SAFETY IN TRANSPORTATION: THE ROLE OF GOVERNMENT

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We can be *too* safe. Achieving safety costs us time and other scarce resources. For example, if all transportation vehicles were restricted to speeds of one mile per hour, there would be a marked decrease in the accident rate, but few people would find they were better off than they are at present. A good transportation mode is one that gets me to my destination quickly, cheaply, and safely. In general, one attribute can be bettered only by worsening another—that is, additional safety is available only by trading for it higher cost or slower speed.

Safety is a scarce resource. To allocate this resource optimally, two basic questions must be answered. What level of safety should we be seeking? (How safe should we be?) What is the least costly way of achieving this level? (In what ways can we buy safety most cheaply?) Transportation safety results from the interaction between passenger, government, law, and the insurance system.¹ The unique role each plays in optimizing transportation safety is the subject of this paper. Particular emphasis is given to automobile safety, and the ultimate objective is to identify analytically the proper role of government fiat and regulation in accomplishing society's safety goals.

The paper begins with a discussion of concepts used in the subsequent analysis. There follows a consideration of transportation safety in a society with no liability laws and no government controls on transportation but in which the individual can insure himself against certain risks. In such a society, insurance has a somewhat remarkable role, although chaos is the rule. In the next section liability laws are introduced. With liability laws and insurance, individuals are encouraged to act in such a way that a more nearly optimal level of transportation safety is reached. However, as shown in the analysis, there are many practical and theoretical reasons why relying on the market alone, including the legal system and insurance incentives, will not bring society to an optimal level of safety. Thus, the discussion moves on to the ways in which government action might be appropriate to improve or even to replace the operation of market forces as a means of achieving particular safety

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¹ The driver of a car is passenger, driver, and owner. An airline passenger has only one of these roles. Public vehicles have their safety regulated by government agencies.

goals. In the final section some current federal safety programs are examined, the focus of the examination being the extent to which these programs perform the role for which government is uniquely suited.²

I

SOME DEFINITIONS AND DISTINCTIONS

The notion of what constitutes an "optimal level of safety" is basic to this paper. This and other notions to be used are defined below.

A. "Optimality" and Safety Decisions

Increased safety is a service which might be purchased in just the same way that other services are purchased. In planning a voyage, a knowledgeable traveler can choose how much safety and comfort he desires. By selecting the class of his ticket, he can choose the "optimal" level of comfort (within a wide range); by choosing the ship, he can choose the "optimal level of safety" (within a wide range).

The individual's safety decision might come in this form: How much are you willing to pay to reduce the probability of accidental death (on this voyage) from, say, one in a hundred thousand to one in a million? This question might be answered in the same way as this more mundane one: How much are you willing to pay for a lottery ticket which gives you one chance in a million of winning a million dollars? If one were completely neutral with respect to risk, one would be willing to pay up to \$1 for the ticket. But some people never take a fair bet and would be willing to pay only something less than a dollar. Someone who likes to gamble would be willing to pay more than a dollar. Some people would regard the chance of winning as so remote that they would not be willing to enter the lottery at all. Thus, if the economic value of my life is \$200,000, and if I take the economic value to be synonymous with the total value, I should be willing to pay about \$1.80 to reduce the probability of death on this voyage from .00001 to .000001. Someone who is risk averse—that is, willing to pay simply to avoid risk—would be willing to pay more; a gambler would be willing to pay less. Many people would consider these odds too small to worry about and would not be willing to pay anything.

To achieve an optimal level of safety, one must purchase all those increments in safety which cost less than the maximum one is willing to pay. For the example above, if the reduction of the death probability from .00001 to .000001 costs more than \$1.80, I should not purchase it; if it costs less than \$1.80, I should. Of course, the issue becomes a bit more complicated in evaluating devices which benefit a number of people, but the same principle applies: from a social viewpoint, an increase in

² For an excellent economic analysis of the safety problem, see Schelling, *The Life You Save May Be Your Own*, in *PROBLEMS IN PUBLIC EXPENDITURE ANALYSIS* (S. Chase ed. 1968).

safety should be purchased if all costs are less than all benefits. The question becomes how to calculate benefits and costs.³

To optimize safety, one must be able to calculate the cost of injury and of death, as well as the cost of damage to property. One way or another, the benefit of each safety-related act must be quantified since optimization requires that the benefit be compared to the cost of the act. Determining the cost (to society) of injury and death is a difficult problem; in order to proceed with the argument, we assume that these costs can be estimated.⁴

B. Externalities

A second concept is that of "technological" and "pecuniary" "externalities."⁵ An externality is an economic effect not directly transmitted through the market. If I cause an accident which damages your property, the loss you sustain would be a technological externality; if the value of your property were to fall due to a new highway, the loss would be a pecuniary externality. Since all externalities represent a gain or loss to an (at least initially) unrepresented party, they would appear to provide possibilities for litigation. Many do give rise to lawsuits, but most are never brought to court. Thus, I am not likely to sue my neighbors to collect the benefit I bestow on them by improving my property; many activities of others may affect my property's value favorably or adversely without giving rise to a legal claim one way or the other. Economists reserve their professional interest for technological externalities. These represent a shift in the production or consumption function of the affected party due to an externality. The loss I sustain in an accident caused by you is a technological externality. It destroys my property, injures me, and may shorten my life. I (and society) must expend resources to repair the damaged property, heal the injury, and possibly replace the productive years lost due to premature

³ When a single individual is involved, the decision will differ depending on the value of the individual and his attitude toward risk. No general determination is possible. Of course, calculating the value of a life is inherently difficult. See note 4 *infra*.

One final caveat here is that all decisions should be made with respect to small increments of safety. Suppose that by paying more and more, one can continue to get increases in safety. One should stop purchasing safety when the last increment of safety costs exactly as much as one is willing to pay. The presumption is that further increments will cost as much or more and give less satisfaction.

⁴ To calculate the cost of an injury, one might begin by determining the value of wages lost during recuperation and the medical expenses which are incurred. Even these simple concepts are ambiguous: there is no easy way to determine when the individual should return to work and no sure way to keep medical expenses from being padded. But the major difficulty is that the individual is damaged beyond this level. He suffers pain, restriction of his normal functions during recovery, and may suffer permanent disability or premature death. Assigning a value to these losses is extremely difficult.

When a victim is killed, an even more difficult problem arises. Many people lose by the individual's death: his family may suffer a measurable financial loss; they will suffer some nonmonetary losses which are almost impossible to measure. Society loses a productive member with all of his potential contribution to output. Some first steps have been taken to measure the economic value of a life. See Fromm, *Civil Aviation Expenditures*, in *MEASURING BENEFITS OF GOVERNMENT INVESTMENTS* (R. Dorfman ed. 1965); Fromm, *Aviation Safety*, in this symposium, p. 590, 600-04; Schelling, *supra* note 2.

