PRODUCTS LIABILITY IN MARKETS WITH HETEROGENOUS CONSUMERS *

J.A. Ordover

New York University

and

Bell Laboratories

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I. Introduction

For several years economists and legal scholars have been arguing, rather inconclusively, about the appropriate locus of liability for injuries and damages caused by product failure.[1] Discussants agree, however, that in ideal circumstances, when consumers and producers are fully informed about the risk of the product, when producers can distinguish perfectly and costlessly between the various types of buyers of their products, and when both product and insurance markets are perfectly competitive, then the choice between consumer liability (*caveat emptor* (CE)) and producer liability (*caveat venditor* (CV)) is immaterial from equity and efficiency considerations.[2] (I am assuming, for purposes of this paper, that sellers who are sued by injured consumers, or their estates, will implead, without exception, the producer of the defective product.)

In this paper, I consider the problem of selection of liability rules when consumers of a product differ with respect to some relevant characteristic.[3] Naturally, to animate my analysis, I must assume that producers cannot distinguish costlessly between various consumer types. Were such costless differentiation feasible, as well as legal, then the analysis of the choice of liability rules would proceed as if all consumers were identical although the analysis might indicate different liability rules for different groups of consumers. I assume also that consumers are not legally compelled to reveal that characteristic to the seller.

I assume that consumers differ in their innate carefulness (or carelessness), some being naturally more careful then others. Hence the probability of an accident or product failure is a function of both the quality of the product and of the innate characteristic of the consumer.[4] Thus if s denotes product quality, and θ indexes the consumer types, then $\pi = \pi(s, \theta)$ is the probability that the product does not fail. Alternatively one might assume that π depends both on product's quality and on consumer's safety expenditures, $x(\theta)$, that is, $\pi = \pi(s, x(\theta))$. Unfortunately this specification introduces into the analysis the problem of moral hazard.[5] To analyze this problem would detract, however, from the major concern of this paper: the critical consequences of *unobservable* differences in the probabilities of accident on the choice of product liability rule. I do not assume, however, that the two groups in the population have differing tastes for safety. Specifically, I do not assume any differences in risk aversion.

The approach in this paper should be contrasted with Professor Oi's paper on product safety which emphasized the differences in the amount of damages sustained by various consumers when a product fails.[6] Oi found that if producers cannot distinguish between consumer types, then a change from consumer liability to producer liability has a profound effect on the extent of product qualities that are offered. In particular, under the CV rule, only one product quality will be produced and sold, whereas under the CE rule, each group of consumers will purchase the product that is best suited to the damage they anticipate. Starting from this proposition, Oi adduces powerful reasons for the social choice of the CE rule over the CV rule, although courts and legislature apparently prefer the CV rule.

My analysis confirms Oi's finding that introducing producer liability conduces to the collapse of the market in the sense Oi described: Producer liability inefficiently forces all consumers to buy the same product. (It does, however, enable them to otbain full warranty.) In addition, producer liability forces one group of consumers -- low-risk consumers -- to subsidize high-risk consumers. Nevertheless I conclude that the presence of these two conceivably undesirable effects does not suffice to establish a presumption in favor of *caveat emptor vis á vis caveat venditor.* The argument against the CE rule also derives from its conjuncture with *imperfect information about consumer types*, whereby low-risk consumers will be forced to purchase incomplete warranty coverage against damage caused by product failure. This incomplete insurance occurs because low-risk consumers desire to differentiate themselves from remaining consumer groups. In some instances, when there are relatively few high-risk consumers, for example, the benefits of successful differentiation may be small relative to the benefits from full coverage which can be obtained when strict producer liability is implemented. Thus consumer liability allows, in principle, free choice of product quality. To the low-risk consumers this freedom of choice does not come costlessly -- they no longer can obtain full insurance coverage. These conclusions are analogous to certain results in the literature on insurance markets under imperfect information,[7] and they rely substantially upon the seminal work by Rothschild and Stiglitz on markets with imperfect information. Hence, the analysis in this paper shows the import of Rothschild and Stiglitz's results for the problem of the selection of the appropriate rule of products liability.

The analysis herein elucidates as well the functions that disclaimers and waivers of liability serve. Briefly, these exculpatory clauses shift the initial locus of liability from the manufacturer onto the consumer. When consciously employed, they enable the consumer to assume the optimal amount of risk in exchange for a lower product price, and thereby increase his expected utility from the transaction, in addition, they increase the seller's expected profits. In this model I do not treat exculpatory clauses as mechanisms for correctly allocating the risks of product failure. Rather I conceive of them as devices which enable some classes of consumers to differentiate themselves from other classes of consumers, in an effort to escape from the confines of the single product market which strict producer liability renders inevitable. By disclaiming certain rights consumers thus signal characteristics which otherwise sellers cannot observe. In this model the heterogeneity of consumers makes the use of exculpatory clauses an attractive option, and not the fact that liability has not been allocated optimally. If all consumers were identical, then consumers and producers would be indifferent between CV and CE, as indicated by the Coase

Theorem.

