Passive Restraints: An Economist's View

GLENN C. BLOMQUIST *and* SAM PELTZMAN

FOR OVER two centuries economists have explored the implications and truth of Adam Smith's assertion that the economy operates as if an invisible hand guides individual actions for the betterment of all society. By now we have defined the conditions under which Smith's principle holds and the criteria under which society is better off. If perfect competition and a set of equilibrium prices exist, if each individual acts to maximize his own well-being, and if each firm acts to maximize its own profit, then resources will be allocated efficiently. These efficiency conditions are socially desirable because under them no reallocation of goods among consumers, no reallocation of resources or productivity among firms, or no change in goods produced can make any member of society better off without making someone else worse off. The conditions under which Smith's principle generally does not hold include the presence of (1) buyers or sellers with market power and (2) externalities in production or consumption broadly defined to include public goods.[1] Put simply, the market works well as long as the signals to individuals are undistorted, but it fails to yield satisfactory results whenever individual benefits or costs do not equal social benefits or costs, that is, there is an externality. It is these divergences of private value from social value (together

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1. A more complete treatment of the relationship between social welfare and the market economy can be found in most price theory texts; for example, Walter Nicholson, *Microeconomic Theory: Basic Principles and Extensions* (Dryden Press, 1978).

with unacceptable distributions of income) that create a demand for intervention in market operations. This demand is in the public interest because policy designed to correct market failure can improve social welfare. Assuming that such a social demand for a government policy on highway safety even exists, it might be helpful to review the motivation for such policy in terms of a simple model of driver behavior.

Social Welfare and Individual Behavior

Elsewhere Blomquist[2] uses a model of lifesaving activity to analyze lap belt use. Essentially the model says that drivers have a demand for and face a supply of highway safety, and that the optimal (to the driver) amount of highway safety is determined in this implicit market. The demand emanates from the value of an increase in the probability of living and from changes in, first, the probabilities of nonfatal injury and property damage and, second, possibly a sense of security. The supply depends on costs of equipment, time, energy, and discomfort. The driver desires more highway safety as long as the additional value of safety is greater than the additional resources spent to get the safety.

However, the amount of safety chosen by the individual will be insufficient if benefits exist that he fails to take into account. Such benefits increase the social demand for driver safety and the socially optimal amount of safety. For example, a drunken driver would value driving sober and safely, but still might lose control and injure himself and others. To the extent that the drunken driver does not fully compensate others for the damage they suffer, the social benefits of a sober driver are greater than the benefits to him alone.[3] The external benefits not considered by the drunken driver cause the problem of insufficient safety. To solve the externality problem Pigou and other economists recommend placing a tax on activities with social costs greater than individual costs and instituting a subsidy for activities with social benefits greater than individual benefits.[4] One can imagine a schedule of income tax credits avail-

2. Glenn Blomquist, "Value of Life Saving: Implications of Consumption Activity," *Journal of Political Economy*, vol. 87 (June 1979), pp. 540–58.

3. Surprisingly little attention has been given to identifying and measuring highway safety externalities. Those dealt with by Faigin are discussed later in the text. See Barbara Moyer Faigin, *1975 Societal Costs of Motor Vehicle Accidents* (National Highway Traffic Safety Administration, 1976).

4. A. C. Pigou, *The Economics of Welfare* (London: Macmillan, 1946).

able to drivers who avoid certain types of accidents each year. Other solutions involve developing a better compensation mechanism, perhaps through clearer establishment of liability, so that benefits and costs perceived by individuals more fully reflect social values. However, it is not at all clear that a substantial externality problem now exists, and it is even less clear that tax incentives or mandatory vehicle design standards are appropriate responses.

Financial Incentives versus Standards

Two points are often forgotten in discussions of highway safety.

First, there is a private market for safety and, where costs and benefits are fully borne by the driver, there is no clear case for government intervention, whether through taxes, subsidies, *or* regulation of vehicle design.