⁵ This terminology is standard in economics. For a discussion, see Coase, *The Problem of Social Cost*, 3 J. LAW & ECON. 1 (1960), and Demsetz, *Some Aspects of Property Rights*, 9 J. LAW & ECON. 61 (1966).

death. If a way could be found to avert the accident, there would be resources available to society to achieve other ends.

Pecuniary externalities are changes in prices, such as that of land. These externalities imply a change in the distribution of income or wealth but no change in individual consumption or production functions. Curtailing a pecuniary externality merely shifts the distribution of income and wealth back toward its former position. While there are many arguments to be made for or against compensation, these questions are usually left by economists to others, that is, to lawyers and the courts.⁶

Another way of indicating the distinction between pecuniary and technological externalities is to note that the economist is not interested in compensation per se. Whether a negligent driver *should* pay for the damage to me and my property is not the central concern of the economist. But the negligent driver should act *as if* he paid these costs—that is, he should face the real (full social) cost of his actions so that he is motivated to optimize safety (in a broad, social context), taking all effects into account. Facing the full cost of accidents, he might decide to drive less, to drive more carefully, to buy a safer vehicle, or to maintain his vehicle in better mechanical condition. Once the driver has optimized (in general, not maximized) the safety of his driving, the economist loses interest in the problem. He lacks special competence to decide how much compensation should be paid and might entrust this question to the courts.

C. Public Versus Private

A third concept is that of a "public good."⁷ A pure public good is one that is automatically provided to everyone when it is provided to a single individual. For example, the security due to our national defense is automatically provided to everyone in the United States. Another example is the flood protection offered to a region by a dam. Everyone in the region receives the same protection, and there is no way to deny someone this protection. The usual (private) good has the property of being allocated strictly to the consumption of one individual. I consume my steak and exclude all others from enjoying it. The market system is an efficient way to allocate steaks and all private goods. Public goods cannot be located in the market since an individual can receive the benefit of the good without paying for it.

A final concept is the distinction between private, public, and collective trans-

⁶ Economic analysis of welfare problems is based on the notion of Pareto optimality. One situation is better than another if at least one person is better off and no one is worse off. Such inefficient situations rarely occur. However, situations do occur where it would be possible for the gainers to compensate the losers and still be better off. When compensation could be paid, economists advocate that the more efficient solution be adopted. However, there is much argument over whether compensation need actually be paid or whether it is sufficient that it merely could be paid, in which case the issue becomes one of distribution of wealth, a pecuniary externality. Logic purists contend that unless compensation is actually paid, the loss in utility to losers could outweigh the gain in utility to the gainers—in which case the move might lower social welfare.

⁷ The term was invented by Samuelson, *Diagrammatic Exposition of a Theory of Public Expenditures*, 37 REV. ECON. & STATISTICS 350 (1955).

portation vehicles. A private vehicle is built and maintained for the transportation of a particular individual; it is assumed that no other person ever rides in or drives this vehicle. In contrast, a collective vehicle is one which transports a number of people—for example, a bus or airliner. A public vehicle is one whose services are for hire—for example, a rental car, taxicab, or ocean liner. (There is no need to distinguish public vehicles on the basis of the number of passengers.)

Few private vehicles exist. An automobile carries more than a single person and may be sold to a second owner who has little choice about the safety features he purchases with the vehicle. An automobile which carried only members of one family might take on many of the features of a private vehicle since one might expect that the preferences of each family member would be taken into account in the selection of the vehicle, its safety features, and the care with which it was driven. Even though few are ever encountered, it is worth considering private vehicles since their safety ought to be quite different from the safety of a collective or public vehicle; as argued below, a collective, public vehicle ought to be much safer than the average private vehicle.

II

THE FUNCTION OF INSURANCE AND LIABILITY LAWS

A. The Level of Safety in a Society Without Liability or Government Controls

Consider a society in which there are no liability laws, no government controls on transportation vehicles, and no insurance. In this society if my actions result in harm to you, you have no way of seeking compensation for your loss. Here the individual faces only the costs of damage to himself, his family, and his property.⁸ In driving, he is motivated to reduce injury to himself and to purchase a vehicle which is not easily damaged and which protects him in case of accidents—in the extreme case, an armored car. In purchasing a vehicle which promotes his safety (one with few mechanical defects) and in driving so as to avert injury to himself, the individual promotes the safety of others. But, unfortunately, protecting oneself is not entirely synonymous with protecting others. Many sorts of collisions—for example, hitting pedestrians—result in little damage to me or my vehicle but do substantial damage to others.

The resulting situation is dangerous, inefficient, and uncomfortable. While most people would be motivated to drive so as to avoid accidents, they would be undermotivated to avoid those accidents which resulted in little damage to them. Due in part to this undermotivation, an individual could not depend on the careful driving of others. Most people put a high premium on personal safety, but there are some drivers who like risk. The average driver would probably have to drive more slowly and carefully than he does now. His speed would be slower and the capacity

⁸ The extent to which an individual considers the effect of his actions on others will depend upon the extent to which the welfare of others enters his utility function.

of the highway would also be lower.⁹ The average automobile would be more expensive and less comfortable than at present. More would be spent to protect one's property: off-street parking and a thick wall around one's property would be essential.

Under these circumstances, individuals would be motivated to bribe others to drive more safely and to drive in mechanically safe vehicles. As noted by Coase, I can enhance my safety by driving more carefully, by protecting my property, *and* by bribing others to cause fewer accidents.¹⁰ If making and enforcing contracts were costless, and if all individuals knew their preferences, contracts would arise which would tend to optimize safety. However, in a society like our own, it is difficult to imagine that attempting to bribe others to drive more carefully would accomplish much. Without liability laws, all transportation would be more costly, slower, and less safe. One can imagine the level of national income and wealth being substantially lower.

B. Introducing Casualty Insurance

Casualty insurance would be of benefit in this society since there are three roles that might be performed. The first role of casualty insurance is the primary role for any insurance: it is worth a great deal to protect against the financial loss which can result from an improbable but expensive event. Even if I drive carefully and purchase many safety features, there is still a small probability that damage to me and my property could be financially disastrous; someone is sure to be this unlucky. Insurance provides a solution by having all drivers pay a premium equal to their expected loss (the magnitude of the loss multiplied by the probability that it will occur) plus a transaction charge. In practice drivers are willing to pay a substantial transaction charge in order to avoid the severe financial loss eventuating from an unlucky set of circumstances.