II. The Model and the Analysis

1. Basic Assumptions

In this paper I confine my analysis to the provision of a risky product under two distinct liability rules: consumer liability (CE) and producer liability (CV). Under the former rule, the consumer sustains the losses caused by product failure, unless he is able to obtain insurance against those losses. Under the latter rule, the consumer is reimbursed for damages from defective products by the manufacturer/seller of the product.[8]

I shall assume that the product is sold in perfectly competitive markets, one market for each product quality. Since I assume that there are two distinct consumer groups, indexed by θ_1 and θ_2, two markets at most will be opened. Consumers' reservation prices are such that they are always willing to buy one unit of the commodity, no more, no less. Under the CE liability rule, consumers purchase insurance in a perfectly competitive insurance market. (Insurance may be provided, in fact, by manufacturers themselves.) Insurance rates are based on the quality of the product, s, the amount of the damage d, caused by product failure, and, whenever possible, on the type of consumer who purchases a product of a given quality.

Let us present these assumptions more formally, beginning with the demand side of the market. A consumer who purchases a product of quality s at the price $p(s)$ and obtains no insurance has an income of $W_{NA} = y - p(s)$, if an accident does not occur, and an income of $W_A = y - p(s) - d$, if an accident does occur. Since the product market is perfectly competitive, the price of a product of quality s must be equal to the marginal cost of that product. This marginal cost, $c(s)$, is constant for all scales of output. Naturally $c'(s)$ and $c''(s)$ are both positive.

If a product is risky, a consumer would like to insure against the damages caused by product failure. His income in the two possible states, with insurance, will be given by $W_{NA} = y - c(s) - \alpha_1$ and $W_A = y - c(s) - d + \alpha_2 - \alpha_1$. Here α_1 is the premium paid to the insurance company; and α_2 is the payment to the insured. The consumer's expected utility can thus be written as

$$\bar{u}(s, \alpha_1, \alpha_2; \theta_i) = \pi(s, \theta_i) u(W_{NA}) + (1-\pi(s, \theta_i)) u(W_A), \quad i = 1, 2. \qquad (1)$$

Since the insurance industry is competitive, all insurance policies offered to insureds must break even. Thus if the policy (α_1, α_2) is offered to consumers of type θ_i, who purchase the product of quality s then

$$\alpha_1 = (1-\pi(s, \theta_i))\alpha_2, \qquad \pi_s = \partial\pi(\cdot)/\partial s > 0. \qquad (2)$$

2. Equilibrium with One Consumer Type

If there were only one consumer group in the population, manufacturers would select that quality level which maximizes $\bar{u}(\ )$, given by equation (1), when consumers purchase insurance contracts defined by the break even constraint, equation (2). This maximization implies the following first-order conditions:

$$\frac{\partial \bar{u}(\cdot)}{\partial s} = \pi_s(s,\theta_i)[u(W_{NA})-u(W_A)] - [c'(s)-\alpha_2\pi_s(s,\theta_i)]$$

$$[\pi(s,\theta_i)u'(W_{NA}) + (1-\pi(s,\theta_i))u'(W_A)] = 0. \tag{3}$$

For any given quality level, consumers select optimal insurance policies. Substituting again (2) into (1) and differentiating with respect to α_2 gives

$$\frac{\partial \bar{u}(\cdot)}{\partial \alpha_2} = -\ \pi(s,\theta_i)(1-\pi(s,\theta_i))u'(W_{NA})$$

$$+ (1-\pi(s,\theta_i))\pi(s,\theta_i)u'(W_A) = 0 \tag{4}$$

which is the standard result that, if consumers are risk averse and insurance rates are fair, consumers will equalize incomes in the two states through the purchase of insurance. Hence

$$\alpha_2 = \frac{\alpha_1}{1-\pi(\cdot)} = d. \tag{5}$$

Using (5), the first-order condition for quality choice given by equation (3), or the reliability condition in Spence's [16] terminology, becomes

$$c'(s) = \alpha_2\pi_s(s,\theta_i), \qquad i = 1,2. \tag{6}$$

(To ensure that this condition holds for any $\alpha_2 = d$ it is sufficient to assume that $c'(s)$ tends to infinity as s tends to some value $\bar{s}$ which subsequently I set equal to one.)

Using (6) we know something about the optimal quality levels that will be chosen by various risk classes of consumers. As equation (6) discloses, it is the partial derivative of the safety production function, $\pi(\cdot)$, with respect to innate riskiness which is relevant for the choice of optimal quality. We know that safer consumers innately experience fewer accidents for any product quality, i.e., $\pi(s,\theta_1) < \pi(s,\theta_2)$ if $\theta_1 < \theta_2$. But this inequality imposes a weak restriction at most on the values of the relevant partial derivative. This restriction is

$$\int_0^s \pi_{\hat{s}}(\hat{s},\theta_1)\,d\hat{s} \leqslant \int_0^s \pi_{\hat{s}}(\hat{s},\theta_2)\,d\hat{s}$$

for all values of s.

It is perhaps surprising that high-risk consumers will buy inferior products -- products that is, which are relatively unsafe when compared with products bought by less accident-prone consumers. Indeed one might expect an opposite choice of products. But we may assail easily this presumption. Let us assume for a moment that careless consumers -- the θ_1-types -- suffer accidents (almost) irrespectively of the intrinsic quality of the products they buy; for them $\pi(s, \theta_1)$ is uniformly close to zero. By buying superior products, they might reduce their insurance premium α_1, but this reduction would not be substantial. The increase in the product price, p, may be significant, however, because the product price increases at increasing rates with product quality. Consequently, for inordinately accident-prone customers, the optimal solution might involve a very cheap, inferior-quality product, combined with high insurance premiums. It is easy to understand that if $\pi(\cdot)$ is given by

$$\pi(s, \theta) = s\theta \tag{7}$$

then the high-risk consumers always buy worse products than the low-risk consumers. In what follows I shall assume that $\pi(\cdot)$ is given by equation (7) and that $\theta_2 = 1$, without any consequences for the generality of the analysis.

