product fails to meet the producer's own specifications of the product. The producer is held to his own standards, even if these are higher than the normal industry standards or those specified by statute.

There are two problems with proving the existence of a defect. The first is that the defect must be traced to that point where it left the control of the defendant.[52] This is more difficult to prove for a defect in manufacture than design because a design defect will be present throughout the product line while the defect in manufacture will be present only in the specific unit in question. The second problem deals with the causal relationship between the apparent defect and the accident, especially when dealing with mechanical defects.[53] The problem is that the apparent defect may be a result of the accident instead of the cause of the accident.[54]

Keeton et al. [1984] divide the problems of proof into three evidentiary types:

(1) "evidence is introduced, usually of an expert, of an identifiable flaw that could have caused the accident."[55]

(2) "when the user or someone present testifies that a component part malfunctions, but, for some reason, either because the accident destroys the evidence or the product disappears, there is no evidence as to an identifiable flaw that could have caused the accident."[56]

(3) "when the plaintiff is relying primarily on the nature of the accident as circumstantial evidence of a construction or marketing flaw."[57]

Perhaps the most interesting point with respect to proving the presence of a manufacturing defect is that there is, usually, no need for direct evidence of the existence of a defect due to the fact that the product is altered as a result of the accident.[58]

The second general type of defect consists of a failure to warn.[59] A product can be considered unreasonably dangerous by failing to adequately warn of the dangers of using a product which are related to the way the product was designed.[60] The failure to warn is specifically addressed in §402A comment (j) of the Second Restatement of Torts by stating that "to prevent the product from being unreasonably dangerous the seller may be required to give directions or warning, on the container, as to its use."[61] It must be emphasized that the failure to provide some minimal level of safety cannot be escaped with a warning of the hazards involved in the consumption of the product.[62]

Likewise, if a product is "incorrigibly unsafe" or of "doubtful value" a warning will not suffice to escape liability.[63]

Epstein [1980] points out that the duty to warn is particularly important when dealing with drugs and other types of chemicals.[64] The wrong label on a product removes the consumer from the "common pool" of knowledge thus making the producer responsible for the risk involved. Other than blatant mislabeling, there is apparently an ambiguous demarcation between what would be considered adequate and inadequate information. This naturally relates to the impact of information on the consumer's behavior. If the consumer is completely ignorant of the risk involved, as in Thomas v. Winchester, he will behave as if there is no risk involved. In the absence of suicidal tendencies, it seems unlikely that a person would take belladonna. The more accurate the consumer's information the less likely he is to take untoward risks.

The duty to warn by a producer of drugs, for example, apparently extends to the final consumer of the drug, in addition to the physician.[65] A warning which would be otherwise adequate can be offset by the over promotion of the drug.[66] While strict liability and negligence actions are very similar with respect to the duty to warn, they are different in one very important aspect. If a good is produced and sold with an inadequate warning, and is sold to an intermediary who then resells the product to its ultimate user, both will be strictly liable for the resultant injuries. A whole chain of intermediaries could thus be liable for a failure to warn.[67]

The third, and perhaps most interesting, is the defect in design Keeton et al. [1984] list two approaches to the problems of a "defec-

tively" designed product. The first of these is the consumer-user contemplation test. A product is defectively designed if "it is dangerous to an extent beyond that which would be contemplated by the ordinary consumer who purchased it with the ordinary knowledge common to the community as to the product's characteristics."[68] They list three reasons why the consumer contemplation test is not usually adequate.[69] The first is that it would not allow the injured party to recover from a design hazard that was "open" or "obvious," regardless of whether a safer product could have been placed on the market at a small change in costs. This problem speaks to the stated purpose of the courts which is to encourage safer products.[70] The second problem is that it can result in a product being identified as being defectively dangerous which is not.[71] The third problem deals with the ambiguous nature of consumer contemplation. Keeton et al. [1984] point out that with such an ambiguous statement of the conditions for recovery, the consumer contemplation test can be used to explain any result which a particular jury chooses.[72]

The second approach to a defective design is that of comparing the danger or harm with the utility and benefits of a product. All products are associated with some positive, though possibly very small, probability of failure. This approach recognizes that there is no way to evaluate the net loss or gain from the hazards of consumption without including the benefits of consumption in the analysis. This test allows a product to be declared "unreasonably dangerous" if "a reasonable person would conclude that the danger-in-fact, whether foreseeable or not, outweighs the utility of the product."[73] This conclusion is reached if the harm, in fact, outweighed the utility, even if a

safer product were available or if the product could have been more safely designed.[74] If there is no feasible way of eliminating the danger [user specifications were followed or industry standards were met (or state of the art)], the defendant will not be held liable.[75] The compliance with statute is generally not an escape of liability.[76]

A product can be defective in design, manufacture or warning. When an unreasonably dangerous defect is present, the producer is liable for the damages which result from the use of the product.

Section 6: Discussion

There are many other characteristics of products liability than a rule of liability and a standard of care. These include the consistency of verdicts,[77] the validity of statutes restraining damage awards,[78] manufacturer identification,[79] liability of successor corporations[80] and many other issues.[81] A detailed analysis of these is beyond the scope of this research and readily available elsewhere.[82]

Products liability is primarily a tort-developed set of rules which were developed on a state-by-state basis. This is not to say that there has been no legislative activity in this area. Herman [1983] provides an overview of this legislative activity, which is summarized in Table IV.

The statute of repose is the amount of time during which the manufacturer can be held liable for accidents. The statute of repose is generally between eight and twelve years. A statute of repose is a limit on the liability of the manufacturer. The shorter the statute of repose, the lower the burden of manufacturer liability. A second area of legislative activity is a statute of limitations. This limits

the time after an injury is known to have occurred for which the producer is liable. In addition to statutes of repose and limitations, products liability statutes often include certain presumptions or defenses. The most common of these concern, 1) state of the art defenses, 2) alteration or modification of the product, 3) compliance with government statutes or regulations and 4) the assumption of risk. Comparative negligence as applied to negligence has been usually adopted by statute (see Table IV).

The burden of liability is a function of many variables, the most important of which are the rule of liability and the standard of liability. As these rules and standards vary, producer and consumer behavior would be expected to vary. The only variable which is readily quantifiable is the liability rule. In the analysis contained in chapter three, the burden of liability was specified as being continuous and between zero and one. The empirical analysis presumes that strict products liability represents a larger burden than negligence and that comparative negligence represents a smaller burden than strict products liability, though presumably a larger burden than negligence. The analysis of the relationship between the rule of liability and product related accidents is presented in chapter six.

TABLE III*

STATUTES AND CASES DETERMINING LIABILITY

State	Establishment of Strict Liability
Alabama (1976)	Atkins v. American Motors Corporation, 335 So. 2d 134 (1976) Casrill v. Altech Indus., 335 So. 2d 128 (1976)
Alaska (1970)	Bachner v. Pearson, 479 P. 2d 319 (1970)
Arizona (1968)	O.S. Stapley Co. v. Miller, 103 Ariz 556, 447 P. 2d 248, (1968)
Arkansas (1973)	Arkansas Stat. Ann. § 85-2-318 (1985 supp)
California (1962)	Greenman v. Yuba Power Prod. Inc., 59 Cal. 2d 51, 27 Cal Rptr 697, 377 P. 2d 897 (1962)
Colorado (1974)	Bradford v. Bendix - Westinghouse Auto, Air and Brake, 33 Colo App 99, 517 P. 2d 406 (1974)
Connecticut (1970)	Wachtel v. Rosol, 159 Conn 496, 271 A. 2d 84 (1970)
Delaware (1976)	Martin v. Ryder Truck Rental Inc. 353 A. 2d 581 (1976) (limited to product bailments)
Florida (1976)	West v. Caterpiller Tractor Company, Inc. Fla 336 So 2d 80 (1976)
Georgia (1975)	Center Chemical Co. v. Parzini, 234 Ga 868, 218 S.E. 2d 580 (1975)

TABLE III* (Continued)

Hawaii (1970)	Stewart v. Budget Rent-a-Car Corp., 52 Huw 71, 470 P. 2d 240 (1970)
Idaho (1974)	Shields v. Morton Chemical Co. 518 P. 2d 857 (1974)
Illinois (1965)	Suvada v. White Moton Co., 32 I11. 2d 612 (1986)
Indiana (1970)	Perfect Paint and Color Co. v. Karduris, 142, Ind. App. 106 611, 258 N.E. 2d (1970)
Iowa (1970)	Hawkeye Sec. Ins. Co. v. Ford Motor Co., 174 N.W. 2d 672 (1970)
Kansas (1976)	Brooks v. Dietz, 218 Kan 698, 545 P. 2d 1104 (1976)
Kentucky (1966)	Dealers Transp. Co. v. Battery Distrib. Co., 402 S.W. 2d 441 (Ky 1966)
Louisiana (1971)	Weber v. Fidelity & Cas. Inc. of New York, 259 La 599 So. 2d 754 (1971)
Maine (1973)	14 M.R.S.A. § 221 (1973)
Maryland (1976)	Phipps v. General Motors Corp., 278 Md. 337, 363 A. 2d 955 (1976)
Massachusetts (1958)	Rely's on warranty Mass. Gen. Laws Ann. Ch. 106 § 2-314 to 318 (West 1958)
Michigan (1965)	Piercefield v. Remington Arms Co., 375 Mich. 85 133 N.W. 2d 129 (1965)
Minnesota (1969)	Kerr v. Corning Glass Works, 2 84 Minn 115, 169 N.W. 2d 587 (1969)

TABLE III* (Continued)

Mississippi (1966)	State Stove Mfg. Co. v. Hodges, 189 S. 2d 113 (1966)
Missouri (1974)	Gilberson v. Ford Motor Co., 504 S.W. 2d 8 (1974)
Montana (1973)	Branden Berger v. Toyota Motor Sales, 162 Mont. 506, 513 P. 2d 268 (1973)
Nebraska (1971)	Kohler v. Ford Motor Co., 187 Neb 428 191 N.W. 2d 601 (1971)
Nevada (1970)	Ginnis v. Mapes Hotel Corp., 86 Nev 408, 470 P. 2d 135 (1970)
New Hampshire (1969)	Buttrick v. Arthur Lessard & Sons, Inc., 110 N.H. 36, 260 A. 2d 111 (1969)
New Jersey (1965)	Santor v. A&M Karragheusin, Inc., 44 NJ 52 207 A. 2d 305 (1965)
New Mexico (1972)	Stang v. Hertz Corp, 83 NM 730 497 P. 2d 732 (1972)
New York (1973)	Codling v. Paglia, 32 NY. 2d 330, 298 N.E. 298 622 (1973)
North Carolina	Not Applicable
North Dakota (1974)	Johnson v. American Motors Corp., 275 N.W. 2d 57 (1974)
Ohio (1966)	Lazrick v. Republic Steel Corp., 6 Ohio St. 2d 227, 218 N.E. 2d 185 (1966)
Oklahoma (1974)	Kirkland v. General Motors Corp., 521 P. 2d 1353 (1974)

