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The Efficacy of Seat Belt Legislation

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ABSTRACT

The countries surveyed in this paper contain over 80 per cent of the world's car population. Most of them experienced a substantial decrease in road accident fatalities after the 1973 oil crisis. The decrease was greater in those countries that did not pass seat belt laws than in those that did.

This paper proffers the hypothesis that protecting car occupants from the consequences of bad driving encourages bad driving.

THE PROBLEM

In Britain every year around 2,500 car occupants are killed in road accidents, 35,000 seriously injured, and a further 120,000 slightly injured.

A SOLUTION?

It is very widely believed that a law making the wearing of seat belts compulsory would produce a significant reduction in this annual toll. In the parliamentary debate on the subject in 1979 William Rodgers, then Secretary of State for Transport, claimed

'On the best available evidence of accidents in this country - evidence which has not been seriously contested - compulsion could save up to 1000 lives and 10,000 injuries a year'.(1)

The following are some equally optimistic claims culled from evidence presented to a United States Congressional Inquiry into seat belts in 1978.

'Mandatory safety belt usage ... (holds) the potential to save 89,000 lives on the highways over the next 10 years'.(2)

'The potential for saving lives right now is tremendous with estimates ranging from 10,000 to 20,000 lives per year if everybody always wore lap and shoulder belts'.(3)

'French police have estimated that seat belts have reduced fatalities in France by 63 per cent'.(4)

'Two separate studies (in Sweden) ... found that seat belts reduced fatalities and serious injuries by 50 to 70 per cent, minor injuries by 20 per cent'.(5)

'... the [German] government estimates that 1,700 deaths and 30,000 injuries are prevented annually by the use of seat belts'.(6)

'... occupant restraints is the largest highway safety issue that we have ever had since the automobile came on the scene. It is more important than the safety aspects of the interstate, more important than getting drunk drivers off the road. In my opinion, it is the number-one issue, and I base that on the profound benefits that can be obtained from occupant restraint ...'.(7)

Hurst, in a paper in the journal Accident Analysis and Prevention cites Swedish evidence that

'belt use reduces chances of fatal injury by about 83 per cent for drivers and 80 per cent for front seat passengers'.(8)

A Transport and Road Research Laboratory Report concludes that

'seat belts reduce deaths of car occupants by at least 40 per cent'.(9)

The Royal Society for the Prevention of Accidents in a recent report cites American evidence that '... for belted occupants the deaths were reduced by 77 per cent in full frontal crashes and 91 per cent in rollovers'. The report concludes 'no other single practical piece of legislation could achieve such

dramatic savings in lives and serious injuries'.(10)

During the second reading of the Transport Bill in 1981 David Ennals asserted that not wearing a belt increased six-fold a motorist's chances of being killed in an accident.(11)

The evidence that the use of a seat belt greatly improves a car occupant's chances of surviving a crash appears to be overwhelming. That a person travelling at speed inside a hard metal shell will stand a better chance of surviving a crash if he is restrained from rattling about inside the shell is both intuitively obvious and supported by an impressive body of empirical evidence.

EXPECTATIONS AND RESULTS

The claims cited above promise very substantial reductions in numbers killed on the highways if most car occupants can be persuaded, or compelled, to use seat belts. Generally, the higher a country's level of car ownership, the larger its ratio of car occupant fatalities to total road accident fatalities, and, therefore, the greater the potential benefit of measures that reduce occupant fatalities; occupant fatalities comprise 37 per cent of all highway fatalities in Japan, 42 per cent in Britain, 56 per cent in France and 72 per cent in the United States.(12)

Estimates of the percentage reduction in occupant fatalities that would be achieved by the wearing of seat belts are consistently very large. In Sweden, for example, the seat belt law is estimated to have increased wearing rates from between 8 per cent and 33 per cent before the law to between 85 per cent and 90 per cent after the law.(13) Car occupant fatalities accounted for 50 per cent of all road deaths in Sweden before the law came into effect.(14) Therefore, applying the Swedish fatality reduction estimates of 80-83 per cent cited by Hurst, the law should have resulted, all other influences remaining constant, in a reduction in occupant fatalities of at least 57 per cent, and in total road deaths of at least 28 per cent. As Figures 13 and 21 below show, in Sweden this did not happen.