Second, if there is a case for intervention it would rest on costs imposed by the driver on others that the driver would not bear. (Our drunken driver, for example, would bear at least some of the costs his actions imposed on others, through legal sanctions, increased insurance premiums, or other penalties.)

Current safety regulation appears to ignore the first point by assuming implicitly that design changes must be required by law to bring about significant improvements. As we argue later, this will typically lead to overestimates of the net effectiveness of the regulation. Regulatory practice ignores the second point by focusing its major effort on protecting the driver rather than his victim. That is, we are discussing, for example, an air bag that explodes inward from the steering column and dashboard when perhaps we ought to be discussing one that explodes outward from the front fender. As we also argue later, this sort of displaced concern will exacerbate rather than alleviate whatever externality problem exists. We also point out that—should it even be contemplated—an outward-exploding air bag would probably be a less efficient response to the externality problem than appropriately designed financial incentives.

If the incentive and standard were designed to yield the same level of safety, the standard would require more resources unless it imposed the cheapest solution for each driver in all circumstances. The financial incentive is more efficient because it leads drivers to produce safety as cheaply as possible. The money and time saved can then be used for important nonsafety goods and services. The incentive encourages and permits

drivers to use various types of equipment and different combinations of effort (while driving) and equipment, depending on which benefits and costs apply to each driver's situation. Another advantage is that a smaller cost is imposed on low-income drivers with an incentive scheme than with regulation, and the dollar cost is even smaller, since time and effort can be substituted for equipment in producing safety.

Why, then, has highway safety policy in the United States taken the form of standards, such as that for mandatory passive restraint systems, rather than an incentive system that is flexible and more efficient? It is questionable even why there is any government effort at all, since market failures are costly to correct—that is, the government effort is not free.[5] Only some market failures call for a response by government—those failures in which the externality cost is great enough to pay for the cost of a government response. In the case of automobile safety, so much of the relevant benefits and costs are already internalized by the government through liability laws and by the market through insurance that it cannot merely be *presumed* that the remaining externality problem is large enough to merit intervention.

Of course, it is naive to think that social welfare (the economist's concept of public interest) considerations determine or even greatly influence the direction of regulation.[6] Nevertheless, until an alternative rationale for regulation is established, we have, as economists, little choice but to analyze regulation on its own presumptive terms—as a program that, in some sense, tries to yield social benefits greater than its costs.

The Effectiveness and Social Benefits of Mandatory Passive Restraints

Cost-benefit analysis is applied welfare analysis by which social benefits and social costs of a proposed policy can be evaluated to determine whether or not it increases social welfare by increasing allocative effi-

5. Weidenbaum and DeFina estimate that in 1976 the administrative costs alone of the Department of Transportation for safety regulation were $183 million. See Murray L. Weidenbaum and Robert DeFina, *The Cost of Federal Regulation of Economic Activity* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1978), p. 4.

6. Stigler and Peltzman suggest factors other than social welfare that influence regulatory decisions. See George J. Stigler, "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science,* vol. 2 (Spring 1971), pp. 3–21; and Sam Peltzman, "Toward a More General Theory of Regulation," *Journal of Law and Economics,* vol. 19 (August 1976), pp. 211–48.

ciency.[7] Careful analysis can identify traffic safety externalities and indicate whether or not mandatory passive restraints are socially desirable—that is, whether they would increase social welfare more than any alternative policy such as mandatory safety belt use, accident taxes, safe driving subsidies, and so forth.

An integral part of estimating benefits is determining the reduction in fatalities, nonfatal injuries, and property damage to all highway users that will result from the safety regulation. Huelke and O'Day analyze both accident data for occupant restraints and the evidence from various studies of accident data. They estimate that occupant fatalities are reduced with the use of lap-shoulder belts by 31 to 77 percent, with passive belts by 28 percent, with air bags by 18 to 25 percent, and with air bags and lap belts by 29 to 34 percent.[8] The estimated reductions for serious injuries are also considerable. We question neither the care with which the studies were executed nor the objectivity of the investigators. However, the methodology will overestimate the effectiveness of the safety equipment in actual experience—which Huelke and O'Day suspect but fail to pursue.[9]