TABLE III* (Continued)

Oregon (1967)	Heaton v. Ford Motor Co., 248 OR 467, 435 P. 2d 806 (1967)
Pennsylvania (1966)	Webb v. Zern, 472 Pa 424 200 A. 2d 853 (1966)
Rhode Island (1971)	Ritter v. Narragansett Elec. Co., 109 R.I. 176 A. 2d (1971)
South Carolina	Relys on warranty S.C. code Ann. § 36-2-314 to 318 (Law Coop 1977) See also Lane v. Trenholm, 299 S.E. 2d 728
Tennessee (1966)	Ford Motor Company v. Lanon, 217 Tenn 400, 398 S.W. 2d 240 1966
Texas (1969)	Daryl v. Ford Motor Co., 440 S.W. 2d 630 Tex (1969)
Utah (1979)	Ernest W Hahn, Inc v. Armco Steel Co., 601 P. 2d 152 Utah 1979
Vermont (1975)	Zaleski v. Joyce, 133 Vt. 150 333 A. 2d 110 (1975)
Virginia	Relys on warranty V.A. Code § 8-2-314 to 318 (1965)
Washington (1969)	Ulmer v. Ford Motor Co., 75 Wash. 2d 522, 452 P. 2d 729 (1969)
West Virginia (1979)	Morningstar v. Black and Decker Mfg. Co., 253 S.E. 2d 666 W.V (1979)
Wisconsin (1967)	Dipple v. Sciano, 37 Wisc 2d 443, 155 N.W. 2d 55 (1967)

TABLE III* (Continued)

Wyoming (1972)	Relys on warranty Wyo Stat. Ann. Sec 1 -- 1 -- 109 (1972)

TABLE III* (Continued)

State	Comparative Fault Applied to Negligence
Alabama	Not Applicable.
Alaska (1975)	Kaatz v. State, 540 P. 2d 1037 (Alaska 1975)
Arizona	Not Applicable.
Arkansas (1975)	Arkansas Stat. Ann. § 27-1765 (1979) Enacted 1975
California (1975)	Li v. Yellow Cab, (1975) 13 Cal. 3d 804, 119 Cal. Rptr 858, 532 P. 2d 1226
Colorado (1973)	Colo. Rev. Stat. § 13-21-111 (Supp 1983) Enacted 1973
Connecticut (1973)	Conn. Gen. Stat. Ann. § 52-572 (L) (West Supp 1984) Effective 1973
Delaware	Not Applicable.
Florida (1973)	Hoffman v. Jones, 780 So 2d 431 (1973)
Georgia (1968)	Zayer of Georgia, Inc. v. Ray, 117 Ga App. 160 S.E. 2d 648 (1968)
Hawaii (1976)	Hawaii Rev. Stat. § 663-31 Enacted 1976
Idaho (1979)	Idaho Code § 6-801 (1979)
Illinois (1981)	Alvis v. Ribar, 85 Ill. 2d 1, 421 N.E. 2d 886

TABLE III* (Continued)

Indiana (1983)	Ind. Code Ann § 34-4-33-14 (West Supp 1983-1984)
Iowa (1982)	Goetzman v. Wichern, 327 N.W. 2d 742 (1982)
Kansas (1976)	Kansas Stat. Sec. 60 258a (1976)
Kentucky	Not Applicable.
Louisiana (1980)	La. Civil Code Ann. Art 2323 (West supp 1984) Effective 1980
Maine (1965)	Me Rev. Stat. Ann. (4 § 156 (1964)
Maryland	Not Applicable.
Massachusetts (1978)	Mass Gen Laws Ann Ch. 231 § 85 (1978)
Michigan (1979)	Placek v. City of Sterling Heights, 405 Mich. 638, 275 N.W. 2d 511 (1979)
Minnesota (1969)	Minn. Stat. Ann. § 604.01 (West Supp 1984)
Mississippi (1910)	1910 Miss. Laws 135 Ms. Code Ann § 58-607.1 (Supp 1977)
Missouri (1983)	Gustafson v. Benda 661 S.W. 2d 11 (1983)
Montana (1977)	Montana Rev. Codes Ann. Sec. 58-607.1 supp (1977)

TABLE III* (Continued)

Nebraska (1913)	Neb. Rev. Stat § 24-1151 Laws (1979) Laws 1913, C. 124, §1, p. 311
Nevada (1973)	Nev. Rev. Stat. § 41-141 (1979)
New Hampshire (1969)	N.H. Rev. Stat § 507: 7-A (1983)
New Jersey (1973)	N.J. S.A. 2A: 15-5.1 to 5.3
New Mexico (1981)	Scott v. Rizzo, 96 N.M. 682, 634 P. 2d 1234 (1981)
New York (1975)	N.Y. Civ. Prac. Law § 1411 (McKinney 1976)
North Carolina (1977)2	Relys on Warranty S.C. Code. Ann. § 36-2-314 to 318 (Law Coop 1977)
North Dakota (1975)	N.D. CENT. Code § 9-10-07 (1975)
Ohio (1980)	Ohio Rev. Code Ann. § 2315.19 (Page 1981)
Oklahoma (1979)	Okla. Stat. Ann. tit. § 13, § 14 (West supp 1983-84)
Oregon (1975)	Or. Rev. Stat. § 18:407 (1981)
Pennsylvania (1978)	Pa. Stat. Ann. tit 42 § 7102 (Pardon 1982 Supp. 1984-85)
Rhode Island (1971)	R.I. General Laws §§ 9-20-4 ?? 4.1 (Supp 1983)

TABLE III* (Continued)

South Carolina	Not Applicable.
Tennessee	Not Applicable.
Texas (1977)	Tex. Rev. Civ. Stat. Ann. art. 2212a (Vernon Supp 83-84)
Utah (1973)	Utah Code Ann § 78-27-37 (1977)
Vermont (1974)	Vt. Stat. Ann. tit. 12 Sec 1036 (1973)
Virginia	Not Applicable.
Washington (1974)	Wash. Rev. Code Ann. § 4-22-05 (Supp 1983-84)
West Virginia (1979)	Bradley v. Appalacian Power Co., 256 S.E. 2d, 879 (W.V. 1979)
Wisconsin (1931)	Wis. Stat. Ann. § 895.045 (West 1983) ((1931) Wis. Laws 242)
Wyoming (1973)	Wyo. Stat. § 1-1-09 (Supp 84) Laws 1973, ch. 28, § 1

TABLE III* (Continued)

State	Comparative Fault Merged with Strict Products Liability
Alabama	Not Applicable.
Alaska (1976)	Butaud v. Suburban Marina and Sporting Goods, Inc., 555 P. 2d 42 (1976)
Arizona	Not Applicable.
Arkansas (1975)	Arkansas Stat. Ann. §§ 27-1763 to 1765
California (1978)	Daly v. General Motors Corporation, 575 P. 2d 1162 (1978) Safeway Stores, Inc. v. Nest-Kart, 579 P. 2d 441 (1978)
Colorado (1973)	Colo. Rev. Stat. § 13-21-406 (Supp 1983)
Connecticut (1979)	Conn. Gen. Stat. Ann § 52-572 (o)
Delaware	Not Applicable.
Florida (1976)	West v. Caterpiller Tractor Company, Inc., Fla. 336 So. 2d 80 (1976)
Georgia	Not Applicable.
Hawaii (1982)	Kaneko v. Hilo Coast Processing Hawaii, 654 P. 2d 343 (1982)
Idaho (1976)	Sun Valley Airlines Inc. v. Avco Lycoming, Corp., 2111 F. Supp 598 (1976)

TABLE III* (Continued)

Illinois	Not Applicable.
Indiana (1983)	Ind. Code Ann § 34-4-33-14 (West Supp 1983-1984)
Iowa	Not Applicable.
Kansas (1980)	Kennedy v. The City of Sawyer, 228 Kan 439, 618 P. 2d 788 (1980)
Kentucky (1984)	Hilen v. Hayes, 673 S.W. 2d 713 (Ky 1984)
Louisiana	Not Applicable.
Maine (1965)	Me. Rev. Stat. Ann. 14 § 156 (1965)
Maryland	Not Applicable.
Massachusetts	Not Applicable.
Michigan	Not Applicable.
Minnesota (1977)	Busch v. Busch Construction Inc. 262 N.W. 2d, 377 (1977)
Mississippi (1975)	Edwards v. Sears and Roebuck Co., 512 F. 2d 276 (1975)
Missouri	Not Applicable.
Montana (1983)	Trust Corp of Montana v. Piper Aircraft Corp., 506 F supp 1093, 38 St. Rep. 249 (D.C. Mont 1981) (Zahrte v. Strum, Ruger & Co., 661 P. 2d 17 (Mont 1983))

TABLE III* (Continued)

Nebraska (1979)	Neb. Rev. Stat. § 25-1151 (1979)
Nevada (1981)	Aetna Casualty & Surety Co. v. Jeppson & Co. 642 F. 2d 339 (9th Cir 1981)
New Hampshire (1978)	Thibault v. Sears, Roebuck & Co., 118 N.H.-802, 395 A. 2d 843 (1978)
New Jersey (1979)	Suter v. San Angelo Foundry & Machine, 81 NJ 150 406 A. 2d 140 (1979)
New Mexico (1981)	Scott v. Rizzo, NM, 634 P. 2d 1234
New York (1975)	NY Civ. Prac. Law § 1411 (McKinney 1976) (effective 1975)
North Carolina	Not Applicable.
North Dakota (1984)	Mauch v. Manufacturers Sales & Service, Inc., 345 N.W. 2d 338 (1984)
	Day v. General Motors Corp., 345 N.W. 2d 349 (1984)
Ohio	Not Applicable.
Oklahoma	Not Applicable.
Oregon (1982)	Sandford v. Cheverolet Division of General Motors, 292 or 590, 642 P. 2d 624 (1982)
Pennsylvania	Not Applicable.
Rhode Island	Not Applicable.