And, as the other graphs show, in no country in which a seat belt law has been passed have reductions in fatalities occurred which remotely approach the dramatic reductions promised in the claims cited above. There have been reductions in fatalities in some countries in which seat belt laws have been passed, but they have not been as great as the reductions that have occurred in the same period in countries in which seat belt laws have not been passed.

CAVEATS

Road death statistics can fluctuate substantially from year to year in a way that frequently mystifies the experts. For example, in explaining Ontario's road fatality statistics to the 1978 U.S. Congressional inquiry, an Ontario Government safety expert said 'If you go back to 1970, there was a big drop for no apparent reason and a very substantial increase from that year to the next. That kind of increase in the order of 20 per cent in fatalities in one year causes a great deal of panic among certain legislators, but I don't think there is any particular systematic reason for it, at least not one we know'.(15) One must be careful not to be too impressed by the statistics for any one particular year. Nevertheless, the abundant evidence about the effectiveness of seat belts in reducing deaths and injuries resulting from crashes suggests that, in general, one should expect a large reduction in fatalities immediately following the introduction of a law that produces substantial increases in wearing rates. Because the safety benefit of a seat belt is conferred immediately it is securely in place, there should be no delay in its effect. The fatality statistics should record an instant drop that is proportional to the increase in wearing rates.

In a particular country, in a particular year, other influences might obscure, or greatly exaggerate, the effect of a seat belt law. Virtually all countries have a variety of road safety campaigns under way at any time, which could, if allowance were not made for their effect, exaggerate the influence of seat belt legislation. Also, during the 1970s, the energy crisis affected some countries more severely than others. But probably all motorists everywhere have been exposed to information about the economic benefits of light-footed driving. In many countries the economic incentive to drive more slowly was reinforced by a lowering of speed limits. In global terms 1973, the year of the 'energy crisis', was a watershed year for road deaths. Until 1973 the death toll in the major motorized countries of the world had been rising for many years. Since 1973 it has declined substantially.

AN HYPOTHESIS

Protecting car occupants from the consequences of bad driving encourages bad driving.

That the use of safety equipment can influence the behaviour of the user is obvious. Rock climbers with safety ropes, trapeze artists and tightrope walkers with safety nets, steeplejacks or novice gymnasts with safety harnesses all attempt manoeuvres with their safety

equipment that they would not attempt without it. Heavily protected ice hockey players and American football players play their games in a way that they would not conceivably play them without their customary protection.

In the realm of motoring, improvements to the brakes and suspensions of racing cars, and to the margins of racing tracks, which have made it safer to take given corners at given speeds have resulted in the corners being taken at higher speeds. And ordinary drivers vary their driving not only according to their sense of the capabilities of their cars, but according to their perception of conditions: driving faster and with less concentration in good weather and on wide, straight unobstructed roads such as motorways; driving more slowly and carefully in conditions of poor visibility, and on narrow twisting roads with cluttered verges. Their driving is modified, in other words, by their perception of the risks involved.

Could such a risk-compensation effect explain the apparent ineffectualness of seat belt legislation? It is not a popular hypothesis. In its recent report Seat Belt Sense the Royal Society for the Prevention of Accidents considers, for purposes of rejecting them, the arguments against seat belt legislation.(16) It does not even mention the hypothesis. Nor does the hypothesis have obvious intuitive appeal. Most people to whom the idea is put reject out of hand the possibility that they might respond to the sense of security that a seat belt provides by driving more dangerously.

Before trusting to one's intuition in this matter it is helpful to consider the magnitudes of the changes in risk and driving behaviour implied by the hypothesis. Let us, for the moment, accept the claim cited above that compulsion might save 1000 lives a year in Britain. If we make the generous assumption that one third of the estimated 390 thousand million passenger kilometers travelled in Britain in 1979 were travelled by voluntarily belted motorists, this leaves 257 thousand million kilometres travelled by unbelted motorists. Thus a measure which would reduce by 1000 the number of lives lost in all this travelling would reduce the risk of a fatal accident per kilometre travelled by one 257 millionth.

A reduction in risk of such a magnitude is not directly perceptible. It can only be seen by statisticians. The motoring public is dependent for its assessment of such risks on the advice of experts.