Consumer liability rules compel consumers first to obtain products in the product market and then *independently* purchase insurance policies whose cost depends on the quality of the product. In fact, insurance policies can be sold by the manufacturer's insurance division. The total price that consumers pay is $\tilde{p} = p + \alpha_1 = c(s) + (1-\pi(s))d$. Obviously the optimal quality minimizes the *full price*, $\tilde{p}$, inasmuch as the consumer's expected utility is $\bar{u} = u(y-\tilde{p})$ which is maximized when $\tilde{p}$ is minimized. Figure 1 illustrates an equilibrium for a representative consumer. Point A corresponds to the consumer's income in the two possible situations -- accident and no accident -- when the consumer purchases a product of the lowest possible quality and obtains no insurance. Purchases of enhanced quality move the consumer along the line AA'. The slope of the line LL is given by $dW_A/dW_{NA} = -\pi(s, \theta)/(1-\pi(s, \theta))$, which is the rate at which the consumer can trade income between the two different states when insurance is fair. The optimum product quality is that quality which results in the full price $\tilde{p}^*$. The expected utility associated with this product quality is $\bar{u}^*$. Any other product quality would induce a lower level of expected utility.

It is apparent that consumers will be indifferent between purchasing a product and, independently, the optimal policy associated with it *and* purchasing the product at price $\tilde{p}$, provided the seller agrees to reimburse the buyer for any damages caused by product failure. Of course the latter arrangement is identical to strict producer liability (CV). We know from the Coase Theorem that these two liability rules are fully equivalent when both producers and consumers have all the relevant information. The equivalence between the two liability rules disappears when buyers and sellers have asymmetric information.

3. Equilibrium with Two Consumer Types and the Caveat Emptor Liability Rule[9]

In the previous section I delimited the conditions which determine the optimal product quality for each group of consumers. Using equation (7) as the appropriate representation of $\pi(\cdot)$, and setting $\theta_1 = \theta < 1$ and $\theta_2 = 1$, those conditions are

$$c'(s_1^*) = \theta d \quad \text{and} \quad c'(s_2^*) = d. \tag{8}$$

Figure 2 plots the associated levels of expected utility for the two groups. Not surprisingly we learn that $\bar{u}_1^* = u(y-\tilde{p}_1^*) < u(y-\tilde{p}_2^*) = \bar{u}_2^*$.

Let us assume now that sellers and especially insurers cannot distinguish between the two groups. Let us assume also that each producer is also an insurer and that each producer-insurer produces a uniquality product.[10] If firms persist in selling products of quality s_1^* and s_2^*, coupled with appropriate full insurance policies, which can be determined from the breakeven equation (2), then some firms will close for lack of customers and negative profits will bankrupt others.

The firms closing for lack of customers will be those firms that sold products of quality s_1^* to high-risk customers -- the θ_1-types. θ_1 consumers will switch to firms producing goods of quality s_2^*, inasmuch as purchasing goods of quality s_2^*, falsely signals their membership in the class of safe consumers. The purchase of good of quality s_2^* entitles them to the purchase of an insurance policy (or warranty) which promises to pay $1/(1-s_2^*)$ for each dollar of insurance. (Note that without low-risk consumers, insurance policies predicated on the purchase of product of quality s_2^* would pay only $1/(1-\theta s_2^*)$ for each dollar of insurance.) The manufacturing division of the s_2^*-type firm earns zero profit; but the insurance division loses money. Whereas it collects in an amount equal to $d(1-s_2^*)$ in premiums, it must disburse an amount equal to $\lambda(1-s_2^*)d + (1-\lambda((1-\theta s_2^*)d$ in claims, where λ is the share of low-risk customers in the total population, which was normalized at one. Consequently the insurance division is making negative profits of $s_2^*(1-\lambda)(1-\theta)d$.

It is not inevitable that firms selling to low-risk consumers should go bankrupt. Two policies will perhaps avail them. They may either change product quality or offer warranties inimical to potential high-risk customers, although satisfactory to low-risk customers. *Separation* of the two groups of customers occurs when a seller contrives a quality - *cum* - warranty package which appeals only to the preferred low-risk customers.

Figure 3 illustrate such *separating* quality and warrant combination. As depicted therein, separation requires that low-risk consumers purchase less than complete insurance. To find the separating warranty for a product of some quality $\tilde{s} > s_1^*$, which is being sold to low-risk consumers, we first draw the indifference curve $u_1^{\tilde{s}}$ through the full insurance point A whose slope at that point is $-\theta\tilde{s}/(1-\theta\tilde{s})$. This indifference curve is the locus of all income combinations which yield the same expected utility as the combination $W_{NA} = y - p_1^* = W_A$. The separating warranty can be found at the intersection of this indifference curve with the line L^sL^s at a point like B on the diagram. (The slope of the line L^sL^s is given by $-\tilde{s}/(1-\tilde{s})$, and is equal to the terms at which low-risk customers can trade income in the two states when they buy product of quality $\tilde{s}$.) At that point the expected utility of a high-risk consumer is $\bar{u}_1^s = \theta\tilde{s}u(y-\tilde{c}(s)-\tilde{\alpha}_1) + (1-\theta\tilde{s})u(y-\tilde{c}(s)-\tilde{\alpha}_1+\tilde{\alpha}_2-d) = \bar{u}_1^*$. Any contract slightly worse than $(\tilde{\alpha}_1, \tilde{\alpha}_2)$ will be purchased only by the low-risk consumers and, consequently, separates the two consumer groups.