The second role of casualty insurance arises from the calculation of the proper insurance premium. People who drive carefully, or drive less, or who operate mechanically sound vehicles, are less likely to be involved in an accident; these people will cost the insurance company less in claims. Consequently, insurance companies should offer a lower premium to careful drivers and to people who are willing to purchase safety features, keep their vehicle mechanically sound, or drive less often.¹¹ These lower

⁹ A comprehensive discussion of the capacity of a highway as a function of the number of vehicles and the speed of vehicles is presented in Smeed, *Traffic Studies and Urban Congestion*, 2 J. TRANSPORT ECON. & POLICY 1 (1968).

¹⁰ See Coase, *supra* note 5. See also Calabresi, *Does the Fault System Optimally Control Primary Accident Costs?*, in this symposium, p. 429, 436-38.

¹¹ One cannot be sure that a profit-maximizing insurance company would lower premiums for safe drivers. A company might find it more profitable to encourage people to drive less safely, if, for example, the service fee was a fixed percentage of total premiums. For the rest of the analysis, insurance companies will be assumed to be welfare-maximizing so that they lower premiums to encourage safe driving and indulge in other safety-producing acts, as long as they do not lose money by these acts. This welfare-maximizing behavior could come about because companies are forced into it by competition, are mutually owned, or are regulated by governmental agencies.

premiums serve an important informational function, which operates to encourage safe driving by bringing home to drivers the costs associated with potential accidents. Safety information can also be communicated effectively through a premium schedule.¹² Suppose I was deciding whether to have my car inspected. My insurance company might inform me that they would reduce my annual premium by five dollars if I presented them with proof that the car was mechanically sound. It would be easy to determine whether inspection was worthwhile, since one would have only to learn the cost of inspection. The role of insurance would be to make the consequences of my actions more evident to me, and the same function could theoretically be served with respect to other safety-related factors, such as particular safety devices, mileage driven, traffic conditions to which the vehicles was exposed, and so forth.

The third role of casualty insurance is that of lowering transaction costs. Suppose that brake failure were found to be a major cause of accidents. A welfare-maximizing company would grant a substantial premium reduction to drivers who had their brakes serviced at regular intervals; if this reduction exceeded the cost of fixing the brakes, one could expect that most drivers would act. However, it is quite possible that this reduction would be less than the cost of having brakes serviced but that better brakes are socially beneficial. Since there are no liability laws, the premium reductions would reflect only the decreased damages to the cars with better brakes; they would not include the savings in damages to other cars which were struck. Suppose that better brakes were socially desirable (the benefit exceeds the cost). As Coase argues, those drivers who might be struck by cars with bad brakes would be motivated to bribe the offending drivers to fix their brakes.¹³ Insurance can become an institution for collecting and dispensing these bribes at minimal cost. The bribes might take the form of an additional reduction in premium for having brakes serviced; it might be collected from a slightly increased general premium for insurance.

Suppose that casualty insurance were made mandatory. Each insurance company

¹² Suppose that an insurance company has determined the marginal contribution to accidents and damage of each safety-related act. They might disseminate this information by publishing a booklet and selling it to drivers or they might incorporate it in premium schedules. In both cases, a knowledgeable driver could determine whether, for example, purchasing a collapsible steering wheel was worthwhile. But if the information were embodied in the premium schedule, two advantages are apparent. The first advantage is that each policy holder is provided with a copy of the premium schedule and so would have easy access to the information. Policy holders are also more likely to study a premium schedule and determine what adjustments are beneficial to them. The second advantage is that the consequences of a safety-related action would be immediately apparent. Buying a collapsible steering wheel would result in an immediate reduction in the premium, rather than in a lower chance of serious injury. The insurance company would be calculating the benefit of each safety-related action; the driver would only have to find the cost of that action in order to determine whether it was worthwhile. Unfortunately, the cost of tailoring rates in this way would be high. Determining the proper rate schedule would be expensive; calculating the correct premium for an individual and enforcing his decisions would probably be even more expensive.

¹³ See Coase, *supra* note 5, at 7.

would try to attract low-risk drivers (and encourage its customers to have fewer accidents) by indicating it would reduce the premium of such careful drivers. While these premium reductions would encourage safe driving, they would not be sufficient to optimize safety. Without liability laws or voluntary agreements, insurance companies would not grant premium reductions to individuals who failed to hit pedestrians or who avoided accidents which did not damage their vehicle. Moreover, the reductions that were granted would reflect only the reduction in damage to the insured vehicle and its driver; thus, drivers would receive less than the optimal incentive to avoid accidents.

There are two exceptions to this conclusion. If there were a single, welfare-maximizing insurance company which insured both drivers and pedestrians, this company would gear my premiums to *all* the damage which resulted from my driving, not just that which injured me and my property. If I struck a pedestrian under these circumstances, the company would have to pay a claim, even though my property was not damaged. The existence of this claim means that my premium would rise. This company would attempt to motivate an optimal level of safety.

The second exception revolves around the ability of insurance companies to lower transaction costs. It was argued above that insurance provides a mechanism for bribing drivers to further increase the safety with which they drive. If this mechanism could be made both effective and cheap, optimal safety would result.

However, these exceptions do not seem important. If there were more than one company, premiums would reflect less than the total damage, unless companies were able to collude. The existence of many companies would also make the lowering of transaction costs more difficult. While it is conceptually possible for insurance to optimize safety, it is difficult to imagine this occurring in practice.

C. The Role of Liability Laws

The contribution of liability laws can most easily be seen by considering a world of complete knowledge. It is assumed that everyone knows the distribution of consequences of each act. For example, I know that driving too fast doubles the chance of my having an accident. It is also assumed that the contribution of each driver in "causing" an accident is known. Note that complete knowledge exists only in knowing the distribution of outcomes of my actions; I do not know when I will have an accident, or even that I will have one. What I do know is the probability that I will have an accident, given my behavior.

Liability laws have the role of reallocating the cost of an accident among individuals; without liability laws, each individual bears his own cost. For an accident which is clearly the fault of one driver—for example, hitting a legally parked car—the existence of liability laws would mean that the driver at fault would have to pay the entire cost. In other situations where the cause of the accident is unclear, the cost would be allocated according to the dictates of law or judicial precedent. What-

ever the allocation, people are assumed to know how things are to be decided and so will know the probable consequences of their actions.

In such a world I would know the consequences of buying a collapsible steering wheel or better brakes. Given the way in which I have decided to drive and the amount I have decided to drive, I could decide whether each device was worthwhile. I could decide what my driving habits ought to be, how many safety features to purchase, and how often to have my vehicle inspected. Since liability laws result in a different allocation of expenses, my decisions are going to depend on the way accident costs are calculated and allocated to me.