TABLE III* (Continued)

South Carolina	Not Applicable.
Tennessee	Not Applicable.
Texas (184)	Duncan v. Cessna Aircraft Co., 665 S.W. 2d 414 (1984)
Utah (1981)	Mulherin v. Ingersol-Rand Co., 628 P. 2d 1301 (1981)
Vermont	Not Applicable.
Virginia	Not Applicable.
Washington	Not Applicable.
West Virginia (1982)	Star Furniture Co. v. Palaski Furniture Co., 297 S.E. 2d 854 (1982)
Wisconsin (1967)	Dipple v. Sciano, 37 Wisc. 2d 443, 155 N.W. 2d 55 (1967)
Wyoming	Not Applicable.

* The information in this table is drawn from a number of sources. The primary problem in gathering these data was in determining the effective dates of statutes or court rulings. This often necessitated a direct referral to a statute or case. Below is a list of primary sources which provided preliminary listings of cases and statutes.

West v. Caterpiller Tractor Company, Inc., Fl. 336 SO. 2d 80

Alvis v. Ribar, 85 Ill. 2d 1, 421 NE 2d 886

Henry Woods "The Trend Towards Comparative Fault." Journal of Products Liability, Vol. 7 (1984) pp. 399-411.

Henry Wood "Product Liability: Is Comparative Fault Winning the Day" Arkansas Law Review Vol. 36 (1983) pp. 360-382.

Lawrence R. Kulig "Comment: Comparative Negligence and Strict Products Liability: Where Do We Stand? Where Do We Go?" Villanova Law Review Vol. 29 (Je 1984) pp. 695-740.

Richard K. Hermann "An Overview of State Statutory Product Liability Law" The Trial Lawyers Guide Vol. 27 (Spr 83) pp. 1-52.

American Jurrisprudence 2d Products Liability Vol. 63 (1984) § 528-549 pp. 723-770.

TABLE IV. PRODUCTS LIABILITY LEGISLATION*

Alabama	Eff. July 30, 1979	Combines into one action claims for negligence, breach of warranty and manufacturers liability. Limited to "natural persons"
	Statute of Limitations.	1 year
	Statute of repose.	10 years (may be waived or extended by contract and does not apply to continuing obligations or latent defects).
	Not applied retroactively.	
	Alternative "B" to §2-318 of U.C.C. has been adopted.	
Alaska	No separate products liability statute.	
	Alternate "A" of §2-318 U.C.C.	
Arizona	September 3, 1978	Establishes Affirmative defenses of (1) "State of Art" (2) Alternation or modification of the Product (3) Unforeseeable use of misuse Complaint may not include any dollar amount in the addendum clause. Prohibition of use of changes in state of art as evidence of a defect
	Statute of limitations.	2 years
	Statute of repose.	12 years from first date of sale for use or consumption.
	Alternate "A" of §2-318.	

TABLE IV (Continued)

Arkansas	adapted in 1979	Provides defenses of (1) Compliance with federal or state statutes or regulations (2) Use where consumer was aware that it was outside the anticipated life of the product. (3) Unforeseeable alternation or misuse. (goes to the degree of fault - not an absolute defense) (state of Arkansas is not a defense but is admissible in evidence)
	Comparative fault statute is applicable if plaintiff is 50% or greater in responsibility.	
	Statute of limitations.	3 years
	Alternate "A" of §2-318.	
California	1979	Statute of limitation of 1 year placed on asbestos cases.
	1981	limited manufacturers liability in cases where product was altered or modified.
	Has not adopted §2-318.	
Colorado	1977	Rebuttable presumptions that product is not defective if: (1) it conformed to the state of the art. (2) complied with applicable codes of government standards. (3) the injury occurred more than ten years after the product was first sold for consumption or use.

TABLE IV (Continued)

Colorado cont.	Advances in technology one not admissible as evidence of a defect, but are allowable to establish a duty to warn.	
	Statute of limitations.	3 years
	Statute of repose.	10 years with limitations of (1) latent defects (2) prolonged exposure to hazardous material (3) intentional misrepresentation or fraud
	Alternate "B" of §2-318 U.C.C.	
Connecticut	October of 1979	(1) consolidates claims of strict liability, negligence and breach of warranty. (2) "comparative responsibility" established. (3) provides a defense of alternation or modification. (4) reduces damages by amount of workman compensation. (5) provision for award of attorney's fees in frivolous cases. (6) punitive damages allowed if reckless disregard is present. (7) punitive damages limited to twice the amount of damages.
	Statute of limitations.	3 years (prospectively from 10/1/79)
	Statute of repose.	10 years
	Alternate "A" to §2-318 U.C.C.	

TABLE IV (Continued)

Delaware	No separate products liability statute. Strict products liability is limited to product bailments.	
	Alternate "B" of §2-318.	
Florida	Statute of limitations.	4 years
	Statute of repose.	12 years
	Alternate "A" of §2-318 U.C.C.	
Georgia	November 1, 1982	
	Statute of repose.	10 years
	Alternative "A" of §2-318.	
Hawaii	(pending bill)	
	Statute of repose.	10 years
	Statute of limitations.	3 years includes comparative responsibility and allows punitive damages for reckless disregard.
	Alternative "C" of §2-318.	
Idaho	July 1980	
	Comparative responsibility established.	
	Changes in design or state of art do not establish defect, but can establish a failure to warn.	
	Establishes greater protection for non-manufacturer sellers (with exceptions).	
	No dollar amount allowed in addendum clauses.	

TABLE IV (Continued)

Idaho cont.		
	Statue of repose.	10 years can be altered by warranty, fraud or misrepresentation, or prolonged exposure.
	Statute of limitations.	2 years
	Alternative "A" of §2-318.	
Illinois	1979	adopted a statutory strict liability in tort which appears to limit that established in case law.
	1980 Statue of repose.	10 years (unless the product is sold by letter in/which case it may be 12 years if the 12 years is earlier than the 10 years).
	Statute of limitation.	8 years as long as it falls within the statute of repose. 2 years if it falls outside of the state of repose.
	Alternate "A" of §2-318, U.C.C.	
Indiana	Effective 1978	Codification of state common law strict liability in tort. Defenses of (1) assumption of risk (2) nonforeseeable misuse (3) nonforeseeable modification or alternation. (4) state of the art
	Statute of repose.	10 years.
	Statue of limitations.	2 years
	Alternative "A" of §2-318, U.C.C.	

TABLE IV (Continued)

Iowa	No distinct Statute.	
	Alternative "C" of §2-318, U.C.C.	
Kansas	1981	consolidates claims for strict products liability, negligence and breach of warranty.
	Defenses	(1) compliance with government standards (2) assumption of risk or contributory negligence
	Statute of repose.	presumption of safe life of 10 years. Rebuttable for (1) extended warranty (2) misrepresentation (3) prolonged exposure
	Alternate "B" of §2-318, U.C.C.	
Kentucky	Effective 1978	
	Established Defenses of	(1) Alternation or Modification (2) Contributory Negligence (3) State of Art (4) Advances in product are not admissible
	Statute of repose.	5 years for sale 8 years from manufacture
	Alternative "A" of §2-318, U.C.C.	
Louisiana	"The seller who knows the vice of a thing he sells and omits to declare it, besides the restitution of the price and repayment of the expenses, including reasonable attorney's fees, is answerable to the buyer for damages."	
	Louisiana Civil Code Art 2545 (1972 comp ed)	
	Not adopted §2-318 of U.C.C.	

TABLE IV (Continued)

Maine	1973	Statutory provision for strict products liability
	Unique version of §2-318.	
Maryland	1981	Introduced but failed
	Alternative "B" of §2-318.	
Massachusetts	No separate products liability act	
	Unique version of §2-318.	
Michigan	1978	(1) State of art is admissible (2) Compliance with state or federal laws is admissible (3) Changes in state of art are not admissible (4) Provides for comparative fault
	Statute of repose.	10 years
	Statute of limitations.	3 years
	Alternative "A" of §2-318, U.C.C.	
Minnesota	1978	Adopted comparative fault, uses the useful life defense for repose
	Statute of limitations.	4 years
	Alternative "C" of §2-318.	
Mississippi	No state product liability statute.	
	Alternative "A" of §2-318, U.C.C.	

TABLE IV (Continued)

Missouri	No state product liability statute.	
	Alternative "A" of §2-318, U.C.C.	
Montana	No specific products liability statute.	
	Alternative "A" of §2-318, U.C.C.	
Nebraska	1978	Allows for one product liability action regardless for the theory.
		State of art defense is available.
	Statute of repose.	10 years
	Statute of limitations.	4 years comparative negligence is in effect.
	Alternative "A" of §2-318, U.C.C.	
Nevada	No products liability statute but does have comparative negligence.	
	Alternative "A" of §2-318, U.C.C.	
New Hampshire	1978	Consolidates actions into claim.
	Defenses	Modification or alteration state of the art.
	Comparative fault is available.	
	Statute of limitation.	3 years
	Statute of repose.	12 years
	Unique version of §2-318.	

TABLE IV (Continued)

New Jersey	No products liability statute.	
	Comparative fault statute is in effect.	
	Alternative "A" of §2-318, U.C.C.	
New Mexico	No products liability statute.	
	Alternative "A" of §2-318, U.C.C.	
New York	No products liability statute.	
	Alternative "B" of §2-318, U.C.C.	
North Carolina	1979	Defenses (a) modification or alteration (b) contributory negligence or assumption of risk.
	Statute of repose.	10 years
	Statute of limitations.	3 years
	Alternative "A" of §2-318, U.C.C.	
North Dakota	July 1979	Provides that there is one action regardless of other theories.
	Alternation is a complete defense.	
	Presumption that not defective is in compliant with government regulations.	
	Statute of Repose/ limitations.	10 years from initial purchase
	Alternative "C" of §2-318, U.C.C.	