Driving consists of a continuous flow of very finely judged decisions and

actions taken in the context of an attitude toward risk. The risk associated with each individual decision is extremely small. A Swedish study has estimated that for every fatal accident there have been 400 million driver decisions made and 50,000 'mistakes'.(17) The figures themselves are not particularly believable - the definitions of 'decisions' and the measurement of 'mistakes' are both likely to be crude and arbitrary. But they illuminate an important facet of the road safety problem. Most mistakes go unpunished.

Driving is a lottery in which the top prizes are fatal accidents. Most mistakes are lapses in concentration or errors in judgement. With every lapse of concentration or error of judgement a driver purchases another ticket. The chances of a ticket being drawn during any one kilometre of driving are, as we have noted, extremely small. The tickets are very easy to come by. They can be bought by driving after a few extra drinks, by running on a worn tyre, by going a bit too fast, by driving when sleepy, or angry, or preoccupied, by showing-off, by skimping on maintenance etc., etc., but the chances of any particular ticket being a winning one are negligible. Just as in a conventional lottery, the number of tickets drawn is a small but fairly constant proportion of the number of tickets bought. In Britain in 1978 on an average day 19 top prizes were won in the automotive lottery.(18)

The proponents of seat belt legislation hold out the promise that compulsion will reduce dramatically the proportion of top-prize tickets drawn. They ignore the possibility of a contrary effect on the number of tickets bought.

As noted above safety measures which reduce the consequences of making mistakes very commonly influence behaviour in a way that counters the measures' effect. The extent of this influence would appear to depend on the amount by which the seriousness of the consequences of a mistake are reduced, the amount by which they are perceived to be reduced, and the extent to which the user's attitude toward risk remains unchanged. If the safety benefit is accurately perceived and attitudes toward taking risks remain unaltered, then one would expect the benefit to be very precisely cancelled out.(19) If the safety measure is perceived as reducing risk by more than it actually does then it would give a false sense of security and could actually be the cause of injury or death.

The reduction in the risk of being killed in a crash per kilometre travelled is minute. Motorists are encouraged by safety experts and intensive advertising campaigns to believe that wearing a seat

belt makes them very much safer. Most claims about the efficacy of seat belts are based upon evidence of the way in which they improve chances of surviving a crash. The evidence that they improve chances greatly is convincing and not disputed. But there is a dearth of evidence in the literature on seat belts addressed to the hypothesis discussed above. The next section looks at some relevant evidence.

EVIDENCE

The road fatality records of 13 countries with 'effective' seat belt legislation were compared with the records of four countries without 'effective' seat belt legislation.(20) Together these countries contain over 80 per cent of the world's car population. The road death tolls (including non-car occupants) of all 17 countries were converted to indices, with 1973, the year of the 'energy crisis', set equal to 100. Two composite indices consisting of the average of the indices of the 13 countries with seat belt legislation, and the average of the indices of the four countries without legislation were calculated. These are displayed in Figure 1.(21) It shows that the index for countries with seat belt laws fell 17 points between 1972, and 1978, while the index for countries without laws fell by 25 points over the same period.