We can offer three reasons for this overestimation. One we have already alluded to: individuals will voluntarily purchase some safety without being required or induced to do so. This safety can take a myriad of forms, including the way a vehicle is driven as well as its particular design features. The typical approach of safety engineers ignores this private demand. Consequently their approach ignores the possibility that a car equipped with an air bag, for example, might have been built to be safer even if an air bag were not required. The second reason is closely related: since safety is the outcome of a choice, the regulation can affect the choices made. In particular, if drivers would prefer safety in another form but are forced to buy air bags, they will not buy as much of the other form of safety. This substitution of more mandated safety for less

7. Several papers on benefit-cost analysis of highway safety policy are in National Highway Traffic Safety Administration, *Proceedings of the Fourth International Congress on Automotive Safety* (Government Printing Office, 1975). Useful benefit-cost analysis would consider all relevant benefits and costs (including implicit costs) and quantify them to the extent possible. Such an analysis would focus on traffic safety externalities and thus avoid bias either for or against an active government role.

8. See the paper by Huelke and O'Day in this volume. Secretary of Transportation Coleman and National Highway Traffic Safety Administration estimates of effectiveness are higher. See "The Secretary's Decision Concerning Motor Vehicle Occupant Crash Protection" (Department of Transportation, 1976), p. A-8.

9. See the paper by Huelke and O'Day in this volume.

nonmandated safety will offset some of the benefits promised by regulation. The third reason is similar: if drivers use less care in driving as a result of mandated safety, then an increase in deaths and injuries to other roadway users will result. The increased injuries to bicyclists, motorcyclists, and pedestrians will partly offset the reduced injuries to drivers.

Voluntary Use of Safety Belts

We can illustrate the force of these points in several ways. One that is most relevant here concerns the most direct competitors of the air bag: lap-shoulder belts and the newer passive belts. To estimate the benefits of the mandatory passive restraints standard the safety obtained with the standard must be compared to the safety obtained without the standard. The difference in safety will depend on the use of lap-shoulder belts without the standard, the use of passive belts without the standard, the use of lap belts and air bags with the standard, and the effectiveness of safety equipment in crashes (as estimated by Huelke and O'Day).

Drivers do use safety belts. Marzoni found the following concerning the use of safety belts in 1970 and 1971 for cars of all model years: 17 percent of drivers "always" used lap belts for short trips, 39 percent used them for longer trips, and 44 percent used them for cross-country trips.[10] Use was confined almost totally to lap belts. For a national sample of drivers surveyed in 1972 by the University of Michigan, Blomquist reports that the use of belts by those who had them was 23 percent.[11] According to the National Highway Traffic Safety Administration, with the installation in 1973 model automobiles of the more convenient and comfortable second-generation belt systems, lap belt and lap-shoulder belt use increased to 30 percent and 6 percent, respectively, making combined belt use 36 percent.[12] Use in 1974 and 1975 model cars was greater yet—5 percent for lap belts and 40 percent for lap-shoulder belts—although this usage was not totally voluntary because of the ignition interlock device. Three recent studies show lower usage: Stowell and

10. P. Marzoni, Jr., *Motivating Factors in the Use of Restraint Systems*, prepared for the National Highway Traffic Safety Administration (New York: National Analysts, Inc., 1971), p. 14.

11. Glenn Blomquist, "Economics of Safety and Seat Belt Use," *Journal of Safety Research*, vol. 9 (December 1977), p. 182.

12. Data are for automobiles involved in tow-away accidents. See U.S. Department of Transportation, National Highway Traffic Safety Administration, *Fact Book: Statistical Information on Highway Safety* (NHTSA, 1977), p. I.5.2.1.

Bryant found that only 18.5 percent of drivers of 1964–77 cars use safety belts, Opinion Research Corporation found that 14 percent of drivers of 1964–78 cars use safety belts, and the National Highway Traffic Safety Administration found that 8 percent of occupants (not just drivers) involved in tow-away crashes use safety belts.[13] The apparent decline in safety belt use may be a result of the study design and lack of comparability to earlier studies rather than of driver behavior.