Apart from notions of equity, is there an "efficient" way of allocating accident costs? The answer is affirmative since individuals can modify their behavior in view of the costs they will be assessed. If liability laws make the driver responsible in pedestrian accidents, the driver would provide himself with devices to minimize his cost. If the pedestrian is made responsible, he is the one who would change his habits and purchase devices to minimize his cost. Achieving an optimal level of safety depends on splitting the cost of the accident according to who can most cheaply avert the damage. If the cheapest way of minimizing damage is to have better brakes and soft bumpers on cars, drivers ought to be held liable.¹⁴

As noted above, the basic role of insurance is protecting against a huge loss. In a society without liability laws, one role of casualty insurance is protecting a driver against losses resulting from damage to his property in an accident. Under liability laws, the mirror image of this role is that of guaranteeing that the damaged party (pedestrian or property owner) can collect the damage due him from the driver at fault. Liability insurance guarantees that an award will be paid and so prevents catastrophic financial loss to the injured party.

Just as casualty insurance had the role of dramatizing accidents costs in a society without liability, so liability insurance performs the same role once liability has been introduced. Without liability laws, the financial consequence of an accident involves only the property of a driver; with liability laws, one driver may be responsible for the entire cost of the accident. A liability insurer would be motivated to determine the *total* cost of each safety-related act; it would be motivated to gear its premium schedule to the total cost of each safety-related act and so internalize the entire cost of the act. With liability laws, the reduction in my insurance premium stemming from fixing my brakes would reflect the cost to the people I was likely to strike as well as the cost to my property. This premium reduction would be of the correct size to motivate an optimal level of safety.

The basic role of liability laws does not change when the assumption of certainty is dropped. However, complications ensue in that drivers will not have enough knowledge to optimize; they lack knowledge of the efficacy of safety features and driving rules; they are also uncertain of how the cost of an accident

¹⁴ See generally Calabresi, *supra* note 10.

will be calculated and of how it will be allocated among the parties involved. While these difficulties might do much to vitiate the effectiveness of liability laws in motivating optimal behavior, the basic role will be unchanged. When the assumption of perfect knowledge is dropped, the information dissemination role of insurance takes on new importance. When it is impossible to learn the efficacy of each safety-related act and difficult for most drivers to make even a reasonable guess, insurance companies can be of enormous help to a driver in showing him the financial consequences of his acts in the premium schedule.

III

WHY BETTER LAWS AND INSURANCE FALL SHORT OF OPTIMIZING SAFETY

Earlier it was argued that optimum safety could not be obtained without liability laws (since there are positive transaction costs associated with inducing others to practice safety). Then it was shown that liability laws could be efficacious and that liability laws and insurance could work well together. The natural question to ask now is whether an improved, revitalized insurance system and liability system would do the whole job of optimizing transportation safety. Unfortunately, the answer is "no." Even at their best, insurance and liability laws leave important classes of difficulties unsolved. There are imperfections which prevent the market from optimizing safety. Some problems are associated with friction, inertia, and imperfect knowledge; other problems stem from externalities, increasing returns, and public goods.

A. Market Imperfections

1. *Shortcomings of Insurance*

One set of market imperfections is associated with implementing the role of insurance. In order to fulfill adequately the important function of dissemination of safety information, it is essential that insurance companies possess information on the marginal contribution of each of the required factors which might cause accidents or increase accident damage.

(1) One difficulty with the market place is that there is no mechanism for determining how much information should be collected and analyzed. More information is useful in confirming conclusions or investigating subtle effects, but there are clearly diminishing returns.

(2) A second difficulty stems from the fact that there are a number of insurance companies. This task of analyzing accident data need only be done once; the market place provides no mechanism for coordinating the research among companies to see that each analysis is done only once.

(3) A third difficulty is associated with the dissemination of this information through premium schedules. Premium schedules which reflect all of the relevant

facts are going to be complex. They might be so complex as to impair or destroy their information-transmitting function.¹⁵

(4) A fourth difficulty stems from the cost of checking and enforcing the facts relating to the mechanical condition of an automobile and the driving habits of its owner. There is no cheap and easy way to see that vehicles are inspected, that safety devices are operating, and that drivers operate their vehicles when and as often as they report they will. The greater the premium reductions offered, the more temptation there will be for policyholders to cheat.

(5) Tailoring insurance premiums to an individual driver motivates him to optimize safety. Unfortunately, the failure to tailor premiums correctly leads an individual away from optimizing safety. The extreme case occurs when premiums are uniform no matter what my driving habits or vehicle. Current rating systems are generally inadequate in this respect, perhaps due to the cost of data collection and verification. A simple proposal along these lines would be to put every driver on a self-insurance basis. If I know that I will eventually be responsible for all damage I cause, I will drive more carefully than if I know that my premium will have no relation to my experience. One unfortunate consequence of a self-insurance scheme would be the loss of the value of the insurance system as an information disseminator.

It is important to stress the adverse effects of failing to tailor insurance premiums to the driving habits and vehicle of each driver. With rates that do not change when I have an accident and with a vehicle where severe injury is unlikely, I should speed, run red lights, and generally behave in a way which will maximize accidents. Some of this behavior can be controlled by the procedure for licensing drivers and vehicles, and by traffic laws, but these will be a very imperfect substitute for an incentive insurance scheme.

2. *The Costs of Finding "Fault" and Awarding Proper Compensation*

(6) Probably the most important cost of the current fault system is that of determining who "caused" a particular accident. If the determination of fault is left to the courts, the system will be slow, somewhat arbitrary, and expensive. If determination is left to insurance companies, the cost will still be high and one might worry about injustices. Certainly, there are times when it would be better to neglect who caused an accident and simply allocate the cost of such accidents among a wide class of drivers. However, neglecting the cause of accidents has two detrimental

¹⁵ If premium schedules were to reflect most of the safety-related actions that are possible, the schedule would be complicated. In fact, one can imagine a schedule so complicated that an insured would never be able to figure out the premium reduction to be given for driving less, given his driving habits and vehicle. A complicated schedule would vitiate the information-dissemination function of the schedule. Vickrey has a number of proposals for billing a driver on the basis of the miles he drives, his speed, and where he drives. Vickrey, *Automobile Accidents, Tort Law, Externalities and Insurance: An Economist's Critique*, in this symposium, p. 464, 471-75.

effects. The first is that drivers will be ignorant of what to do to avoid accidents. In the absence of knowing that brake failure is an important cause of accidents, I will do little to make sure that my brakes do not fail. The second is that drivers will not be sufficiently motivated to avoid accidents. If full compensation is paid, I should purchase fewer than the optimal number of safety devices and should drive less carefully than would be optimal from a social viewpoint. I am motivated to satisfy other goals, such as enjoying the thrill of fast driving and getting to my destination more quickly. I would certainly not be led to optimize safety.