TABLE IV (Continued)

Ohio	No product liability statute.	
	General Statute of limitations.	2 years
	Alternative "A" of §2-318, U.C.C.	
Oklahoma	No product liability statute.	
	Comparative fault has been adopted.	
Oregon	1978	Establishes 402A and comments.
		Disputable presumption that product is not usually defective.
		Alteration or modification is a conditional defense.
		Punitive damages are available if wanton disregard.
	Statute of Repose.	8 years
	Statute of limitation.	2 years
	Alternative "A" of §2-318, U.C.C.	
Pennsylvania	No product liability statute.	
	(one had been introduced and was under consideration)	
	Alternative of "A" §2-318, U.C.C.	
Rhode Island	1978	Allows defense of alteration or modification.
	Statute of Limitations/ repose.	10 years

TABLE IV (Continued)

Rhode Island cont.		
	Comparative fault is available. Alternative "C" of §2-318, U.C.C.	
South Carolina	No products liability statute. Alternative "B" of §2-318, U.C.C.	
South Dakota	1979	Provides defenses of alteration or modification
	Comparatione fault has been adopted.	
	Statute of limitations/ repose.	6 years
	Alternative "B" of §2-318, U.C.C.	
Tennessee	1978	Provides for one product liability action.
	State of art is a defense but not on absolute defense. Alteration or modification is a defense as long as it is not foreseeable. Addendum clause must state the amount.	
	Statute of repose.	10 years (unless anticipated life has expired)
	Statute of limitations.	6 years
	Alternative "A" of §2-318, U.C.C.	
Texas	No specific products liability statute. Unique versions of §2-318, U.C.C.	
Utah	1977	Alteration or modification is a defense where it changed the purpose, use,

TABLE IV (Continued)

Utah cont.		function or intended use of the product.
	Statute of limitations/ repose.	6 years from purchase or 10 years from manufacture.
	Prohibition of amount in the addendum clause.	
	Alternative "C" of §2-318, U.C.C.	
Vermont	No products liability statute.	
	Alternative "A" of §2-318, U.C.C.	
Virginia	No separate products liability statute.	
	Unique version of §2-318, U.C.C.	
Washington	1981	Provides one product liability claim regardless of theory.
		State of art is admissible through out an absolute defense.
		Compliance with mandatory regulations is a complete defense.
	Contributory fault is in effect.	
	Rebuttable presumption that useful life is	12 years
	Statute of limitations	3 years
	Alternative "A" of §2-318, U.C.C.	

TABLE IV (Continued)

West Virginia	No separate products liability statute. Alternative "A" of §2-318, U.C.C.
Wisconsin	Many attempted but non adopted. Comparative fault is in effect. Alternative "A" of §2-318, U.C.C.
Wyoming	No separate products liability statute. Comparative fault is in effect. Alternative "B" of §2-318, U.C.C.

* This information is summarized from an overview of state statutory product liability law by Richard K. Hermann, The Trial Lawyers Guide 27 Spring 83, pp. 1-52.

CHAPTER IV

ENDNOTES

[1]Richard A.Epstein, Products Liability, (Westport Connecticut, 1980). Epstein separates the evolution of products liability law into three phases. The first two correspond roughly to the first two phases used in this analysis. For the purposes of this analysis there is the inclusion of the very definite tendency towards the merging of strict liability in tort and comparative liability, thus representing the fourth phase. Much of the analysis synopsesed in the section on privity depends heavily on Epstein's analysis. The reader is encouraged to refer to this work for an in depth and concise discussion of the issues involved.

[2]1842, 10 M & W 109, 152 Eng. Rep. 402. Dix W. Noel and Jerry J. Phillips, as discussed in Products Liability in a Nut Shell, (St. Paul Minnesota, 1981); Richard A. Epstein, Products Liability, (Westport Connecticut, 1980), chs. 1 to 6.

[3]Whether this situation exists for other areas of tort is a question for legal scholars and is not addressed here.

[4]W. Page Keeton et al., Prosser and Keeton on Torts, 5th edition Handbook Series, Student Edition, (St. Paul, Minnesota, 1984) p. 705-718. See Table I for the specific statutes and cases.

[5]M. 6 W. 519, 150 Eng. Rep. 863 (Ex 1837), as discussed in Epstein, Chapter 2.

[6]Epstein p. 20.

[7]6 NY 397 (1852), as discussed in Epstein Chapter 2.

[8]Epstein, p. 16.

[9]89 NY 470, 478, 1882, as discussed in Epstein Chapter 2.

[10]120 F. 865, 870-871 (8th Civ, 1903), as quoted in Epstein p. 15.

[11]Mississippi was the last state to leave Winterbottom v. Wright behind. However, Mississippi never accepted MacPherson but skipped directly to strict liability in tort in State Stove Manufacturing Co. v. Hodges, MS 1966, 189 So. 2d, 113.

[12]Keeton et. al.

[13]Keeton et al., 685.

[14]Keeton et al., 686.

[15]Rhodes v. Service Machine Co (ED Ark) 329 F. Supp. 367 (applying Arkansas law).

[16]Brown, John P. "Toward An Economic Theory of Liability" Journal of Legal Studies, 2 June 1973, p. 323-379. The exact response would depend on whether the standard of negligence is above or below the current level provided by producers. If is below, the no change in the burden of liability would occur. If it is above then producers would increase their level of care while consumers reduce their provision of care. The implications for product related accidents are ambiguous.

[16]Hertzler v. Marshun, 228 Mich. 416, 422, 200 N.W. 155, 156 (1924), as quoted in Epstein, p. 30.

[18]Epstein.

[19]Keeton et al., p. 244; these are derived from 4 Wigmore, Evidence 1 ed. 1905, § 2509.

[20]Keeton, et al., p. 244.

[21]Ibid.

[22]Ibid., p. 245.

[23]In Ibid. it is stated that this fourth condition has been "at least suggested by some courts".

[24]250 Mass. 198, 145 N.E. 261 (1924), as discussed in Epstein p. 31-32.

[25]24 Cal. 2d 453, 150 P. 2d 436 (1944), as discussed in Epstein.

[26]Noel and Phillips, p. 31.

[27]24 Cal. 2d 453, 150 p. 2d 436 (1944) as quoted in Noel and Phillips, p. 31.

[28]Noel and Phillips p. 35.

[29]24 Cal. 2d 453, 150 P. 2d 436 (1944).

[30]Section 402 A. Second Restatement of Torts:

> (1) One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if
>
> (a) the seller is engaged in the business of selling such a product, and
>
> (b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.
>
> (2) The rule stated in Subsection (1) applies although
>
> (a) the seller has exercised all possible care in the preparation and sale of his product, and
>
> (b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.

[31]59 Cal. 2d 57, 377 P. 2d 897, 27 Cal. Rptr 697 (1963).

[32]Kulig, Lawrence R. "Comment: Comparative Negligence and Strict Products Liability: Where Do We Stand? Where Do We Go?" Villanova

Law Review, 29 pp. 695-758, the specific cases and statutes are listed in Table I.

[33]Ibid., p.705.

[34]Epstein, pp. 40-48.

[35]575 P. 2d 1162 (Cal. 1978).

[36]Keeton et al., pp. 696-700. list of the specific statutes can be found in Table III.

[37]Dippel v. Sciano, 155 N.W. 2d 55 (Wis 1967).

[38]Stephen v. Sears Roebuck & Co., 266 A 2d 855 (NH 1970).

[39]Butand v. Suburban Marine & Sporting Goods, Inc., 555 P. 2d § 42, 46 (Alaska 1976).

[40]Chapter 14, Title 6, Idaho Code.

[41]Miss Ann Code § 11-7-15 91972).

[42]Nebraska Rev. Stat § 25-1151 (1979).

[43]Keeton et al., pp. 705-718. See Table I for the specific statutes and cases.

[44]Alvis v. Ribar 421 N.E. 2d 886.

[45]Ibid.

[46]Ibid.

[47]Neb. Rev. Stat. sec. 25 -- 1151 (1979).

[48]S.D. Complied Laws Ann sec. 20 -- 9 -- 2 (1979).

[49]665 SW 2d 414 (Tex 1984).

[50]Ibid., pp. 424, 425.

[51]Generally Epstein, 1, Dix & Noel, 2, Prosser & Keeton, 12, American Jurisprudence 2d § 555-557.

[52]Dix & Noel, p. 136.

[53]Ibid., p. 137.

[54]See for example Jenkins v. General Motors Corp., 446 F. 2d 377 (5th Cir. 1971)

[55]Keeton et al.

[56]Ibid., p. 696, (see also Annots, 1973, 51 American Legal Reports 3d 8(proof of defect generally); 1974, 54 American Legal Reports 3d 1079, (proof that defect was present when product left defendant's hands).

[57]Keeton et al. p. 696.

[58]Ibid., p. 697

[59]Keeton et al. includes the failure to warn under the general area of a defective product while Dix and Noel, and Epstein place it in a separate category.

[60]See generally Dix and Noel, chapter 6; Epstein, chapter 8; and Keeton et al., pp. 697-698.

[61]Dix and Noel, p. 179

[62]Ibid., p. 179;

[63]Ibid., p. 179;

[64]Epstein pp. 96-112.

65Ibid., pp. 101-103.

[66]Ibid.

[67]Keeton et. al., p. 697.

[68]Second Restatement of Torts, § 402A, Comment i., as quoted in Keeton et. al. p. 698.

[69]Keeton et al., p. 698.

[70]Ibid., pp. 692-693.

[71]Ibid.

[72]Ibid., p. 699.

[73]Ibid. Footnote 30 p. 699.

[74]Ibid.

[75]Epstein, Chapter 5.

[76]Ibid., pp. 145-147.

[77]41 American Law Reports 4th 9.

[78]41 Ibid., 4th 47.

[79]41 Ibid., 3d 1344.

[80]66 Ibid., 3d 824.

[81]For general listing see the Index to American Law Reports at Vol. 6 ALR 2d p 12-44 and at Vol. 7 ALR. Digest to 3d. 4th Federal. p. 706-851.

[82]63 American Jurisprudence 2d, Products liability §§ 1-908 pp. 1-1321, 64 American Jurisprudence 2d, Products liability §§909-977 pp. 32-130.

CHAPTER V

THE ESTIMATION OF THE IMPACT OF STRICT PRODUCTS LIABILITY

This analysis seeks to measure the impact of varying product liability rules on observed product related accidents. The model, as developed in chapter three, indicates that any result is possible. An increase in the burden of liability on the producer is expected to increase the level of care which is provided by the producer and reduce the level of care provided by the consumer. When this occurs, observed accidents may rise or fall depending on the relative productivities of producers and consumers. In chapter four it was shown that the rule of strict liability was adapted individually at the option of the states. The data of interest concerns the date of each state's adaption of strict product liability. This provides a measure of the length of time a state has been under strict product liability. The final element of analysis is the observed level of accidents. These data are provided by the National Electronic Inquiry Surveillance System (NEISS) of the Consumers Products Safety Commission (CPSC).[1] These accident observations are correlated with the amount of time under strict products liability to render an analysis that describes how reported accidents vary with the rule of liability. The results are as would be expected. Some products yield a significant negative correlation while others exhibit a marginal negative, insignificant positive, or insignificant negative correlation. This chap-

ter begins with a description of the dependant variable that is used. Section two contains the regression results and section three contains conclusions and discussion.