Given the importance of speed as a major contributing factor to traffic deaths, we expect that safety devices will be used more in circumstances permitting high speeds such as rural interstate travel. If a safety externality exists it is more likely to cause problems as a result of high-speed driving. But in at least one study, "the intended emphasis of the sampling plan was upon urban driving."[14] In this study Stowell and Bryant did find, even for urban driving, that safety belt use is 20 percent on freeways and 27 percent on the West Coast, where one expects higher average speeds.[15] The results of a study by Hart based on a random national survey found the following on reported safety belt use: 16 percent use safety belts almost all the time, 25 percent use belts most of the time or almost all the time, 43 percent use belts sometimes or most of the time, and 56 percent rarely or never use safety belts.[16] The usage trend is unclear because of the lack of comparability of studies on safety belt use over time.

Based on our research, in the absence of mandated safety we would expect the use of safety belts to increase. In an earlier work Blomquist analyzed lap belt use in 1972 to determine the relative importance of various factors affecting use.[17] One factor is the time cost of finding, fastening, adjusting, and unfastening the lap belts, which was reflected by the negative effect of drivers' value of time on belt use. If the second-generation belts reduced time costs by 20 percent, for example, then

13. See Carol Stowell and Joseph Bryant, *Safety Belt Usage: Survey of the Traffic Population,* prepared for the National Highway Traffic Safety Administration (NHTSA, 1978), p. 4, available from the National Technical Information Service, Springfield, Va.; Opinion Research Corporation, *Safety Belt Usage: Survey of Cars in the Traffic Safety Administration* (Princeton, N.J.: Opinion Research Corp., 1978), p. 1; U.S. General Accounting Office, *Passive Restraints for Automobile Occupants: A Closer Look,* Report to the Congress by the Comptroller General of the United States (GAO, 1979), p. 1.

14. Stowell and Bryant, *Safety Belt Usage,* p. 29.

15. Ibid., pp. 26, 29.

16. Peter D. Hart, *Public Attitudes toward Passive Restraint Systems,* prepared for the National Highway Traffic Safety Administration (NHTSA, 1978), p. 15.

17. Blomquist, "Economics of Safety and Seat Belt Use," pp. 179–89.

drivers would increase belt use from 23 percent to 30 percent. A second factor is growth of labor earnings, which further increases belt use. If earnings increase 5 percent, belt use will increase from 30 to 32 percent. A third factor is the degree of discomfort associated with belt use. Blomquist estimated that the annual discomfort costs associated with lap belt use are much larger than time costs ($45.38 as compared to $6.23).[18] If perceived comfort increases 5 percent, belt use would increase to 50 percent. Since the second-generation belts are more comfortable as well as more convenient, belt use—especially of lap-shoulder belts, which will eventually be used by most belt users—will increase. To predict a safety belt use rate for 1982, when passive restraints become mandatory, we must expect that voluntary use would increase with growth in earnings and the development of more convenient and comfortable belt systems. A lap-shoulder belt use rate of 40 or 50 percent is plausible, particularly during driving where risk of death or serious injury is greatest.

However, the development of third-generation safety belts—passive belt systems—indicates that even 50 percent voluntary belt use is probably an underestimation. Passive belts are and will be a good buy for drivers. The cost of passive belts is approximately $27 in 1978 dollars, according to the General Accounting Office.[19] Adjusting the annual time cost of using belts estimated by Blomquist for the difference between the average wage of the drivers sampled in 1972 to the average industrial wage in 1978, we get a time cost of $7.41. This means that, with a 10 percent discount rate, passive belts pay for themselves in potential time costs saved in less than five years for the average driver (who does not use belts) of a car with first-generation belts. Even for drivers of cars with second-generation belt systems, the passive belts pay for themselves in less than six years if time costs are reduced by 20 percent to allow for the difference between first-generation and second-generation belt systems. If the passive belts of 1982 and the future are more comfortable than second-generation belts, the passive belts will be an even better buy than the second-generation belts. A future combined safety belt use rate of 70 percent seems plausible, especially in light of the 78 percent current usage rate in Volkswagen Rabbits.[20]