The optimal separating product quality, $\tilde{s}$, tends to be greater then the optimal quality, s_2^*, which would have been chosen by low-risk consumers if there were no high-risk consumers in the population. Intuitively, two reasons explain why $\tilde{s}$ may exceed s_2^*. First, θ_2-types do not obtain full insurance in the separating equilibrium; hence they may seek to reduce the probability of product failure by buying a better product. Secondly, improvements in product quality do not benefit substantially high-risk consumers. As I argued earlier, θ_1 - consumers eschew high quality products because additional quality, for them, increases prices significantly, although improves safety marginally. A more detailed discussion of overinvestment in safety is in Appendix I.

The important question is whether products of quality $\tilde{s}$, together with concomitant insurance contracts $(\tilde{\alpha}_1, \tilde{\alpha}_2)$, can survive against other breakeven competitive offerings. The question is then whether there exists a separating equilibrium. Following Rothschild and Stiglitz, I define the separating equilibrium as a situation in which (a) high-risk consumers do not attempt to purchase the product-*cum*-warranty package designed for the low-risk consumers and (b) so there does not exist a quality/warranty package which would earn a nonnegative profit when $(s_1^*, \alpha_1, \alpha_2)$ and $(\tilde{s}, \tilde{\alpha}_1, \tilde{\alpha}_2)$ are being offered. Regarding producers the assumption is made that they do not anticipate competitors' withdrawing their offerings when entry occurs. Let us assume that $(\tilde{\alpha}_1, \tilde{\alpha}_2)$ is the best (potentially) separating contract, whereby it maximizes the expected utility of low-risk consumers, provided that high-risk consumers buy the product s_1^* and full insurance. Conceivably some firm may offer a quality/warranty package which earns it zero profit when bought by low and high risk consumers in a proposition equal to λ. For example, a purchase of a product of quality s^p where s^p is a solution to

$$c'(s^p) = (\lambda+(1-\lambda)\theta)d, \tag{9}$$

concomitant with full insurance, may be preferred by everybody to the existing offerings $(s_1^*, \alpha_1, \alpha_2)$, $(\tilde{s}, \tilde{\alpha}_1, \tilde{\alpha}_2)$. Figure 4 illustrates this situation. At point C, everybody's expected utility is higher than under complete separation, in this instance, we would say that *pooling is preferable to separation.* The obverse case is illustrated in Figure 3. In Figures 3 and 4, the slope of the line L^pL^p gives the income trade-off at the rate - $s^p(1-s^p)$.

If all consumers in a particular market prefer pooling to the best separating warranty and quality combination, the presence of a CE liability rule precludes even the possibility of equilibrium. To prove this assertion, it suffices to show that, under CE liability there exists another quality/warranty combination which exclusively low-risk consumers will purchase. High-risk consumers will eschew this alternative, remaining with firms that offer pooled contracts. As we shall see in Section III, this new product quality - insurance pair must involve incomplete coverage. It is also apparent that the firm that initially served the pooled population must subsequently cease offering the pooling quality and insurance contracts.

One undesirable result of market disequilibrium is frequent changes in product quality, whereby manufacturers-*cum*-insurers attempt in vain to offer quality-warranty pairs that allow them normal rates of return. Such fluctuations in product quality exacerbate, of course, the problem of imperfect information that already besets many markets for consumer goods.

It may be useful to contrast the foregoing results with Oi's [12], wherein he assumes that consumers differ according to the amount of damage caused by product failure. Oi demonstrated that under the CE rule complete separation of consumers into the relevant classes is always feasible. Furthermore both groups of consumers obtain full insurance. The consumers purchase commodities of different qualities to signal their differences regarding the amount of damage. Low-damage consumers in particular signal their desirable characteristics by buying a low-quality goods. (It is obvious that high-damage consumers have no incentive to reveal their characteristics.)

In my model, the quality of products that consumers buy does not signal necessarily small innate propensity to suffer accidents. To signal this latter propensity, consumers must be willing to assume some residual risk by purchasing incomplete insurance. Even if separation is possible -- if a pooling quality and warranty combination is not preferred by low-risk consumers to the best separating quality and warranty combination -- it may nevertheless entail a level of expected utility for θ_2-consumers which is far below the level attainable if there were no high-risk consumers in the population. In determining the desirability of the CE liability rule, this level of utility is, of course, crucial. In the next section I shall delimit those forces that mandate which of these two rules is socially optimal.