(7) Determining the "proper" compensation to be paid is difficult. Unfortunately, there are severe penalties for error. If compensation is too small, an injustice results. This sort of injustice is a pecuniary externality and not important to achieving optimal safety, however important it may be to our sense of justice. More importantly, insofar as compensation is systematically too low, insurance companies and car purchasers will adopt the wrong values in deciding how many safety devices to buy and how carefully to drive. Adopting these low values will lead to a less than optimal amount of safety. The other horn of this dilemma is the danger that compensation would be too large. Overcompensating the injured party leads to increased moral risk and deliberate accidents. If compensation were to reach the level where most people were satisfied, many people would be grossly overcompensated. People have different perceptions about pain and the value of their lives; in paying most people enough to compensate them for pain or loss, a large number of people would be attracted to invite injury in accidents—and the system would break down.

3. Imperfections in the Market for Auto Safety Devices

(8) Another sort of market imperfection stems from the conditions under which safety devices are manufactured. Individual choice is unlikely to lead to optimum safety when there are increasing returns to scale in the manufacture and installation of safety features. For example, many devices cost less to install while the vehicle is being built than after it is purchased. It would probably be cheaper to install collapsible steering columns on all cars during construction than on fifty per cent of the cars after they were built. For such devices, there are reasons for making the feature "standard equipment" and not subject to individual preferences.¹⁶

(9) There are a number of reasons why the individual might change his mind later on and decide he had purchased the wrong safety features. One reason for regretting his decision is that information on the efficacy of safety features is difficult to obtain; with new information, the buyer might regret purchasing or not pur-

¹⁶ A sufficiently imaginative manufacturer could find a means to offer the device voluntarily at little increase in cost. For example, there are at least two assembly lines for each model automobile; one line could install collapsible steering columns while the other did not. In this way, purchasers could be offered their choice and still not have the device be inordinately expensive.

chasing a particular feature. A second reason is that improving the safety of a vehicle increases its cost; if cash were tight at the time of purchase or if the purchaser had time myopia (not worrying about tomorrow until tomorrow), too few safety features would be purchased.

B. Safety as a Public Good

(10) A final problem is probably the most important reason why the market will fail to optimize safety. There is a strong public-good aspect to safety. Consider a collective vehicle, such as an airliner or a car with six occupants. A vehicle carrying a number of people has the property that safety and saved time are pure public goods for all passengers. An improvement for one passenger necessarily benefits all other passengers. The marginal cost of extending the benefit to an additional passenger is zero.

For example, what is the cost of delaying an airplane requesting permission to land? The value of time to each passenger might be expressed as a curve like that of Figure 1.¹⁷ To save ten minutes, this passenger would be willing to pay p^{10}_i per minute. To find the total (collective) demand curve for saved time, the price each passenger is willing to pay for saving t minutes ought to be summed. This aggregate demand curve, shown in Figure 2, is different from the conventional demand curve (which is obtained by summing the t for a given p).

Just as saved time is a public good in a collective vehicle, so is safety. To a first approximation, an increase in safety to one passenger implies an increase in safety to everyone. There is a notable difference between saved time and safety. The time of a trip is the sum of the times required for each part; the safety of a trip is the safety of the most dangerous part.¹⁸ The slow speed of one segment of a trip can be "made up" on other segments; danger on one part of a trip necessarily makes the whole trip dangerous. Passengers with quite different values of time can be accommodated on the same vehicle since they can speed their trip by speeding other segments of the trip, but the same is not true for people with quite different levels of preference for safety. An individual passenger can do much to tailor trip time

¹⁷ The curve for an individual could assume some unusual shapes. For example, someone with a connecting flight would have a value of time of zero up to the point where he missed his connecting flight, but at this point his value of time would be extremely high. If there is a large number of passengers, the aggregate curve should have the shape in Figure 2.

¹⁸ Let t_i be the time required for the i th segment of an n part trip. Then total trip time is $T = \sum_{i=1}^n t_i$. T might be reduced by reducing any of the t_i .

Let p_i be the probability that an accident will occur on the i th segment of the trip. Then the probability that no accident will occur on the trip (that it will be a safe trip) is $\prod_{i=1}^n (1 - p_i)$. While it is possible to improve trip safety by improving the safety of any segment, the safety of the trip can never be greater than the safety of the most dangerous segment.

to his own requirements, but he has no choice about the level of his safety in a given vehicle (although he may have a choice among vehicles) and no way of making his trip safer than the trips of the other passengers.

Since time and safety have public-good aspects in a collective or public vehicle, one would expect that the optimal level is higher than would be optimal for the median passenger. People below the median are not willing to pay less when safety or speed is improved, and those above the median are willing to pay more.

FIGURE 1
THE VALUE OF TIME SAVED TO AN INDIVIDUAL

FIGURE 2
THE VALUE OF TIME SAVED TO ALL PASSENGERS

This effect is more important for safety than it is for speed (since individuals can increase trip speed by their choice of access mode). A few people are willing to pay a great deal for improved safety, and everyone benefits.

As a contrast with a public vehicle, consider a car traveling on an interstate highway.¹⁹ The driver can choose his speed within a wide range (typically forty to seventy miles per hour). There are still some public-good aspects to speed since the driver is not completely free to choose his speed; the minimum and maximum limits are determined by the design of the highway and by traffic laws. The broader is the range of speeds open to a driver, the less will speed be a public good. The driver of a private vehicle can choose how safe he wishes his vehicle to be, how mechanically sound it is, and how carefully he wishes to drive. But safety, like speed, retains some public-good aspects. The basic safety of vehicles on the highway is governed by the safety of the highway design, traffic laws, and the driving of other vehicles. To the extent that these factors prevent a driver from tailoring the safety of his vehicle to his preferences, safety is a public good.

The safety of a (single passenger) private vehicle should be quite different from the safety of a (single passenger) public vehicle, such as a rental car or taxicab. The private vehicle should be made to the specifications of its owner; it will reflect his preferences for safety. A public vehicle is used by a vast number of people; it cannot reflect the preferences of each. Should the vehicle be designed for the safety conscious (those willing to spend much to achieve safety) or those who care little about safety? Since the inherent level of safety must be the same for all passengers, a single-passenger public vehicle is identical to a collective vehicle: safety is a pure public good. As in the collective vehicle, one would expect that the optimal level of safety is greater than would be optimal for the median driver.

In practice, it is difficult to find a single-passenger, private vehicle. One person generally decides on the features of a new vehicle; other occupants have little to say. To take an extreme example, suppose the buyer is a member of a car pool. He would not be motivated to consider the value of all future occupants of the car when he purchased it. After all, he has no financial obligation to his riders (unless his driving is negligent).²⁰ From the viewpoint of society, his car ought to be really safe since it sometimes carries six adult males, who as breadwinners are members of that

¹⁹ Although most automobiles are not private vehicles, this one is assumed to carry only its driver, and to be built and maintained in accordance with his preferences.