The crucial point is that the increase in safety provided by the market

18. Blomquist, "Value of Life Saving," p. 552.

19. General Accounting Office, *Passive Restraints for Automobile Occupants*, p. iv.

20. As reported in Stowell and Bryant, *Safety Belt Usage*, p. 21, the safety belt use rate in Volkswagen Rabbits with passive belt systems was 77.7 percent.

reduces the marginal effect of the mandated passive restraints, specifically, the benefits. The benefits of the mandated restraints might even be negative if the projected 70 percent use of passive belts were compared to installation of air bags if only 5 percent of drivers used lap belts (as drivers substituted mandatory equipment for voluntary safety activity), since Huelke and O'Day show that passive belts are more effective in crashes than air bags alone.[21] Estimates of benefits based on crash effectiveness of mandated equipment exaggerate the benefits that will actually be experienced.

Driver Choice and Highway Death Rates

The impact of driver choice can be viewed from a broader perspective. In 1972, as it was launching the latest round of mandatory design changes, the National Highway Traffic Safety Administration announced in its annual report the goal it then expected to achieve: a highway death rate by 1980 of thirty-six deaths for every billion vehicle miles traveled, or about 20 percent below the then prevailing level.[22] Peltzman analyzed driver behavior in the period before the National Highway Traffic Safety Administration was created, when safety outcomes were the result of choices not constrained by vehicle design regulation. Peltzman concluded that the continued working through of an unregulated choice process would in fact result in even fewer fatalities—thirty-three for every billion vehicle miles by 1980.[23] In fact, the latter figure was reached by 1977, and the reason appears to reflect another sort of driver choice having nothing to do with vehicle design regulation. Neither the National Highway Traffic Safety Administration nor we could then have fully comprehended the impact of rising oil prices, and Peltzman's estimate for 1980 assumed continued increases in average driving speeds. However, Peltzman also found that driving speeds respond to gas prices (as well as to per capita income and the stock of imported cars). Given the rise in gas prices that has occurred since 1972, this response (together with a rise in imports)—a trade-off of more driving time for less gas consumption—

21. See the paper by Huelke and O'Day in this volume.

22. National Highway Traffic Safety Administration, *Traffic Safety '72: A Report on Activities Under the National Traffic and Motor Vehicle Safety Act* (Department of Transportation, 1973), p. 10. (This report is also included in *1972 Annual Reports under the Highway Safety and National Traffic and Motor Vehicle Safety Acts of 1966, Message from the President,* H. Doc. 93-173, 93 Cong. 1 sess. [GPO, 1973].)

23. Sam Peltzman, "The Effects of Automobile Safety Regulation," *Journal of Political Economy,* vol. 83 (August 1975), p. 718.

explains why it took five rather than eight years to reach a fatality rate of thirty-three deaths for every billion vehicle miles.[24] Driving speeds have in fact fallen somewhat more than can be accounted for by steadily rising gas prices.[25] The most plausible explanation for this decline is the speed limit of fifty-five miles per hour. However, the decline in death rates has not been nearly as great as we could have expected from the pre-1972 connection between driving speed and death rates; the decline in death rates has been consistent only with that portion of the decline in speed attributable to an unconstrained driver response to higher gas prices.[26]

One explanation for this is that drivers have substituted mandated safety for voluntary safety: having been forced to consume more safety than they would otherwise have chosen—in this case in the form of a fifty-five-mile speed limit—they have chosen less safety in other forms, perhaps by buying smaller cars or by driving less carefully at the slower speeds.