4. Equilibrium with Two Consumer Types and the Caveat Venditor Liability Rule

In this model, producer liability (CV) implies that consumers automatically obtain full insurance with all products they buy. It is obvious that no signalling of innate differences is possible because low-risk consumers cannot assume any residual risk which is the only available signal of risk differences. Consequently a firm can break even only if it sells products of quality s^p calculated from equation (9). The product will sell at the price $\tilde{p}^p$ given by

$$\tilde{p}^p = c(s^p) + (\lambda s^p + (1-\lambda)(1-\theta s^p))\,d. \tag{10}$$

Thus strict producer liability as interpreted in this and Oi's papers leads inevitably to the pooling of consumers. Therefore the critical problem is whether pooling (CV) is preferable to separation (CE). If separation is not possible, we know beyond peradventure that pooling is preferable to separation. Looking at Figures 3 and 4, we note that CV tends to be preferable to CE if the share λ of θ_2-types in the population becomes large. This preference occurs because point C travels in the north-easterly direction along the 45-degree line as λ increases towards one, implying increases in the expected utility realized by pooling. The location of point B, which defines the best separating contract, is independent of the value of λ which implies, in turn, that the expected utility from the best separating contract does not change with λ. In other words, when the share of the high-risk consumers in the total population decreases, the optimal product quality, s^p, approaches s_2^* -- the optimal product quality for θ_2-types in the absene of high-risk consumers. In addition, the warranty costs associated with s^p approach those associated with s_2^*, when products of quality s_2^* are bought exclusively by θ_2-consumers. In contrast the amount of expected utility that θ_2-consumers must sacrifice to ensure separation in no way depends on the value of λ.

It is somewhat more difficult to ascertain the relative desirability of the two liability rules for different values of $\theta_1 = \theta$. The effect of a change in θ is to displace both points B and C. For example, if θ moves closer to one, the expected utilities that accrue to low-risk customers from both separating and pooling contracts increase. Nevertheless strict producer liability is preferable to consumer liability for values of θ close to $\theta_2 = 1$. This proposition is demonstrated in Appendix II.

To summarize, if there are relatively few consumers (λ close to one), who are innately careful (θ close to one), this analysis indicates that society should rationally opt for the rule of *caveat venditor.* This result does not depend on income-distribution considerations. Indeed, I showed that in some circumstances CV is Pareto-superior to CE.

I should note also that even if low-risk consumers realize a higher expected utility with separation and thus prefer not to be pooled, social welfare considerations might nevertheless mandate the selection of CV over CE. Such selection may occur if pooling reduces the expected utility of low-risk consumers by an insignificant amount but simultaneously deprives high-risk consumers of possible substantial increments in their expected utility. Oi finds such cross-subsidization undesirable inasmuch as it is the low-income, low-damage consumers, in his model, who are forced to to subsidize high-income, high-damage consumers. In my model, on the contrary, a plausible argument exists that a propensity to suffer accidents correlates negatively with income. For example, we can assume that safety, like health,[11] is produced at home, and that education increases efficiency in home production of safety. Because education and income are still positively correlated, we may presume a negative correlation, in this model, between unobservable income and the propensity to suffer accidents. If that correlation holds, social welfare considerations will not preclude, much less abhor, cross-subsidy. But it can be shown that conjoining appropriate taxes and subsidies with CE liability makes it Pareto-superior to CV liability, with its forced pooling of consumers. (This last proposition is established in the Appendix III.) It is important to observe that, with two consumer groups, and this modified CE rule, separating equilibrium always exists.

III. Exculpatory Clauses

In Section II I adduced arguments for preferring *caveat venditor* to *caveat emptor.* Where strict liability obtains, either by decisional law or by statue, should consumers and producers be allowed to shift the allocation of risk nevertheless through voluntary transactions? The condition that transactions be truly voluntary is crucial, of course, without it, the resulting contracts may be found unconscionable on procedural grounds,[12] and void. The inherent assumption in this paper that both product and insurance markets are fully competitive assures voluntariness. I have posited, in addition, that consumers are entirely cognizant of the risks associated with any product they buy. Consequently, contracts which *modify, implicitly or explicitly, either the scope of the warranty or limit the remedies for breach of existing warranties*[13] cannot be voided for consumer misperception.[14]

Even when obvious objections to disclaimers do not apply, that is when consumers have total knowledge hence, total discretion, it is possible nevertheless to adduce cogent reasons for limiting the use of disclaimers as valid defenses in products liability cases. Traditionally disclaimers enable either the seller or the manufacturer -- or both of them -- to shift liability onto the buyer. Consequently courts have abrogated or limited exculpatory clauses to protect unwary consumer-buyers from rapacious sellers and manufacturers, who impose the costs, of personal injury and property damage, by adroit disclaimers, upon the consumer.

In this analysis, however, I denominate disclaimers as *signals* which enable buyers to indicate their risk class to uninformed sellers or manufacturers. By disclaiming discrete rights, the disclaiming party attempts thereby to distinguish himself from other groups in the population, and hence to improve his expected welfare.[15] This process is illustrated in Figure 4. Where a CV liability rule obtains, expected utility $\bar{u}^p$ accrues universally. Let us assume now that a low-risk consumer who buys a product of quality s^p indicates to the seller that he would be willing to exculpate him from certain contractual liability, in exchange for a lower sale price. The resulting transaction may lead to incomes in the two states as indicated by point E on the diagram and the expected utility of $\bar{u}_2^E$ for θ_2-types. As illustrated, therein, this disclaimer was a true signal, in that it correctly revealed the consumer's risk class. However, as θ_2-types desert all together manufacturers who offer pooling quality-warranty packages, they will register negative profits, and the package will be withdrawn. The result of course is that, unwillingly, high-risk consumers now begin to join low-risk consumers in disclaiming their rights. Slowly the pooling equilibrium secured by strict producer liability unravels, to the detriment of all consumers or at least some of them.