²⁰ Actually, the riders might collect damages if either the driving or equipment is deficient. However, courts have not looked at the potential safety of a vehicle. For example, the accident might have been prevented by better windshield wipers, but as long as the existing wipers were working, there would be no deficiency in equipment.

One might argue that the family car is not a good approximation of a private vehicle in that the purchaser does not consider everyone's preferences. Even a "man who loves his family" probably provides them too little protection from an economic standpoint. Suppose a man has a working wife and three sons. The value of his family (including him) is on the order of \$300,000. With such a valuable family, he ought to purchase an extremely safe automobile and a great many safety features. Before the government started setting safety requirements, few people bought cars as safe as this.

group in society whose economic value is the greatest. This undervaluation of safety features could be severe.

The public-good nature of time and speed in public or collective vehicles has a number of testable implications. One would expect that the level of safety in such vehicles would be greater than the level of safety in the average comparable private vehicle. Buses should travel faster than the average automobile and be safer; commercial planes should be faster and safer than private planes. It was argued that passengers have the ability to modify total trip time by speeding up other segments of the trip; they have little ability to modify trip safety. This ability to tailor trip speed to their preferences means that one would expect less contrast between the speeds of public and private vehicles than between the safety of private and public vehicles. All three of these propositions are borne out by recent travel statistics.²¹

IV

THE ROLE OF GOVERNMENT

In previous sections, the specialized roles of liability laws and insurance have been explored. Insurance is an institution to facilitate the bargaining process. Liability laws reallocate the cost of an accident among the parties. If these two forces were to work optimally, the only role that would remain for government would be to correct any undesirable income redistribution caused by the bargaining. If these two forces were not working well, government might (1) find ways of assisting their operation, (2) modify existing institutions or create new ones to facilitate bargaining, or (3) settle some aspects by fiat entirely outside the bargaining process.

There are five areas where government's role is presumptively that of enforcing safety by fiat; government has traditionally been charged with setting up rules in these areas. Although government may elect to leave the primary task of regulation to the market place, this decision must be explicit in these five areas: (a) The first area is the maintenance of a working system of liability laws and the associated

²¹ The death rate per 100,000,000 passenger miles for various modes is shown in the following table. U.S. DEPARTMENT OF COMMERCE, STATISTICAL ABSTRACT OF THE U.S. 552-602 (1967). Cf. Table 1 in Fromm, *supra* note 4, at 594.

	<i>Rail</i>	<i>Bus</i>	<i>Scheduled Air</i>	<i>Auto</i>	<i>General Aviation</i>
1956-60	.17	.10	.55	2.4	
1961-63	.10	.14	.27	2.2	14.0
1964-66	.09	.13	.20	2.4	13.0

It is difficult to get a death rate for general aviation; however, the death rate in the table is calculated for all nonregulated, nonmilitary traffic. Thus, buses were over 13 times as safe as automobiles; all public vehicles (buses, trains, and planes) were more than 14 times as safe as private automobiles. Even more impressive is the fact that scheduled aviation is almost 100 times as safe as general aviation. Department of Commerce figures for speeds show that buses are slightly faster than automobiles on intercity runs and that the average speed of scheduled domestic aviation is about three times as fast as the average speed of general aviation. Thus, the predictions in the paper are borne out: public vehicles are both safer and faster than comparable private vehicles, but they have a greater edge in safety than in speed.

judicial system. (b) A second area is the licensing of insurance companies. The other three areas have to do with (c) licensing vehicles, (d) licensing operators, and (e) making and enforcing traffic laws. There are also areas where government may elect to play a role so as to facilitate the bargaining process. These areas include (f) collecting information on accidents and analyzing it to determine the marginal contribution of each factor which might cause or aggravate an accident, (g) disseminating this information to operators, and (h) informing passengers about the safety of various transportation modes and operators. In each of these eight areas, government must decide whether to play an active or passive role. If an active role is chosen, the activity can take the form of facilitating market adjustment directly, structuring institutions to facilitate it, or settling the matter by fiat.

There is no necessity for fiat; even the first five areas can be handled by market action. For example, competition among insurance companies will compel each to tailor its premiums to the insured's vehicle and driving habits. In the absence of any licensing or regulation, a competitive market will eliminate insurance companies that are inefficient or that fail to tailor their premiums; competition compels many of the welfare-maximizing aspects of the insurance system. Similarly, the market will "prevent" individuals from operating unsafe vehicles or driving in a dangerous fashion. With compulsory insurance, a bad driver would find that his insurance premiums were prohibitively high; the market would thus be "preventing" him from driving. The insurance premium for a mechanically defective vehicle would also be prohibitively high. The same effect is achieved without compulsory insurance, although the adjustment process is more difficult. People are motivated to bribe someone to drive well or to drive a safe vehicle. The principal difference between the system with compulsory insurance and that in which bribes are necessary is that enforcement becomes more difficult. It is difficult to know whom to bribe, since individuals are motivated to appear to be bad drivers so that they can receive a subsidy. A further difference is that the income distribution is quite different under the two systems: With compulsory insurance, good drivers benefit; when bad drivers have to be bribed, they benefit at the expense of the good drivers.

Just as the market can optimize insurance, driving habits, and the condition and equipment of vehicles, it can even optimize the liability system and traffic rules. Individuals are motivated to offer bribes to whoever can most cheaply avert accident damage to them. If one had extreme confidence in the market, one would abolish all traffic laws in the expectation that individual action would lead to a more efficient solution than any set of traffic laws. Few people have sufficient confidence in the market to go this far.

The main reason why bargaining is not entirely successful in optimizing safety has to do with transaction costs and ignorance. These factors seem to be of particular importance with respect to the first five governmental roles outlined above. In addition, for these areas, there are difficulties associated with enforcing agreements

and correctly identifying those who should be bribed. One might justify government fiat in these areas as the most effective, and possibly the only, way in practice to optimize safety. Similarly, fiat is a way of controlling perverse individuals. An individual with preferences that lead him to cause accidents might not react to bribes; it might be easier to identify him and deny him the right to drive.