Section 1: The Measurement of Product Related Accidents

Product related accidents as reported to the NEISS system are used in this analysis.[2] The NEISS data are gathered from a sample of hos- pitals in the United States. These data are used to calculate national estimates. The current sample of hospitals was randomly selected from the 1975 Master Facilities Inventory (MFI) tape which is compiled annually for the National Center for Health Statistics (NCHS) by the American Hospital Association (AHA). The A.H.A. conducts an annual survey of those member hospitals which meet 13 requirements (the most important of which is that they have 6 or more beds). This survey is then supplemented by 250 to 300 hospitals which are not registered. The questionnaire is completed by 95 percent of the hospitals. The registered and unregistered samples are merged. Hospitals specializing in the treatment of the mentally retarded are deleted and the resultant tape sold as the MFI tape. In order to further narrow the sample to those which are more likely to be involved in product related accidents, hospitals specializing in psychiatry, maternity, narcotic addiction, respiratory diseases, rehabilitation, chronic disease and other specialties were excluded. The resultant sample consists of 6,015 hospitals, from which NEISS selected its sampling of hospitals. The data collected at these hospitals consist of product related accidents reported to the emergency room in each of the NEISS sample hospitals.

This sample of 6,015 hospitals is stratified on the basis of size (by emergency room visits) and geography. There are four size strata with hospitals ordered geographically. Given this method of structuring the data, the NEISS budget can accommodate 130 hospitals. The sample of hospitals has been revised during 1978, 1979 and 1980, so that no hospitals in the sample prior to 1979 are in the sample after 1979.

NEISS provides three accident observation variables.[3] The first is a national estimate of accidents in approximately 1,100 product categories. The most important problem with using any national aggregated data is that product liability laws vary from state to state, thus preventing the use of a change in legal structure observed in the states as an independent variable. It is impossible to encompass the impact of changing liability rules on the national estimates. Thus, this variable will not be used.

The second variable is the total number of product related accidents reported at hospitals in the NEISS system. NEISS collects data consisting of the number of product related accidents reported at the emergency rooms of the sample hospitals. It must be emphasized that these data consist exclusively of the number of accidents reported to the various hospital emergency departments. This means that the severity of injury is not reflected in this data, thus differences in the provision of "care" which alter accident severity will <u>not</u> <u>be</u> captured. The system has been collecting data on an annual basis since 1972. Participation in the NEISS system is voluntary, with some turn over observed in each year. The sample of hospitals has been reduced in recent years (perhaps due to the federal budgetary and policy posi-

tions). The above considerations result in the number of hospitals varying between 70 and 130. The main interest in these aggregate observations is to analyze any correlation between the rule of liability and the general level of product related accidents. These data are in the form of a series of cross-sectional observations.

The third data consists of hospital observations for a number of specific products. Again, the analysis is cross sectional in nature. If the variation in the rule of liability has had any meaningful impact on the safety of consumption it should be reflected here. Aggregate and disaggregate hospital data provide the opportunity to analyze variation in the rule of liability on product related accidents.

The sample of hospitals is further restricted due to the availability of the independent variables and as a result of the deletion of all questionable observations. Since hospitals enter and leave the system continuously, valid observations are only those for hospitals which were in the sample in both the preceding and the following year. After these factors are considered the sample of hospitals has fifty to fifty-five observations.

Section 2 The Regression Model.

The theoretical analysis as developed in chapter three of this paper indicates that a change in the liability rule will have an ambiguous result on the consumer's provision of care, with the most plausible result that as the consumer's burden of liability falls his provision of care will fall. Other authors (most notably Spence [1977] and Oi [1973]) indicate that as the producers liability burden rises his provision of care will rise. Consumer's care and producer's

care are the critical determinants of product related accidents. The rule of liability is one of the determinants of the producers burden of liability. The producer's burden is larger and the consumer's burden smaller, ceteris paribus, under strict liability than under negligence. A change from negligence to strict liability, thus, increases the producer's burden of liability thereby increasing his incentive to provide care, while simultaneously reducing the consumer's burden of liability and incentive to provide care. It must be emphasized that observed accidents are for all types of emergency room accidents and thus are not accidents which might be limited to those particular circumstances addressed by products liability. The product's involvement in the accident may be only tangentially related to the occurrence of the injury and not necessarily the sole or primary cause of the accident. As the levels of consumer and producer care change observed product related accidents change. If variations in the rule of liability are associated with changes in the provision of care by producers or consumers, then these changes should be reflected in the level of observed accidents.

There are four rules of liability which have been used in products liability cases in recent years. These are negligence, negligence with comparative fault, strict liability, and strict liability with comparative fault. Since observed city per capita income is available only for 1975 the regression model is restricted to the 1975 observations for specific products, while aggregate data will be analyzed for the 1973 to 1978 period using 1975 data for the independent variables. This restriction allows an empirical analysis of only strict liability. Consumption is, in the short run, locked into those

goods which are immediately available. Since many goods are consumed over a long period of time, the impact of the change in the provision of safety by the producer occurs over a number of years. As the old "less safe" products are replaced by the new "more safe" products, observed product related accidents are expected to fall, ceteris paribus. Safer consumption is expected to be correlated with the length of time under rule of strict products liability. Since 1975 data is being used, 1976 is used as the base year, and is used to calculate the length of time under strict products liability by taking the difference between 1976 and the year that strict products liability was adopted. If strict products liability was adopted in 1967 then the proxy for liability is nine. Nine measures the relative impact of strict products liability, and is expected to be associated with a smaller level of observed accidents than if strict liability was adopted in 1974, ceteris paribus.

Theory indicates that a change in the rule of liability will influence the producer's and consumer's provision of care. Changes in their provision of care will effect the level of observed accidents. Observed accidents are correlated with the length of time under strict products liability in order to analyze the impact of changes in products liability law. There are two measures of liability used in this analysis. The first is the variable described above. This variable includes negative values for states which have adopted strict products liability after 1976. The second measure sets all negative values in the first proxy equal to zero. The second measure is the more accurate of the two, since no change in behavior is anticipated in the absence of an explicit liability rule change.

There are three other variables which are included in this analysis: 1) per capita income, 2) hospital control and 3) a population proxy. Buchannan [1970] has suggested that per capita income might influence the consumer's choice of risk characteristics embodied in the products which he uses. The implication being that as income rises the level of risk in the goods used will fall due to the use of safer products.

Hospital control separates the sample into those which are government controlled and those which are private non-profit. This variable is included to capture the potential tendency of the "poor" to seek aid in government hospitals. Ideally, this sample separates for-profit and not-for-profit hospitals. There are only four for-profit hospitals in the sample, preventing the use of this grouping. This variable is assigned a value of one for public hospitals and zero for private hospitals.

The final variable is the population proxy. The population which each hospital serves is expected to influence the number of accidents observed at the hospital; thus, ceteris paribus, the larger this population the larger the number of observed accidents. The population proxy is calculated by taking the number of beds in the hospital as a percent of the total number of beds in hospitals with emergency departments and multiplying this by the city's population. This proxy is

$$P = \left(\frac{\text{Beds in hospital}}{\text{Total Number of Beds}}\right) \cdot \text{City Population.} \qquad 5.1$$

The model is

$$\text{Product Related Accidents} = \alpha + \beta_1 \text{ Per Capita Income} + \beta_2 \text{ P} + \beta_3 \text{ Control} + \beta_4 \text{ Liability.}$$

The Null Hypotheses for the non liability variables are

$$H_0: \ \beta_1 > 0$$

$$H_0: \ \beta_2 < 0$$

$$H_0: \ \beta_3 = 0.$$

The anticipated results of this analysis with respect to population and per capita income are straightforward. The expected results with respect to the length of time under liability are much less clear. The model developed in chapter three indicates that as the consumer's burden of liability falls he will provide less care. Previous analyses (Oi [1973], Spence [1977]) indicate that the shift in liability to the producer will result in a rise in the producer's provision of care. These two changes act to offset one another. There are three potential results: (1) observed accidents rise, (2) observed accidents fall, and (3) observed accidents do not change. A rise in observed accidents could result if the consumer's provision of care falls, while the producer's marginal product of care is zero. The fall in consumer's care cannot be offset by increasing the producer's level of care. Observed accidents could fall if the rise in the producer's provision of care is large enough to offset the fall in the consumer's provision of care. If the producer and consumer begin in a competitive equilibrium, this result is unlikely. In equilibrium, the value of a dollar spent by the producer on the provision has the same value to the consumer, since it is reflected in the price of

the good, as a marginal dollar spent on a consumption activity. The marginal utilities-per-dollar spent are equal across all uses. If diminishing returns for care are present and observed accidents fall, then the nominal rise in producer's care, and thus in price, must be larger than the nominal value of the consumer's decrease in the provision of care. A more plausible explanation is that consumers are misinformed as to the risks involved in consumption. In this situation, a rise in the producer's provision of care will result in a fall in the level of observed accidents. The producer may be providing safer products or more information, in either situation observed accidents will fall. Observed accidents may remain unchanged due to completely offsetting changes in care, or due to consumer's and producer's provision of care being fixed as a result of the consumption characteristics of the product. The preceding indicates that no general statement as to the impact of a change in the rule of liability can be made. It will depend on the relative productivity of producers and consumers as well as the level of information. The results are expected to exhibit the ad hoc nature of the impact of the rule of liability. Variability of the statistical significance of the coefficients is expected to be a observed across the products analyzed, depending upon the product specific productivities of producer and consumer care and the amount of information which is available. Since one of the purported reasons for the adaption of strict product liability has been the provision of safer products the null hypothesis for the rule of liability is

$$H_0: \quad \beta_4 \geq 0.$$

Regressions have been run on six years of aggregate observed product related accidents and on fifteen products for 1975. Each product has been involved in products liability litigation.[4] The empirical results are reported in Table V. Regression A uses the continuous measure of strict product liability while Regression B uses the truncated measure of liability.