We have demonstrated that unrestricted use of disclaimers can subvert the efficacy of CV liability. My argument establishes that restricting the use of disclaimers is a *de facto* restriction on the alienability of certain rights.[16] By disallowing certain exculpatory clauses, society makes a determination that, in certain cases, the right to the freedom of contract is subordinate to the right to seek complete restitution for damages to person or property caused by product failure. Further research must determine, of course, whether these two rights conflict as well in more sophisticated models of markets with hazardous products.

IV. Conclusions

The social import of this analysis for public policy is plain. First, it is clear that for some distributions of consumers among different risk classes, all consumers may benefit if the product market in question is forced into a pooled equilibrium. This situation arises particularly when there is no separating equilibrium under *caveat emptor.* Second, extensive use of disclaimers aborts, or at least vitiates, the socially optimal policy of spreading accident costs among various risk classes. Strict producer liability, in effect, forces low-risk consumers (or activities) to subsidize high-risk consumers (or activities). Such subsidy may be desirable inasmuch as society abhors income inequality. Certainly, *caveat venditor,* which conduces to equity, diminishes economic efficiency. We can see that at the pooling contract, point *C*, in Figure 4, the rates of substitution between the incomes in the two states for both risk classes do not equal the marginal rate of transformation of income between the two states. Hence the necessary conditions for Pareto-optimality are violated at *C*. But, Figure 3 reveals that those conditions are also violated at the CE separating contract. The theory of the second-best cautions us against choosing allocations which violate fewer Pareto optimality conditions. Third, the use of exculpatory clauses can destabilize the product market and confound, in turn, product quality. Because consumer information about product quality is notoriously inadequate, frequent changes therein can only exacerbate the informational problem. Yet such changes in product quality may be necessary if, in response to certain losses, producers and retailers experiment with different types of products or warranties. Finally, inasmuch as exculpatory clauses serve as sorting or signaling devices, if their use is discouraged by the courts, then consumers, sellers, and manufacturers will doubtless devise other sorting devices, possibly less desirable.

Overall, it is plain that absolute freedom of contract does not inevitably conduce to social welfare. In those instances in which innate carefulness can be easily ascertained -- for example, through mutual bargaining about product quality and warranty terms -- exculpatory clauses should be enforced unless other reasons, like those enumerated by Franklin [5], intrude. In most situations, however, when the same product is designed for a heterogeneous group of users who cannot easily signal their diverse characteristics to the sellers, the use of exculpatory clauses may affect adversely on income distribution; the extent of risk-spreading; the quality of consumer information about the reliability of various products; and last, but perhaps not least, the profits of manufacturers (or retailers). The foregoing analysis demonstrates albeit in the context of an oversimplified model, that certain consumer rights should be treated as inalienable. In support of this position, I have argued that persons should not necessarily be allowed to relinquish their rights solely for the purpose of *signaling* their differences, to and from others.

Footnotes

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1. The diversity of views is well illustrated in Manne [8].
2. For the most recent statement of the Coase Theorem as applied to products liability see Hamada [7].
3. Some characteristic may be irrelevant in that, as Spence writes, "...with varigated consumer preferences, there will be a variety of goods and markets, each attending to some subset of the consumers." He then adds that "varigated preferences may, however, place constraints on the use of liability as a policy instrument in any one of the markets." Spence [16, p. 34, fn. 11].
4. Those readers who object to this infusion of genetics into the model can proceed on the assumption that various consumers put the product to various uses, some riskier than others. By assumption, the seller cannot ascertain *ex ante* the contemplated uses of the product. In addition, none of those uses are either unintended or, unforeseeable, legally. Unintended or unforeseeable use does constitute, however, a valid legal defense in the strict liability action. *Schamel v. General Motors Corporation,* 384 F.2d 802 (1967). For the study which supports the assumption made here see Mellinger, *et al* [10].
5. See Ehrlich and Becker [2] and Shavell [15].
6. Oi [12], assumes that the damage does not depend on the quality of the product.
7. See Rothschild and Stiglitz [14]. I abstract from the major source of imperfect information, namely from the lack of knowledge about product quality.
8. This is somewhat idealized view of the function of product liability rules. For a more realistic view see Prosser [13, chapter 17] and White and Summers [17, chapters 9-12].
9. Both this section and the following section owe much to the seminal paper by Rothschild and Stiglitz [14].
10. The consequences of allowing for multiproduct firms are discussed in Rothschild and Stiglitz [14] and are of no particular interest in the context of this paper.

11. See, for example, Grossman [6].
12. For illuminating discussions of the distinctions between procedural and substantive unconscionability, see White and Summers [17] and Epstein [4].
13. The underlined phrase defines the concept of disclaimers as used in this paper.
14. For arguments in favor of limiting the use of disclaimers as defences in products liability cases, see Franklin [5]; for contradictory arguments, see Epstein [3].
15. Manove and Ordover [9] discuss the use of disclaimers of rights as signals albeit in a different context.
16. For the discussion of inalienability of rights from a transactional perspective, see Calabresi and Melamed [1]. Calabresi and Melamed argue that when alienation of a right causes an externality, inalienability may be a desired social policy. In the model studied here alienation of a right produces an *informational externality:* When I alienate my right this decision reveals something not only about myself but also indirectly produces information about those who chose not to alienate that right. See [9] for additional discussion.

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APPENDIX I

I shall now analyze the consequences of separation on the quality of the product chosen by the low-risk consumers. The question is then, whether separation causes over- or underinvestment in safety as compared to investment in safety when there are no high-risk consumers in the population. Unfortunately, as we shall see, there are no unambiguous answers to this question.