There are many reasons to prefer helping the market reach a solution over turning to fiat or regulation. A principal argument centers around the conviction that government should not unnecessarily restrict the freedom of the individual. If I were to choose to drive a less safe car, even after it was demonstrated to me that I could expect to save money by driving a safer one, I would feel the state was denying my rights if it refused to allow me freedom of choice. This issue becomes acute if this regulation denies me the right to own a car because I cannot afford the cost of making my vehicle safe (but if this cost were offset by decreased insurance premiums, my case would be weakened). Note that in deciding how much freedom of choice the individual should have, one would want to distinguish vehicles which were unsafe because of inadequate "first collision" devices from those which are unsafe because of inadequate "second collision" devices. First collision devices are safety features designed to avert accidents; second collision devices are safety features designed to mitigate injury in case of accident. The car with inadequate first collision devices is likely to cause accidents and is like a man carrying around a container of an easily activated explosive; he is likely to kill other people along with himself. The car with inadequate second collision devices is dangerous to its driver in case it should be involved in an accident; however, by the nature of most second collision devices, the increased danger is confined to the driver. This situation is analogous to the heart patient who decides to shovel snow; however foolish the act, we should probably restrict our actions to warning him of the danger, rather than prohibiting the act by law.²²

A second argument against government's direct regulatory involvement is that minimum safety standards are necessarily inefficient. The optimal level of safety for my acts depends on my income and preferences; I might be willing and able to pay a great deal to increase my safety, or I might choose to pay little. Any meaningful standard will involve too high a level of safety for some people; these people will have to spend more than they desire for safety. At the same time, the standard will be too low for the preferences of others. While this latter group can supplement their safety, the former group is required to spend more than it wishes on safety; it has necessarily lost by the safety standard.

A third argument has to do with the adverse consequences of forming a bureaucracy. Regulations evolve slowly, even when the relevant conditions are changing

²² This statement is not quite correct. Even if the damages were confined to the driver, others would lose if he were injured or killed. Even more important, automobiles are not single passenger vehicles; they generally carry other passengers who would be injured in the event of an accident.

rapidly. Bureaucracies develop a vested interest in surviving and in expanding their role; they sometimes begin to serve interests other than the ones they were designed to serve. Finally, a regulatory agency, being a much more personal force than the market place, can be influenced or attacked politically so as to deviate from its assigned role. For example, regulators would be certain to anticipate the vigor of public reaction to any program which purported to value human life so as to calculate which safety-related acts were beneficial and which too costly.

Nonetheless, there will be times when regulation and fiat are the most effective ways to handle a problem. The question is one of degree rather than principle. Various market imperfections were discussed in the previous section. These are sufficient to preclude market optimization of safety in many areas unless bargaining and bribes are extraordinarily successful. When a safety-related act is extremely beneficial, costs little, and offers a large part of its benefit to someone other than the actor, one might feel justified in employing fiat to require it. For example, consider a safety device which is highly efficacious, which tends to prevent injury to bystanders, where there are high savings from mandatory rather than discretionary installation, and where the device is unnoticeable until it prevents an accident. Few people would object to making such a device mandatory. Since there are considerable imperfections associated with some aspects of transportation safety, one can make a case for requiring certain devices. Government should have the role of requiring devices that have important externalities—for example, such first collision devices as better braking systems. Other required devices might include ones which are inexpensive, effective, show extensive savings in being required rather than voluntary, and do not depend upon individual initiative to be made effective.

V

SOME CURRENT GOVERNMENT PROGRAMS

A number of government agencies are currently engaged in looking at safety information and setting safety standards for transportation. The FAA sets requirements for air safety, the ICC sets requirements for interstate ground transportation, the Maritime Commission looks after ocean-going vessels, and the National Highway Safety Bureau has recently been created to look after automobiles; the Bureau of Public Roads sets the specifications for federal highways, and thus sets their safety standards. State and local governments license vehicles and drivers, construct highways, license insurance companies, and maintain and enforce traffic and liability laws.

While the problems of transportation safety are different for each mode, there are some common elements. Each agency must decide the extent to which it will help to perfect the market or, when it is too expensive to make the market work, to regulate it so as to optimize safety. As emphasized in the previous section, the

choice between perfecting the market and regulating it is a matter of efficiency, not of principle. Safety could be optimized entirely by fiat, with no role for individual choice. Alternatively, optimization could come entirely from individual choice, if the individual were provided with the proper information and the environment were structured so as to have the individual face the full social costs of his actions.

The first task of a regulatory agency is to collect information on the consequences of safety-related acts. With this information, the agency can make a first judgment as to whether safety is currently being optimized; it can do a benefit-cost analysis for each safety-related action. If important discrepancies are found, the agency must ask whether it is more efficient to provide the information to the individual or firm or, if this is very costly, to make the decision itself. While it might seem that it is always more efficient to make the decision itself, one should remember that seemingly arbitrary rules are difficult to enforce and, if optimization requires different action depending on individuals' differing income and preferences, may necessarily be inefficient. Which, if any, actions should be required or prohibited depends on the particular circumstances.

Most agencies are concerned with safety in public, collective vehicles—that is, ships, planes, trains. While the individual may select his level of safety by selecting the mode and particular vehicle, once he is on board he no longer has a choice as to his particular level of safety; safety is a public good for all passengers. For such a vehicle, the level of safety should be greater than that which is optimal for the median passenger. A glance at transportation safety statistics is sufficient to show that public vehicles are many times as safe as comparable private vehicles.²³ Since the fatality rate for trains, planes, and buses is about one-fourteenth the rate for automobiles, public vehicles are quite safe. If anything, one would have to see whether the FAA and ICC are not causing too much to be spent on safety. It might be that the FAA is acting as if the value of saving a life were half a million dollars, instead of the \$100,000 to \$200,000 to be derived from a strict economic calculation based on the income of air passengers.²⁴

Another reason for investigating these regulations more carefully is that the fatality rate per passenger mile is remarkably similar across the regulated modes. This similarity leads one to be suspect that safety regulation takes the form of matching the accident rate of other modes, rather than performing a benefit-cost analysis for safety related acts. The cost of achieving a given safety level is quite different across modes; furthermore, the economic value of the average passenger differs among modes. Thus, one would expect to find quite different accident rates.

There are important consequences from the fact that the economic value of the average passenger differs markedly among modes. The average passenger on a plane is worth a good deal more than his rail counterpart, who in turn is worth

²³ See note 21 *supra*.

²⁴ See Fromm, *supra* note 4.

more than his bus counterpart. If these passengers were allowed to select the level of safety, it seems certain that air passengers would be willing to spend a good deal more than rail passengers or bus passengers to achieve a given level of safety. Thus, the FAA should be using a higher figure for the value of life, one which is two to three times higher, than that used by the ICC; other things being equal, one should expect to find that planes are safer than trains, which in turn are safer than buses. It is interesting to speculate on the public reaction to making such a calculation explicit.

Congress reacted to publicity that automobiles were unsafe by passing the National Traffic and Motor Vehicle Safety Act of 1966.²⁵ The regulatory agency created, the National Highway Safety Bureau, has been engaged both in perfecting the market, by collecting accident information, and in fiat, by setting safety standards for automobiles. Setting safety standards is replete with problems, as illustrated by such devices as improved windshield wipers and seat belts.²⁶ Better windshield wipers would prevent accidents by improving the vision of the driver. However, it is nearly impossible to determine how many accidents would be prevented by this device. While the cost of this device can be determined easily, there is no way of estimating the benefit. Since this device is designed to prevent accidents, a major portion of its benefit accrues to bystanders and thus represents an externality. Thus, if the benefits were known to exceed cost, this device should be required.