Section 3: Regression analysis of Aggregate Data.

The aggregate data used in this analysis consist of the number of accidents reported in sample hospital emergency rooms. The explanatory power of this model is very limited. Error sum squares and R^2's are low in each regression each year. The explanatory power is disturbing because some of the variables in the analysis should provide a higher explanatory power than is evident in the model. The population proxy is, perhaps, most disappointing. Of all variables which should explain aggregate observed product related accidents, population is expected to be most significant. Population obtains a ninety-five percent significance or better in 1973, 1977 and 1978 regressions A and B. In these years the null hypothesis is, thus, rejected at a 95% level of confidence. It is interesting that the t-ratios are smaller for 1975, the year from which the population proxy was calculated. This speaks more of the weakness of the proxy, than the usefulness of population in explaining product related accidents. A proxy using a percent of total admissions was used to calculate a second proxy without an improvement in results and is not included.

A second variable which should have explanatory power is per capita income. These results are even more disappointing. The high-

est level of significance achieved is less than seventy percent with some t-ratios of one tenth or smaller. This bodes ill for the use of per capita income as an explanatory variable for product related accidents. The null hypothesis is not rejected for per capita income. This brings into question the arguments used by Buchanan [1970] and Oi [1973] which imply that variations in income should result in variations in the level of care purchased by consumers. The traditional arguments are not necessarily inconsistent with this result. If consumers purchase safer products but engage in riskier consumption or reduce their level of care, an insignificant coefficient could easily be observed. This possibility is reinforced by the aggregation of all products into the independent variable.

The third variable is the dummy used for control. The null hypothesis is rejected only for 1978. The poorest results occur in 1974 and 1975 with t-ratios less than one for 1975 and less than one twentieth for 1974. The control variables are included more as a possibility than due to concise theoretical analysis. If a larger number of for-profit hospitals were in the sample of hospitals, better results would be expected by using a profit and not for-profit separation.

The final variable of interest is the rule of liability. The rule of liability is marginally significant in 1974 B, 1975 A and B, 1974 B, 1976 B and 1977 A and B. B regression, using the truncated measure of liability, is consistently more significant and all regressions, except 1973 A, have a negative sign. Since 1975 is the base year for the measure of liability, the relative significance of the coefficients in 1975 is encouraging. If products liability has an

TABLE V

REGRESSION RESULTS USING 1973-1978 AGGREGATE DATA AND 1975 PRODUCT DATA

	1973		1974		1975	
Variable	A	B	A	B	A	B
Intercept	1783.17 (0.83)	1970.33 (0.91)	3048.93* (1.34)	3118.305* (1.39)	4451.77* (1.70)	4512.2426* (1.75)
Per-Capita Income	0.187 (0.42)	0.2001 (0.45)	0.0463 (0.10)	0.104 (0.22)	-0.0483 (-0.09)	0.0155 (0.03)
Population	0.0050** (1.77)	0.0051** (1.82)	0.0049* (1.52)	0.00493* (1.54)	0.0046 (1.25)	0.00458 (1.25)
Strict Liability in Tort	8.6937 (0.14)	-35.603 (-0.47)	-56.58 (-0.81)	-114.124* (-1.35)	-133.688* (-1.66)	-191.405** (-1.97)
Control	857.6 (1.17)	797.787 (1.10)	10.304 (0.01)	35.331 (0.04)	660.225 (0.71)	769.708 (0.84)
R^2	0.106	0.11	0.057	0.079	.009	0.118
F Value	1.43	1.48	.074	1.05	1.35	1.64
Degrees of Freedom	53	53	53	53	52	52

TABLE V (Continued)

REGRESSION RESULTS

	1976		1977		1978	
Variable	A	B	A	B	A	B
Intercept	3117.51 (1.23)	3171.24 (1.26)	2733.68 (1.18)	2674.03 (1.16)	986.696 (0.34)	1115.82 (0.39)
Per-Capita Income	0.1474 (0.28)	0.196 (0.37)	.1943 (0.40)	0.218 (0.45)	0.393 (0.66)	0.418 (0.70)
Population	0.0051 (1.41)	0.0051 (1.42)	.0061** (1.89)	0.0061** (1.87)	0.0072** (1.90)	.00732** (1.93)
Strict Liability in Tort	-86.84 (-1.11)	-133.045* (-1.40)	-53.046* (-1.43)	-58.77* (-1.50)	-5.18 (-0.06)	-51.126 (-0.48)
Control	1051.01 (1.13)	113.51 (1.22)	841.57 (1.01)	892.97 (1.08)	1849.41** (1.80)	1799.38** (1.78)
R^2	.1026	.116	.141	.145	.1642	.168
F Value	1.37	1.57	1.97	2.03	2.16	2.23
Degrees of Freedom	52	52	52	52	48	48

TABLE V (Continued)

REGRESSION RESULTS

	Refrigerators		Ranges		Televisions	
Variable	A	B	A	B	A	B
Intercept	14.737***	14.93****	13.912***	13.976***	11.7132**	11.846**
	(2.37)	(2.42)	(2.31)	(2.32)	(1.87)	(1.89)
Per-Capita Income	-0.0016	-0.0014	-0.001112	-0.00105	-0.000453	-0.00337
	(-1.20)	(-1.10)	(-0.88)	(-0.83)	(-0.35)	(-0.26)
Population	.0000062	0.0000063	-0.0000021	-0.0000021	.000419*	0.000118*
	(0.70)	(0.72)	(-0.24)	(-1.12)	(1.34)	(1.33)
Strict Liability in Tort	-0.1599	-0.296*	-0.203	-0.255	-.3791**	-0.485**
	(-0.83)	(-1.27)	(-1.09)	(-1.12)	(-1.96)	(-2.05)
Control	1.451	1.586	1.0419	1.259	-1.6014	-1.198
	(0.64)	(.72)	(0.48)	(0.58)	(-0.70)	(-0.53)
R^2	0.064	0.08	.055	0.056	.10492	.111
F Value	0.82	1.06	0.70	0.71	1.41	1.49
Degrees of Freedom	52	52	52	52	52	52

TABLE V (Continued)

REGRESSION RESULTS

	HiFis		Bunkbeds		Furniture	
Variable	A	B	A	B	A	B
Intercept	4.677 (1.24)	4.716 (1.25)	10.497** (2.07)	10.555** (2.07)	12.905* (1.45)	13.035* (1.46)
Per-Capita Income	-0.00015 (-0.20)	-0.001346 -0.17)	-0.00059 (-0.56)	-0.000525 (-0.49)	-0.000315 (-0.17)	-0.00209 (-0.11)
Population	-0.0000037 (-0.69)	-0.00000036 (-0.68)	-0.0000008 (-0.11)	0.0000010 (-0.13)	0.0000186* (1.47)	0.000186* (1.46)
Strict Liability in Tort	-0.21064 (-0.15)	-0.296 (-0.20)	-0.3331*** (-2.14)	-0.3868** (-2.01)	-0.2816 (-1.02)	-0.3811 (-1.13)
Control	0.0423 (0.36)	0.0183 (0.13)	-1.453 (-0.79)	-1.085 (-0.59)	-2.628 (-0.81)	-2.3359 (-0.73)
R^2	.014	.012	.105	.0965	0.0648	0.069
F Value	0.18	0.15	1.42	1.28	0.83	0.89
Degrees of Freedom	52	52	52	52	52	52

TABLE V (Continued)

REGRESSION RESULTS

	Ladders		Power Saws		Adhesive	
Variable	A	B	A	B	A	B
Intercept	18.955*	19.172*	26.32**	26.723**	13.793	13.69
	(1.33)	(1.33)	(1.71)	(1.75)	(0.98)	(-0.98)
Per-Capita Income	0.0013	0.00152	-0.00074	-0.000399	-0.0016	-0.0017
	(0.43)	(0.50)	(-0.23)	(-0.12)	(-0.55)	(-0.58)
Population	0.0000232	0.0000225	0.0000216	0.0000214	-0.0000089	-0.000087
	(1.14)	(1.10)	(-0.99)	(0.98)	(-0.44)	(-0.44)
Strict Liability in Tort	-1.1196****	-1.3154****	-0.9747**	-1.285***	0.3501	0.4354
	(-2.54)	(-2.41)	(-2.06)	(-2.22)	(0.81)	(0.82)
Control	-4.0316	-2.7945	-1.299	-0.2756	-2.398	-2.775
	(-0.78)	(-0.54)	(-0.23)	(-0.05)	(-0.47)	(-0.55)
R^2	0.137	0.1275	0.097	0.109	0.030	.030
F Value	1.91	1.28	1.29	1.46	0.37	0.37
Degrees of Freedom	52	52	52	52	52	52

TABLE V (Continued)

REGRESSION RESULTS

	Glass Soft Drink Bottles		Other Glass Bottles		Glass Alcohol Bottles	
Variable	A	B	A	B	A	B
Intercept	12.1525 (1.04)	12.111 (1.03)	16.364 (0.82)	16.727 (0.84)	15.776 (2.19)	15.809 (2.19)
Per-Capita Income	0.00043 (0.18)	0.00044 (0.18)	-0.0014 (-0.33)	-0.00114 (-0.27)	-0.00207 (-1.38)*	-0.00207* (-1.37)
Population	0.0000061 (0.37)	0.0000058 (0.35)	0.00007**** (2.45)	0.000702**** (2.47)	-0.0000068 (-0.67)	-0.000067 (-0.65)
Strict Liability in Tort	-0.315 (-0.87)	-0.301 (-0.68)	-0.27 (-0.44)	-0.5288 (-0.70)	.1388 (0.63)	0.123 (0.45)
Control	-4.059 (-0.95)	-3.6853 (-0.87)	13.38** (1.84)	13.606** (1.89)	2.7676 (1.06)	2.599 (1.00)
R^2	0.03	0.025	.184	.188	.0709	.066
F Value	0.38	0.31	2.70	2.79	0.91	0.85
Degrees of Freedom	52	52	52	52	52	52

TABLE V (Continued)