For notational convenience let k, $0 \leqslant k \leqslant 1$. be the fraction of the total loss d that is insured. Thus $(1-k)d$ is the deductible. Define

$$L \equiv \pi(s,\theta_2)U(W_{NA}) + (1-\pi(s,\theta_2))U(W_A). \tag{A1}$$

For any k

$$\frac{\partial L}{\partial s} \equiv L_s = \pi_s[U(W_{NA})-U(W_A)] - (c'-kd\pi_s)$$
$$[\pi U'(W_{NA}) + (1-\pi)U'(W_A)] \tag{A2}$$

where $\pi_s = \partial\pi/\partial s$. At the optimum $L_s = 0$ which implies that

$$c' - kd\pi_s > 0. \tag{A3}$$

Let us denote by $s^*(k)$ that value of s which maximizes L for a given value of k.

Let us denote by $V(\cdot)$ the expected utility of the high-risk consumers who face a deductible $(1-k)d$ when they purchase a product of quality s and obtain the associated warranty which would break even if it were purchased exclusively by the low-risk people. Thus

$$V(\ ) = \pi(s,\theta_1)U(W_{NA}) + (1-\pi(s,\theta_1))U(W_A). \tag{A4}$$

For separation to occur it must be true that $V(\cdot) \leqslant \overline{U}_1^*$, where $\overline{U}_1^*$ is the maximum utility obtainable by the θ_1-types when there are no θ_2-types in the population. If $V(\cdot)$ is concave in s for any k -- and I assume it is -- then for any k there will be in general two values of s, denoted by $s_{\min}(k;\overline{U}_i^*)$ and $s_{\max}(k;\overline{U}_i^*)$ such that at those values of s, $V(\cdot) = \overline{U}_1^*$. It is possible to demonstrate that L when evaluated at $s_{\max}$ is greater than L evaluated at $s_{\min}$. Indeed note that

$$L_s = V_s + \{(\pi_s(s,\theta_2)-\pi_s(s,\theta_1))(U(W_{NA})-U(W_A))$$
$$- [c'-kd\pi_s(s,\theta_2)](U'(W_{NA})-U'(W_A)][\pi(s,\theta_2)-\pi(s,\theta_i)]\} \tag{A5}$$

If we assume that $\partial^2\pi/\partial s\partial\theta > 0$ then the term in the curly bracket is unambiguously positive. Integrating between $s_{\min}$ and $s_{\max}$, proves that

$L(s_{\max}, \cdot) > L(s_{\min}, \cdot)$. Thus in what follows we can disregard the values $s_{\min}(k; \overline{U}_1^*)$. I have shown that, at least from the standpoint of the high-risk consumers, the low-risk consumers overinvest in safety for any value of the deductible $(1-k)d$. In other words $s_{\max}$ is always greater than the value of s that maximizes $V(\cdot)$ for a given k.

It is easy to show that $s_{\max}$ is also greater than $s^*(k)$, at least for the relevant values of k. Note that

$$\frac{dL}{dk} = L_s \left. \left(\frac{\partial s_{\max}}{\partial k} \right) \right|_{v=\overline{U}_1^*} + L_k. \tag{A6}$$

Now $L_k > 0$ for $0 \leqslant k \leqslant 1$. Also, if for some k^0 $\partial s_{\max}/\partial k)_{V=\overline{U}_1^*} < 0$ then for the same $s_{\max}$ we can find another $k^1 > k^0$ for which $(\partial s_{\max}/\partial k)_{V=\overline{U}_1^*} > 0$. Since $L_k > 0$ then k^0 is dominated by k^1. Thus only relevant values of k are those for which $\partial s_{\max}/\partial k > 0$. Putting those facts together implies that at optimum k^*, $\partial L/\partial s < 0$. Consequently, to accomplish separation, the low-risk consumers overinvest in safety in the sense that $s_{\max}(k^*, \overline{U}_1^*) > s^*(k^*)$. This result points up the possibility of a Pareto improvement: the low-risk consumers would be willing to pay some amount to the θ_1-types if they would refrain from buying the θ_2-type's product.

It is much more difficult to compare $s_{\max}(k^*, \overline{U}_1^*)$ with s_2^*, i.e. with $s^*(1)$. When $ds^*/dk < 0$, it is obvious that $s_{\max} > s^*(k^*)$. Unfortunately the assumption that $ds^*/dk < 0$ although reasonable at first blush -- one does expect consumers to buy a safer product the smaller the percentage of the risk that is uninsured -- appears somewhat less plausible. Since $\partial^2 L/\partial s^2$ is negative at $s^*(k)$, the sign of $ds^*(k)/dk$ is the same as the sign of $\partial^2 L/\partial s \partial k$. The latter mixed partial can be calculated as

$$\begin{aligned} L_{sk} = & -\pi_s d[U'(W_{NA}) - U'(W_A)](1-2\pi) \\ & + d(c'(s) - kd\pi_s)[U''(W_{NA}) - U''(W_A)]\pi(1-\pi). \end{aligned} \tag{A7}$$

The second term is positive provided that $U''' > 0$, a reasonable assumption which is necessary for the absolute risk aversion to be decreasing in income. The sign of the first term depends on $(1-2\pi)$. For very safe products, π close to one, the first term is negative and may dominate the second term.