24. To elaborate on the basis for this conclusion, let us first convert the basic facts to percent changes per year (PPA). Peltzman's original projection (thirty-three deaths for every billion vehicle miles in 1980) meant a 3.7 PPA decline from 1972 death rates. In fact, the 1972–77 decline was 5.8 PPA, or 2.1 PPA more than projected. The 3.7 PPA projection comes from two ingredients. The first is knowledge of how death rates had responded to various causative factors in the past. This element is summarized in a regression equation in Peltzman, "The Effects of Automobile Safety Regulation," p. 692, which relates death rates to such factors as alcohol consumption, the segment of the population aged eighteen to twenty-four, and so on. Prominent among these factors was driving speed: in the period between 1947 and 1965, each PPA increase in average speed led to a 1.8 PPA increase in death rates, all else being the same. The second ingredient in the projection was an estimate of the course of these causative factors in 1972–80. Here Peltzman simply assumed that future driving speeds would increase, as they had in the past, by 1 PPA.

However, in another regression Peltzman ("The Effects of Automobile Safety Regulation," p. 703) found that before 1972 driving speed had fallen by 0.2 percent for each 1 percent rise in the price of gas (relative to the consumer price index) and by 1.3 percent for each percentage point increase in the fraction of the automobile stock made up of imports. Had the substantial increases in these variables been foreseen in 1972, Peltzman's regression would have implied a forecast of a 0.2 PPA *decline* in speed, instead of the 1 PPA increase he actually assumed. In turn, a projected 0.2 PPA decline in speed implies a 2.2 PPA greater decline in death rates than does a 1 PPA increase. This is virtually the same as the 2.1 PPA discrepancy between the actual 1972–77 decline and Peltzman's original projection.

25. Average speeds declined 2.2 PPA between 1972 and 1977 rather than the 0.2 PPA decline that is consistent with the actual rise in gas prices and imports.

26. If death rates had responded to the full 2.2 PPA decline in speed rather than just to the projected 0.2 PPA decline (see footnotes 24 and 25 above), Peltzman's regression would imply that the 1972–77 decline in death rates would have been 3.6 PPA more than the 5.8 PPA that has occurred.

This brings us to our second objection to the overselling of safety regulation, which is that drivers will probably substitute against it. This would not be perverse or stupid behavior, but a rational response to the incentives provided by regulation—that is, the forced consumption of safety in a specific form in excess of what the driver finds optimal. Indeed, in earlier work Peltzman found evidence that there was considerable substitution against the earlier generation of traffic safety standards.[27] Huelke and O'Day also allude to their disappointment with the results of Australia's mandatory belt-wearing law.[28] They neglect to mention that Australian researchers found that, although driver deaths fell much more than the 15 percent overall figure they cite, pedestrian deaths and injuries rose dramatically (about 20 to 30 percent).[29] This is consistent with a rational choice process: if the driver is forced to be safer than he would otherwise choose to be when an accident occurs—and this is precisely the message of a belt law—his incentive to avoid accidents, including those that involve pedestrians, is correspondingly reduced. Air bags and the gamut of mandated vehicle design changes will create the same sort of incentives; Peltzman found evidence that these changes led to the same sort of substitution found in Australia—the substitution of pedestrian for occupant deaths.[30] This sort of substitution creates conditions under which a smaller cost is absorbed by the driver and a larger cost is imposed on other parties.

The conclusion of this analysis of equipment effectiveness is that compelling theoretical explanations and ample empirical evidence show that the National Highway Traffic Safety Administration is substantially overestimating the benefits of mandatory passive restraint systems by the methodology it is currently using.

The Value of Safety Gained and the Costs of Safety Policy

So far we have discussed the effectiveness of safety policy in purely physical terms, that is, reduced accident injury. In doing this we have

27. Peltzman, "The Effects of Automobile Safety Regulation."

28. See the paper by Huelke and O'Day in this volume.

29. A. P. Vulcan, R. Ungers, and P. W. Milne, "Australian Approach to Motor Vehicle Safety Standards," in *Proceedings of the Fourth International Congress on Automotive Safety*, pp. 849–50.