REGRESSION RESULTS

	Lawn Mowers		Chain Saws		Stairs/Steps	
Variable	A	B	A	B	A	B
Intercept	5.957 (0.45)	6.3003 (0.48)	10.58 (0.91)	10.761 (0.93)	103.977 (0.62)	105.33 (0.62)
Per-Capita Income	0.0028 (1.00)	0.00306 (1.11)	-0.00010 (-0.04)	0.0000425 (0.02)	0.034 (0.96)	0.03576 (1.01)
Population	0.000024* (1.28)	0.000024* (1.28)	0.0000056 (0.34)	0.0000056 (0.34)	0.000043 (0.18)	0.000344 (0.14)
Strict Liability in Tort	-0.833** (-2.04)	-1.0997*** (-2.20)	-0.3418 (-.96)	-0.481 (-1.10)	-12.695**** (-2.46)	-14.1741*** (-2.21)
Control	1.11 (0.23)	1.983 (0.42)	1.416 (0.34)	1.763 (0.42)	-43.412 (-0.71)	-29.104 (-0.48)
R^2	.1237	.135	.026	.031	0.123	0.102
F Value	1.69	1.88	0.31	0.39	1.66	1.37
Degrees of Freedom	52	52	52	52	52	52

TABLE V (Continued)

REGRESSION RESULTS

	Doors	
Variable	A	B
Intercept	318.712**	323.138**
	(1.97)	(2.01)
Per-Capita Income	0.000077	.0000798
	(0.34)	(0.35)
Population	-0.037	-0.0335
	(-1.08)	(-0.99)
Strict Liability in Tort	-4.188	-7.331
	(-0.84)	(-1.20)
Control	27.1269	30.838
	(0.46)	(0.53)
R^2	0.026	0.063
F Value	0.62	0.81
Degrees of Freedom	52	52

* Indicates a 90% level of confidence.
** Indicates a 95% level of confidence.
*** Indicates a 97.5% level ofconfidence.
**** Indicates a 99% level of confidence.

impact, it should have only a marginally significant impact on aggregate observed accidents.

The second set of sixteen regressions contains the results for specific products. Per capita income is significant, at any level, only for bottles used in serving alcohol. Population is marginally significant for televisions and highly significant for other glass bottles. Control is significant only for other glass bottles.

The results for the impact of the measures of liability on consumer related accidents are encouraging, though only marginal in nature. Refrigerators A, televisions A and B, bunkbeds A and B, ladders A and B, saws A and B, lawn mowers A and B, and stairs and steps A and B, have coefficients that test at a ninety percent level of significance or higher, with only refrigerators A having a level of significance of less the ninety five percent. The best results are for ladders A and B and stairs and steps A which test at a ninety nine percent level of significance. All coefficients which are significant exhibit negative signs.

Section 4: Conclusions

The empirical estimates provided in this chapter lend credence to those (such as Calabresi and Bass [1970]) who argue that strict liability or greater producer liability should be imposed in an ad hoc manner. The impact on the sample of products analyzed indicates that for selected products, the amount of time a state has been under the rule of strict products liability is negatively correlated with product related accidents.

CHAPTER V

ENDNOTES

[1]Wakesberg, Joseph and Richard Valliant, NEISS Sample Redesign Final Report, U.S. Consumer Products Safety Commission (Bethesda Maryland, November 1, 1977) pp. 1-1 to 5-24.

[2]NEISS Hospital Survey Final Report, U.S. Consumer Products Safety Commission (Bethesda Maryland, January 1978) Part I pp. 1-33, Part II pp. 1-13. Survey of Ambulance Services for Sample Hospitals Final Report, U.S. Consumer Products Safety Commission (Bethesda Maryland, September 1978) pp. 1-52. NEISS Coding Manual, U.S. Consumer Products Safety Commission, Directorate for Epidemiology (1985) pp. 1-219.

[3]Product Summary Report and NEISS Estimates of National Injury Incidents, U.S. Consumer Products Safety Commission, (Bethesda, Maryland) For 1973-1985. Hospital data were procured directly from the Consumers Products Safety Commission.

[4]American Jurisprudence, Vol. 63 §220-776.

CHAPTER VI

CONCLUSIONS

This analysis has demonstrated the potential ambiguities, theoretical and empirical, in the area of product liability. The empirical results tend to support the hypothesis that a rise in the burden of liability on the producer will result in safer consumption, but only for certain products. The strongest results are for the truncated measure of liability. Ladders, power saws, bunkbeds, lawn mowers, televisions and stairs and steps provide coefficients that test at or greater than a ninety five level of confidence. Other products provide coefficients for the liability rule that are insignificant and for adhesive and glass alcohol bottles insignificant and positive.

There are several areas in which this analysis can be extended. The theoretical framework can be further simplified by assuming that work time is constant. This will allow expected utility to be stated as a function exclusively of care time. The framework can then be extended to consider the role the firm. When both the firm and consumer are included, a more complete comparative static analysis of the implications of varying products liability structure can be performed.

A second extension lies in the empirical area. A large amount of data is available but is not used in this analysis. The main difficulty in the use of this data is that it requires the procurement of

observations for the independent variables. This requires the development of estimates for population and a more appropriate set of independent variables. Other independent variables which could be included are such things as a weather variable, industrial composition, and other characteristics of population, such as percent below poverty.

A third extension would allow for a more sophisticated measure of the producer's burden of liability. Integration of tort, legislative and regulatory standards as well as a more complete specification of tort liability should provide a better measure of the liability burden. The measure of strict product liability can be refined to allow for a product specific assumption instead of relying on the general adoption of strict products liability.

A final extension would be to analyze activities and products for which comparative negligence and negligence with comparative negligence are applicable. This would allow a more comprehensive analysis of liability.

BIBLIOGRAPHY OF STATUTES AND CASES BY STATE

Alabama — Casrell v. Altec Ind. 335 So. 2d. 128 (Ala. 1976).

Atkins v. American Motors Corp. 335 So. 2d. 134 (Ala. 1976).

Alaska — Butaud v. Suburban Marine & Sporting Goods, Inc. 555 P. 2d. 42 (Alaska 1976).

Arkansas — Ford Motor Co. v. Ried 465 S.W. 2d. 80 (Arkansas 1971).

Arkansas Stat. Ann §§27-1763 to 1765 (1979).

California — Greenman v. Yuba Power Products Inc. 377 p. 2d. 897 (Cal. 1962).

Safeway Stores, Inc. v. Nest-Kart 597 p. 2d. 441 (Cal. 1978).

Daly v. General Motors Copr., 575 p. 2d. 1162 (Cal. 1978).

Colorado — Col. Rev. Stat. (1973) § 13-21-401 to 13-21-406.

Col. Rev. Stat. (1973) § 13-80-127.5 and 127.6.

Col. Rev. Stat. (1973) § 13-21-111.

Connecticut — Conn. Gen. Stat. Ann. §§ 52-572h to 572o.

Delaware — Kates v. Pepsi Cola Botteling Co., 263 A. 2d. 308 (Del. 1970).

Martin v. Ryder Truck Rental Inc., 353 A. 2d. 581 (Del. 1976).

Florida	West v. Caterpiller Tractor Company, Inc., 336 So. 2d. 80 (Fl. 1976).
Georgia	Ga. Code Ann. § 46-8-291.
	Ga. Code Ann. § 51-1-11 to 51-1-12.
Georgia cont.	Center Chemical Co. v. Parzini, 218 S.E. 2d. 580 (Ga. 1975).
Hawaii	Kaneko v. Hilo Coast Processing, 654 p. 2d. 343 (Hawaii 198-).
Idaho	Idaho Code, Chapter 14, Title 6.
	Shields v. Morton Chemical Company, 518 p. 2d. 857 (Idaho 1974).
Illinois	Alvis v. Ribar, 421 N.E. 2d. 886 (Ill. 1981).
Indiana	Ind. Code Ann. §§ 34-4-33-1 to -8.
Kansas	Kan. Stat. Ann. §§ 60-258a to 258b.
	Kennedy v. Sawyer, 618 p. 2d. 788 (Kan. 1980).
Kentucky	Montgomery Elevator Co. v. McCullough, 676 S.W. 2d. 776 (Ky. 1984).LouisianaLa. Civil Code Ann. art. 2323
Maine	Me. Rev. Stat. Ann tit. 14, § 156.
	Adams v. Buffalo Forge Co., 443 A. 2d. 932 (Maine 1982).
Massachusetts	Mass. Ann Laws, Ch. 231, § 85.
Michigan	Phillips v. J.L. Hudson Co., 263 N.W. 2d. 3 (Michigan 1977).
Minnesota	Minn. Stat. Ann. §§ 604-01-02.
	Bush v. Bush Construction Co., 262 NW 2d. 377, 393 (Minn. 1977).
Mississippi	Miss. Code Ann. § 11-7-15.

Missouri	Gustafson v. Beneda, 661 SW 2d. 11 (Mo. 1983).
Montana	Mont. Code. Ann. §§ 27-1-702 to 703.
Nebraska	Neb. Rev. Stat. § 25-1151.
Nevada	Neb. Rev. Stat., § 41-141.
New Hampshire	NH Rev. Stat. Ann. § 507.
	Heath v. Sears, Roebuck & Co., 123 NH, 512(NH 1983).
	Thibault v. Sears, Roebuck & Co., 395 A. 2d. 843.
New Jersey	NJ Stat. Ann. §§ 2A: 15-5.1 to 3.
	Suter v. San Angelo Foundry & Machine Company, 406 A. 2d 140.
New Mexico	Scott v. Rizzo, 634 p. 2d. 1234 (NM 1981).
New York	NY Civ. Prac. Law § 1411.
	Codling v. Pagling, 32 NY 2d. 330 (NY 1973).
	Goldberg v. Kollsman Instrument Copr., 191 NE 2d. 81 (NY 1963).
North Dakota	ND Cent. Code § 9-10-07.
Ohio	Ohio Rev. Code Ann. § 2315.19.
Oklahoma	Ok. Stat. Ann. tit. 23, §§ 13-14.
Oregon	Or. Rev. Stat. § 30.900 - .925.
	Or. Rev. Stat. § 18.470.
	Sanford v. Cheverolet Division of General Motors, 642 p. 2d. 624 (Or. 1982).
Pennsylvania	Pa. Stat. Ann. tit. 412 § 7102.
Rhode Island	RI Gen. Laws §§ 9-20-4 to 4.1.
South Carolina	Lane v. Trenholm Bldg. Co., 299 SE 2d. 728 (SC 1976).
South Dakota	SD Comp. Laws Ann. § 20-9-2.
Tennessee	Tenn. Rev. Stat. Ann. § 29-28-101 - 108.