Whenever $ds^*(k)/dk < 0$, $s^*(k) > s^*(1)$, $k < 1$. But, as we have seen, $s_{\max}(k) > s^*(k)$. Thus we conclude that if $ds^*(k)/dk < 0$, the θ_2-types overinvest in product quality even when compared to the product quality they would purchase if they did not attempt to separate themselves from the high-risk consumers.

APPENDIX II

I shall now demonstrate that CV is more desirable than CE when the two groups of consumers have innate differences which are not too far apart.

Let us define implicitly two sets of tax rates

$$U(y-\tilde{p}_2^* - T_s) - \bar{U}_2^s(\cdot) = 0 \tag{A1}$$

and

$$U(y-\tilde{p}_2^* - T_p) - U(y-\tilde{p}^p) = 0. \tag{A2}$$

Thus T_s and T_p can be interpreted as the maximum lump-sum taxes that a θ_2-type consumer would be willing to pay rather than to find himself respectively in a separating and pooling equilibrium, (see also Appendix III). It is easy to show that $dT_s/d\theta < 0$. We also know that $dT_s/d\theta$ does not depend on the value of λ. Turning to the behavior of T_p, totally differentiating (A2) yields

$$\frac{dT_p}{d\theta} = U'(y-\tilde{p}^p)\,\frac{\left[\dfrac{d\tilde{p}^p}{d\theta}\right]}{U'(y-\tilde{p}_2^* - T_p)}. \tag{A3}$$

By (A2), $U'(y-\tilde{p}^p) = U'(y-\tilde{p}_2^* - T_p)$. Also $d\tilde{p}^p/d\theta = \partial s^p/\partial\theta$ since $\tilde{p}^p$ is optimized with respect to s for any given values of θ and λ. Hence,

$$\frac{dT_p}{d\theta} = -\,(1-\lambda)\,s^p. \tag{A4}$$

Differentiating again we obtain

$$\frac{d^2T_p}{d\theta^2} = -(1-\lambda)\frac{\partial s^p}{\partial\theta} > 0, \tag{A5}$$

which establishes that for any λ, T_p is a nonincreasing convex function of θ. Furthermore it is easy to show that $dT_p/d\lambda < 0$. Putting all those facts together we note that for large values of λ, λ close to one, that is, $T_p < T_s$. Also, for a given λ, $T_p < T_s$ if θ is close to one. Furthermore, the critical value of θ for which $T_p > T_s$ increases as λ increases. Figure 5 illustrates this result.

APPENDIX III

I show here that CE assisted by taxes and subsidies is a Pareto-superior rule to CV. The proof utilizes the fact that the full price that consumers pay in a pooled equilibrium is a monotonically decreasing concave function of the share λ of θ_2-types in the population. The full price is

$$\tilde{p}^p = c(s^p) + [\lambda(1-s^p) + (1-\lambda)(1-s^p\theta)]d \tag{A1}$$

where s^p is calculated from

$$c'(s) = [\lambda+\theta(1-\lambda)]d. \tag{A2}$$

Differentiating (A1) totally with respect to λ and using (A2) yields

$$\frac{d\tilde{p}^p}{d\lambda} = [c'(s)-d(\lambda+(1-\lambda)\theta]\frac{ds}{d\lambda} - (1-\theta)s^p = -(1-\theta)s^p \tag{A3}$$

Differentiating (A3) with respect to λ gives

$$\frac{d^2\tilde{p}^p}{d\lambda^2} = -(1-\theta)\frac{ds^p}{d\lambda}. \tag{A4}$$

From (A2)

$$\frac{ds^p}{d\lambda} = \frac{1-\theta}{c''(s)} > 0. \tag{A5}$$

Hence (A4) is negative. It follows that

$$\tilde{p}^p > \tilde{p}_2^* + (1-\lambda)\tilde{p}_1^*$$

where $\tilde{p}_i^*$ is the full price paid by the ith group in the event that is is the only group in the population.

Now consider a tax T on a representative type θ_2 consumer which is payable when the consumer buys his optimal product s_2^* and obtains full insurance. This tax is such that after paying it, the θ_2-type consumers are as well off as they were in the pooling equilibrium. Thus

$$y - \tilde{p}_2^* - T = y - \tilde{p}^p. \tag{A6}$$

Assume next that the revenues from this tax are distributed as a subsidy to θ_1-type consumers and payable when those consumers purchase their optimal product s_1^*. Clearly for each dollar collected in taxes the subsidy is $\lambda(1-\lambda)$. It is easy to show that

$$y - p_1^* + \frac{\lambda}{1-\lambda}(\tilde{p}^p - \tilde{p}_2^*) > y - \tilde{p}^p. \tag{A7}$$

To prove this inequality we rearrange the terms and multiply by $(1-\lambda)$ which yields

$$-[(1-\lambda)\tilde{p}_1^* + \lambda\tilde{p}_2^*] \geqslant -\tilde{p}^p. \tag{A8}$$

Of course (A8) is satisfied because $\tilde{p}^p$ is concave in λ.

It follows that there exists a tax T^* which leaves θ_1-types as well off as they were in the pooling equilibrium and makes θ_2-types better off. This situation is illustrated in Figure 6. It is also apparent from Figure 6, that high-risk consumers would be willing to buy product s_2^*, obtain full insurance *and* pay the tax T^*. In other words the combined taxation and subsidy scheme grafted on the CE rule does not obviate the need to separate consumer groups into the relevant risk categories. As in the case of simple unassisted CE, the low-risk consumers must purchase incomplete insurance for signaling purposes.