30. Peltzman, "The Effects of Automobile Safety Regulation."

emphasized the importance of driver response in the measurement of expected gain. To further analyze benefits and costs of safety policy it is necessary to place a value on any gain in safety and to estimate the costs of the policy.

Value of Lifesaving

Determining the benefits of saving lives is essential if efficient allocation of scarce resources to public programs affecting human health is to be achieved. Along with the increasing concern for systematic evaluation of highway safety regulations, interest in the value of lifesaving—what is called the value of life—is growing. It has become apparent that treating the benefits of lifesaving as if they were infinitely great leads to the untenable position that all government expenditures should be devoted to health and safety programs and that the government should prohibit all individual behavior that reduces health and safety. To say that it is necessary to value safety and that the value is not infinite does not mean, of course, that it is easy to determine practical values of life for the purposes of cost-benefit analysis. Although measuring the value of life is usually viewed as being much more difficult than estimating the effectiveness of policy designed to improve highway safety, we have shown in the previous section that estimating overall effectiveness for all highway users is more complex than most people think. Despite the difficulties, meaningful progress in measuring the benefits of lifesaving is being made, theoretically and empirically.

The value of life, in the context of cost-benefit analysis of highway safety policy, is the value of a small change in the probability of survival, not the value of avoiding certain death. Such a value of life is determined by the marginal rate of substitution between consumption or wealth and probability of survival. The value of this marginal change is usually extrapolated to a unit (0 to 1) change. It is called "value of life" or "value of lifesaving" only because such terminology permits easy comparison among situations with small but different changes and because of the lack of another accepted unit of measure.

A value of life based on the individual's value or willingness to pay is superior to the more easily measured and less theoretical value of expected future labor earnings (future earnings). Linnerooth's review of the recent theoretical literature on value of life concludes that there is no

theoretical basis for an empirical relationship between value of life based on willingness to pay (for safety) and future earnings.[31] Her review also shows that theoretically value of life typically exceeds future earnings. This is plausible since accounting of market earnings or market consumption ignores important nonmarket (household) counterparts.

There is a growing body of empirical evidence on the premiums that individuals are willing to pay to reduce the risk of death by a small amount. In a recent review of the estimates of what people are willing to pay for safety, Blomquist concludes that there is a strong indication that the value of life exceeds future earnings.[32] The estimates were derived from two types of studies. The estimates based on observable behavior consider the value implied by production or consumption activity. The other type is based on replies to questionnaires that pose situations risky to individuals. The estimates based on observable behavior range from $310,000 to $2.5 million, and those based on replies to questionnaires range from $50,000 to $8.9 million (in 1979 dollars). While theory suggests that the value of life will vary with individual circumstances, the wide range suggests that a sensitivity analysis of results that are in terms of benefits and costs is warranted. It should also be recognized that these values of life are individual values; to the extent that there are others who value the individual's well-being and to the extent that their values are not already taken into account by the individual through love, friendship, insurance, or legal sanction, the social value of life would be greater than the individual value. Bailey has estimated that the increase in social value of life over private value is due to factors such as income tax.[33] (Faigin includes costs of vehicle repair, court proceedings, and insurance processing, but most of these costs would already be considered in the individual's value of life.[34]) The increase is small in relation to the range of individual values of life.

We conclude that although measuring the benefits of lifesaving is still an imprecise process, cost-benefit analysis of safety policy can be improved by using recent theoretical and empirical advances.

31. Joanne Linnerooth, "The Value of Human Life: A Review of the Models," *Economic Inquiry*, vol. 17 (January 1979), pp. 52–74.

32. Glenn Blomquist, "The Value of Human Life: An Empirical Perspective," *Economic Inquiry*, vol. 19 (January 1981), pp. 157–64.

33. Martin J. Bailey, *Reducing Risks to Life: Measurement of the Benefits* (American Enterprise Institute for Public Policy Research, 1980).