Texas	Tex. Rev. Stat. Ann. art. 2212a.
	McKisson v. Sales Affiliates, Inc., 416 SW 2d. 787 (Tex 1967).
	Duncan v. Cessna Aircraft Co., 665 SW 414 (Texas 1984).
Utah	Utah Code Ann. §§ 78-27-37 to 43.
Vermont	Vt. Stat. Ann. Tit. 12 § 1036.
Washington	Wash. Rev. Code §§ 4.22.005 - .920.
West Virginia	Star Furniture Co. v. Pulaski Furniture Co., 297 SE 2d. 854 (WV 1982).Wisconsin Wis. Stat. Ann. § 895.045.
	Dipple v. Sciano, 155 NW 2d. 55 (Wisc. 1967).
Wyoming	Wyo. Stat. § 1-1-1-09.

A SELECTED BIBLIOGRAPHY

American Hospital Association Guide to the Health Care Field. American Hospital Association, Chicago, Illinois, 1975) pp. 17-262.

American Jurisprudence, Products Liability, 2nd Ed. Vol. 63 §§ 1-908, p. 1-1321, Vol 64 §§ 909-977, p. 32-130. Rochester New York: The Lawyers Co-operative Publishing Co., San Francisco California: Bancroft-Whitney Ca, (1984).

Assaf, George. "The Shape of the Reaction Functions and the Efficiency of Liability Rules: A Correction." Journal of Legal Studies, Vol. 13 (1984), pp. 101-111.

Becker, Gary S. "A Theory of the Allocation of Time." Economic Journal, Vol. 74 (September 1965), pp. 493-517.

Brown, John Prather. "Toward An Economic Theory of Liability." The Journal of Legal Studies, Vol. 2 (1973), pp. 323-349.

Buchanan, J.M. "In Defense of Caveat Emptor." University of Chicago Law Review, Vol. 38 (Fall, 1970), pp. 64-73.

Bureau of the Ceases, City County Data Book for 1977 (Statistical Abstract Supplement) U.S. Government Printing Office, Washington, D.C. 20402, 1978.

Burrows, Paul. "Tort and Tautology: The Logic of Restricting the Scope of Liability." Journal of Legal Studies, Vol XIII (June, 1984), pp. 399-414.

Calabresi, G. and K.C. Bass III. "Right Approach, Wrong Implications: A Critique of McKean on Products Liability." University of Chicago Law Review, Vol. 38 (Fall, 1970), pp. 74-91.

Clark, Allistair. "The Conceptual Basis of Product Liability." The Modern Law Review, Vol. 48 (May, 1985) pp. 325-339.

Coase, R.H. "The Problem of Social Costs." Journal of Law and Economics, Vol. 3 (1960), pp. 1-40.

Colley, Michael and Michael Thomas. "Comparative Negligence Principles and Strict Liability." Trial, Vol. 19 (November, 1983), pp. 59-59.

Crandall, Robert W. and John D. Grahm. "Automobile Safety Regulation and Offsetting Behavior: Some Empirical Estimates" American Economic Review, Vol. 74 (1984), pp. 328-331.

Eclaves, Romuuldo P. "Applicability of Comparative Negligence Doctrine to Actions Based on Strict Liability in Tort." American Law Reports 4th, Cases and Annotions, Rochester, New York, Lawyers Co-operative Publishing Co. and Bancroft-Whitney Co., San Francisco California, Vol. 9 (1981), pp. 633-653.

Epple, Denis and Arthur Raviv. "Product Safety: Liability Rules, Market Structure and Imperfect Information." The American Economic Review, Vol. 68 (March 1978), pp. 80-95.

Epstein, Richard A. Product Liability. Westport, Connecticut: Quorum Books, 1980.

Felder, Frederick E. "Products Liability: Alternations of Product After it Leaves Hand of Manufacturer or Seller as Affecting Liability for Product-Caused Harm." American Law Reports 3rd, Cases and Annotions, Rochester, New York, Lawyers Co-operative Publishing Co. and Bancroft-Whitney Co., San Francisco California, Vol. 41 (1972), pp. 1251-1267.

Goldberd, Victor P. "The Economics of Product Safety and Imperfect Information." The Bell Journal of Economics and Management Science, Vol. II (Autumn, 1974), pp. 683-688.

Grabowski, Henry G. and John M. Vernon. "Consumer Products Safety Regulation." The American Economic Review, Vol. 68 (May 1978), pp. 284-289.

Grahm, Daniel A and Ellen R. Pierce. "Contingent Damages for Products Liability." Journal of Legal Studies, Vol. XIII (August, 1984), pp. 441-474.

Green, Jerry. "On The Optimal Structure of Liability Laws." Bell Journal of Economics and Management Science, Vol. 7 91976), pp. 553-574.

Hamada, Koichi. "Liability Rules and Income Distribution in Product Liability." The American Economic Review, Vol. 66 (March, 1976), pp. 228-234.

Haddock, David and Christopher Curran. "An Economic Theory of Comparative Negligence." Journal of Legal Studies, Vol. XIV (January, 1985), pp. 42-72.

Hermann, Richard K. "An Overview of State Statutory Product Liability Law." The Trial Lawyers Guide, Vol. 27 (Spring 1983), pp. 1-52.

Keaton, W. Page, et. al. Posser and Keaton on Torts, Handbook Series. Student Edition. 5th Ed. St. Paul Minnesota: West Publishing Co., 1984.

Kulig, Lawrence R. "Comment: Comparative Negligence and Strict Products Liability: Where Do We Stand? Where Do We Go? Villanova Law Review, Vol. 29 (June, 1984), pp. 595-758.

Mantel, Edmund H. "Allocative and Distributive Efficiency of Products Liability in a Monopolistic Market." Journal of Products Liability, Vol. 7 (1984), pp. 143-152.

McKean, Roland N. "Products Liability: Implications of Some Changing Property Rights." Quarterly Journal of Economics, Vol. 84 (November, 1970), pp. 611-626.

————. "Products Liability: Trends and Implications." University of Chicago Law Review, Vol. 38 (Fall, 1970), pp. 3-63.

NEISS Coding Manual, U.S. Consumer Products Safety Commission, Directorate for Epidemiology (1985) pp. 1-219.

NEISS Hospital Survey Final Report, U.S. Consumer Products Safety Commission (Bethesda Maryland, January 1978) Part I p. 1-33, Part II pp. 1-13.

Noel, Dix W. and Jerry J. Phillips. Products Liability in a Nut Shell. St. Paul Minnesota: West Publishing Co. 1980.

Oi, Walter Y. "The Economics of Product Safety." The Bell Journal of Economic and Management Science, Vol. 4 (Spring 1973), pp. 3-28.

————. "The Economics of Product Safety: A Rejoinder." The Bell Journal of Economics and Management Science, Vol. 2 (Autumn, 1974), pp. 689-695.

Peltzman, Sam. "The Effects of Automobile Safety Regulation." Journal of Political Economy, Vol. 83 (1975), pp. 677-725.

Polinsky, A. Michael and William P. Rogerson. "Products Liability, Consumer Misperceptions and Market Power." The Bell Journal of Economics and Management Science, Vol. (Spring, 1984), pp. 581-589.

Product Summary Report and NEISS Estimates of National Injury Incidents, U.S. Consumer Products Safety Commission, (Bethesda, Maryland) for 1973-1985.

Rea, Samuel A., Jr. "Nonpecuniary Loss and Breach of Contract." Journal of Legal Studies, Vol. XI (January, 1982), pp. 35-53.

Reed, O. Lee and John L. Watkins. "Product Liability Tort Reform: The Case For Federal Action" Nebraska Law Review, Vol. 63:389 (1984), pp. 389-472.

Sales, James B. "The Emergence of Panitive Damages in Product Liability." St. Marys Law Journal, Vol. 14 (1983), pp. 351-404.

Shapiro, S.R. "Products Liability: Strict Liability in Tort." American Law Reports 3rd, Cases and Annotions, Rochester, New York, Lawyers Co-operative Publishing Co. and Bancroft-Whitney Co., San Francisco California, Vol. 13 (1967), pp. 1057-1103.

Spence, A. Michael. "Monopoly, Quality and Regulation." The Bell Journal of Economics and Management Science, Vol. 6 (Autumn, 1974), pp. 417-429.

————. "Consumer Misperceptions, Product Failure and Producers Liability." Review of Economics Studies, Vol. 44 (October, 1977) pp. 561-572.

Survey of Ambulance Services for Sample Hospitals Final Report, U.S. Consumer Products Safety Commission (Bethesda Maryland, September 1978) pp. 1-52.

Theuman, John E. "Products Liability: Inconsistency of Verdicts on Separate Theories of Negligence, Breach of Warranty, or Strict Liability." American Law Reports 4th, Cases and Annotions, Rochester, New York, Lawyers Co-operative Publishing Co. and Bancroft-Whitney Co., San Francisco California, Vol. 41 (1985), pp. 9-29.

Trenkner, Thomas R. "Products Liability: Liability of Successor Corporation for Injury or Damage Caused by Product Issued by Predecessor." American Law Reports 3rd, Cases and Annotions, Rochester, New York, Lawyers Co-operative Publishing Co. and Bancroft-Whitney Co., San Francisco California, Vol. 66 (1975), pp. 824-884.

Viscusi, W. Kip. "Consumer Behavior and the Safety Effects of Product Safety Regulation." Journal of Law and Economics, Vol. XXVII (October, 1985), pp. 527-553.

————. Regulating Consumer Product Safety. Washington, D.C.: American Enterprise Institute for Public Policy Research, 1984.

Wakesberg, Jopseph and Richard Valliant, NEISS Sample Redesign Final Report, U.S. Consumer Products Safety Commission, (Bethesda Maryland, November 1, 1977) pp. 1-1 to 5-24.

Woods, Henry. "The Trend Towards Comparative Fault." Journal of Products Liability, Vol. 7 (1984), pp. 399-411.

————. "Product Liability: Is Comparative Fault Winning the Day." Arkansas Law Review, Vol. 36 (1983), pp. 360-382.

Zitter, Jay M. "Validity and Construction of products Liability Statute Precluding or Limiting Recovery Where Product has been Altered or Modified After Leaving the Hands of Manufacturer or Seller." American Law Reports 3rd, Cases and Annotions, Rochester, New York, Lawyers Co-operative Publishing Co. and Bancroft-Whitney Co., San Francisco California, Vol. 41 (1985, pp. 47-50.

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