Seat belts can be put into a benefit-cost framework easily. It is easy to calculate the cost of putting belts in all cars and easy to calculate the amount of injury prevention that would result if all people wore seat belts. The problem is that someone must take the trouble to put on a seat belt before it can be effective. Another argument is that seat belts can be installed almost as cheaply after the car is purchased. Finally, the seat belt benefits only the wearer (since only the wearer will have his injury lessened.) While some people would rather have an expert (government agency) make the decision on whether to buy seat belts, it is difficult to argue that they ought to be mandatory for everyone.

These points illustrate the argument that benefit-cost analysis is not likely to solve all problems in the safety area. A complete benefit-cost analysis must include analysis of individual preferences, of the number of individuals who will take the trouble to activate a device (such as a seat belt), and of a number of secondary effects.²⁷

In addition to its role in regulating the safety equipment on automobiles, government can exercise its power to license. All states require a showing of driver competence as a prerequisite to licensing, and state motor vehicle inspection

²⁵ 80 Stat. 718.

²⁶ For a benefit-cost study of certain auto safety devices, see Lave & Weber, A Benefit-Cost Analysis of Auto Safety Features (mimeo. 1968).

²⁷ The difficulties in performing a benefit-cost analysis of auto safety features are described in *id.*

programs are now required by the Federal Highway Safety Act of 1966.²⁸ Strict licensing requirements for drivers and vehicles are not automatically desirable; they represent a solution by fiat rather than by disseminating information and attempting to motivate more nearly optimal behavior. In attempting to optimize safety by fiat, care must be taken to subject each regulation to an analysis of the probable benefits and costs it represents. While it is difficult to capture all of the benefits and costs in the analysis, nonetheless such a calculation can prove helpful in deciding that many regulations are obviously good or obviously bad.

The costs and benefits of motor vehicle inspections are difficult to measure. It is inherently difficult to collect the sort of data required to calculate the benefit; since inspections serve to reduce the number of accidents or extent of injury caused by mechanical defects, data must be obtained on which accidents are due to such defects. Alternatively, one might compare the accident statistics in states which have different inspection requirements and attempt to isolate this affect. Neither line of attack has been satisfactory in measuring the benefit of inspection. However, preliminary evidence suggests that accident reduction through inspection is not of great significance.²⁹ The cost of vehicle inspection is easier to measure. In states where the program is under close state supervision, the costs of building and staffing inspection stations are high. Where private individuals are licensed to inspect vehicles for a fee, the cost includes this fee as well as the potential for corruption and inefficiency. Any inspection system imposes costs on the individual in the form of the time and trouble needed for inspection; an additional cost is the increased cost of repairs discovered by the inspection procedure. Although it is difficult to quantify the costs and benefits of vehicle inspection, one analyst has concluded that this program is not justified and that safety could be purchased more cheaply in other ways.³⁰

The discussion of the role of government has implications for the type of inspection, given that vehicle inspection is to be compulsory. Inspections should cover devices which prevent accidents; they might include inspection of injury-preventing devices, if the additional cost is small. However, the role of inspection should not be extended to requiring that injury-preventing, second-collision devices be operable; these devices tend to benefit only the user. If the user is informed that a device is not working (and what it will cost to fix it), he can decide whether he would be better off by having it fixed.³¹

²⁸ 80 Stat. 731.

²⁹ See ARTHUR D. LITTLE, INC., *THE STATE OF THE ART IN TRAFFIC SAFETY* 274-85 (1966).

³⁰ See J. Little, *Highway Safety Programs and the Public Trust* (mimeo, 1967).

³¹ One other way to optimize safety involves making use of government purchasing power. The General Services Administration is the largest single purchaser of automobiles in the world. It is likely that any GSA requirements will become standard for all automobiles. Another way to optimize safety involves government testing of new devices. For example, if it appears worthwhile to adopt an improved windshield wiper, the government might have these installed on half the new cars purchased. This kind of testing would provide excellent information of the effectiveness of safety devices.

VI

SUMMARY AND CONCLUSION

While liability laws and insurance have well defined roles in optimizing transportation safety, government is something of a residual claimant. Depending on the particular circumstances, government might be called upon to do nothing or to settle everything by fiat. Given the disadvantages of fiat, the governmental role outlined in this paper is minimal: whenever there are important deviations from optimal safety, government should find a way of correcting the situation. The solutions open to government take three basic forms: help perfect the market directly, create institutions to perfect the market, or correct the deviation by fiat. The first form should be stressed: government can help the adjustment of the market by collecting information on the efficacy of safety-related acts, by standardizing claim procedures, and by improving the workings of liability laws and adjudication procedures. Alternatively, government might create or strengthen a national safety council or national insurance council to collect relevant information, standardize claim procedures, and make recommendations on the ways to improve the liability system. Finally, if it is determined that it is taking the market too long to adjust or that market imperfections make optimization hopeless, safety standards can be written into law or promulgated by a regulatory agency.

If a single culprit had to be chosen for the current imperfections in transportation safety, it would be the liability system relating to transportation accidents. As noted above, the function of the liability system is to define the cost of an accident and reallocate this cost among the parties involved, as well as others. The current liability system has no consistent rule for determining the cost of property damage, much less the compensation due a victim for his suffering. As noted by Calabresi,³² some individuals are grossly overcompensated while most receive little or no compensation. At the same time, the allocation of the cost of the accident is also largely arbitrary because of the perverseness of some legal rules (contributory negligence, "last clear chance," etc.) and the uncertainties and emotionalism. An accident victim can have little confidence that he will be awarded a judgment if he should pursue litigation. Finally, the courts take such a long time to settle any litigation that all parties will have had to make financial adjustments long before the nature of the award is apparent. The effect of this uncertainty and delay is to prevent individuals and their insurance companies from estimating the costs of safety-related acts.³³ Analysts such as Calabresi and Keeton and O'Connell³⁴ have concluded that safety

³² Calabresi, *supra* note 10, at 450-52.

³³ To be more precise, there is a large error associated with the estimated cost of a safety-related action. Uncertainty stems from the lack of information on the effects of the action, from uncertainty about who will be found at fault, and from uncertainty about the size of the award.

³⁴ See Calabresi, *supra* note 10, and R. KEETON & J. O'CONNELL, *BASIC PROTECTION FOR THE TRAFFIC VICTIM* (1965).

would be more nearly optimized without the current liability system. The detrimental effects of the current liability system can hardly be overstated. In preventing individuals and their insurance companies from estimating the consequences of safety-related acts, incentives toward optimizing safety are vitiated. Furthermore, it is nearly impossible for a government agency to determine which safety devices to require; accident data are cloudy or perverse, and there is always the possibility that the liability system will stimulate perverse behavior from a good device.