34. Faigin, *1975 Societal Costs of Motor Vehicle Accidents.*

Implicit Costs

Systematic analysis of highway safety policy can be improved further by recognizing that not all costs are the result of explicit market transactions or congressional appropriations. It is ironic that after years of following a sound practice of measuring part of the benefits of expressway and interstate highways by travel time saved, additional time expenditures by drivers are now ignored. Errors resulting from the failure to recognize implicit costs bias the analysis of safety programs toward those with high implicit costs paid by drivers. The *National Highway Safety Needs Reports,* which considers mandatory safety belt use and the nationwide fifty-five-mile speed limit—two of the best safety policy options—makes this evident.[35] We have already shown that these options will not be and are not as effective in improving safety as claimed. They also cost more than is claimed.

According to the Department of Transportation, the discounted present cost of ten years of mandatory safety belt use is $45 million, with no user costs.[36] But Blomquist finds that user (time and disutility) costs associated with safety belt use are important in explaining voluntary belt use. If 50 percent of all drivers are already using safety belts, the time cost of mandatory use imposed on drivers will be $436 million per year.[37] Disutility costs raise driver costs even further, making mandatory belt use even less attractive. If more drivers use safety belts voluntarily, the costs of mandatory use fall, but the benefits decrease also.

The costs of the nationwide speed limit of fifty-five miles an hour are also misleading. The social costs are estimated to be $676 million (the present value of ten years of costs), with no driver costs.[38] However, the Department of Transportation acknowledges that added time costs might be at least $1 billion per year.[39] If this estimate is correct, then the social costs are approximately ten times what the Department of Transportation reported them to be in evaluating the fifty-five-mile limit in relation to other highway safety measures. Since many drivers began driving slowly

35. Department of Transportation, *The National Highway Safety Needs Report* (DOT, 1976), p. II-2.

36. Ibid., p. VI-2.

37. Blomquist, "Value of Life Saving."

38. Department of Transportation, *The National Highway Safety Needs Report,* p. VI-2.

39. Ibid., p. VI-7.

because of rising fuel costs, the costs of the fifty-five-mile speed limit were probably overestimated; however, the benefits are also overestimated. Even with effectiveness measured correctly and the lifesaving value measured appropriately, the assumption of no implicit costs to drivers biases policies toward those with high costs in driver time and prevents citizens from getting the socially optimal amount of highway safety at the least social cost.

Toward Improved Highway Safety Policy

Successful highway safety policy must be formulated with a keen awareness of the nonregulatory demand for and supply of safety. Policy designed with no recognition of likely driver response or of what driver behavior will be without the policy risks a government failure that could be greater than any market failure safety policy is trying to correct. A successful policy must also consider traffic safety externalities and whether the costs of the problems caused by these externalities are greater than the costs of correcting them. If intervention is warranted, successful policy should choose the most efficient way, including incentives, to correct the externality problem. An estimate of the effectiveness of a particular policy should consider only the additional increase in safety over what drivers would experience anyway. A systematic evaluation of the resulting benefits and costs should place a value on reductions in fatalities using estimates based on willingness to pay for safety and should include implicit social costs.

Current regulation fails on at least two counts: it is excessively costly in that it fails to let the driver make the best use of safety resources already available to him, and it specifies precisely the wrong mix of resources, which includes more external costs than would otherwise occur.

In light of these considerations, we ought to greet skeptically the claims now being made for mandatory passive restraints. These claims are exaggerated partly because other devices and driver responses would have done part of the job mandated equipment promises to do, and (although this is partly another way of saying the same thing) because some of these other driver responses will not occur when the use of air bags is imposed. Unfortunately, the dynamics of this interaction between regulations and drivers cannot always offset regulatory costs, which happens when drivers respond to regulation by taking greater risks. The most obvious sort of

response that air bags will elicit is a reduction in safety belt use. We can easily imagine this leading to pressure for mandatory seat belt laws and other rules designed to induce belt-wearing. We believe, however, that this would reduce the marginal impact of air bags to virtually zero and, in retrospect, the entire effort devoted to mandatory passive restraints would have been wasted. Future efforts should be devoted to formulating a highway safety policy that increases overall social welfare—not safety equipment or even highway safety—as much as possible.