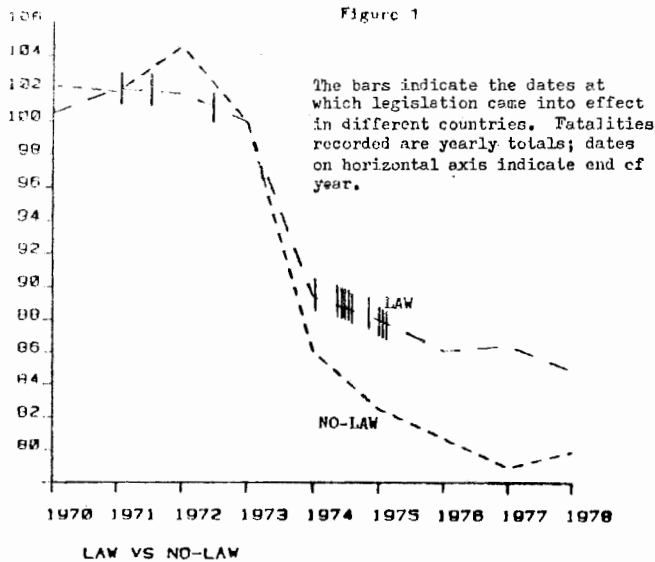
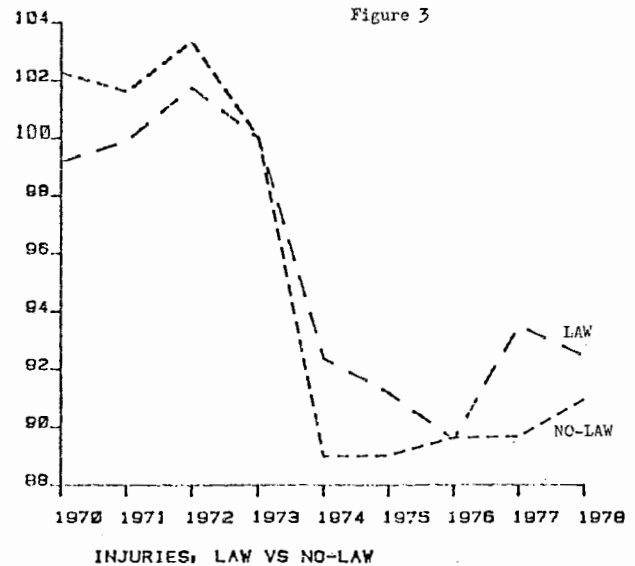
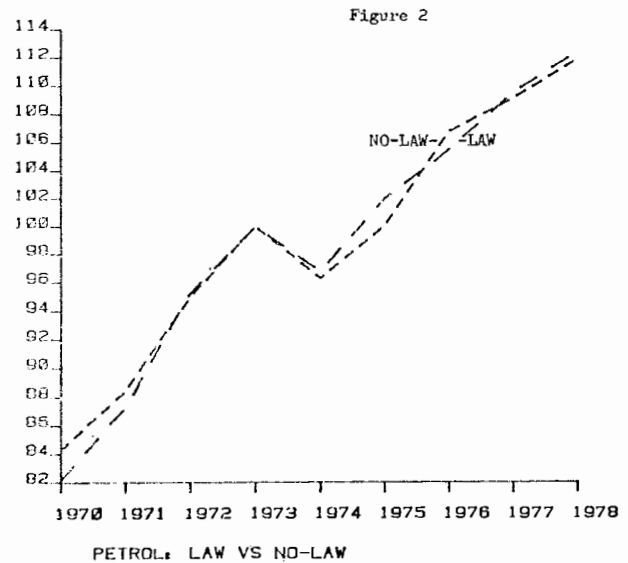


Figure 2.(22) shows the changes that occurred in petrol consumption over this period in the belt law and non-belt law countries. It suggests that the experience of the energy crisis was similar in the two sets of countries.

Figure 3 shows the changes that occurred in the indices of road traffic injuries for the two sets of countries. Injury statistics for individual countries behaved in a more erratic fashion than the fatality statistics.



Injury statistics are inherently less reliable than fatality statistics; almost all deaths get recorded, while only an unknown and possibly variable percentage of injuries get recorded. The composite indices for the law and no-law countries indicate that in both sets of countries the decrease in injuries following the energy crisis was less than the decrease in fatalities. As with the fatality indices, the decrease was greater in those countries that did not pass seat belt laws than in those that did. A comparison of injury graphs for individual countries leads to the same conclusions as a comparison of fatality graphs. Because of their greater reliability the following analysis is confined to fatality statistics.

TRAFFIC-DEATH INDICES FOR INDIVIDUAL COUNTRIES

Figure 4 compares the road death index for Belgium with the average index for the non-belt law countries. The law was passed in Belgium on June 1, 1975.(23) The Belgian index dropped further between 1974 and 1975 (9 points) than did the composite index (3.5 points). But from 1976, the first full year of the law's operation, the Belgian death toll increased steadily while in the non-law countries it continued to drop until 1978 when a slight rise occurred. The Belgian Transportation Administration attributed the decline in 1974 not only to the seat belt law, but also to harsher drunk-driving laws and stiffer penalties for violations of the traffic code.(24) Belt usage is estimated to have increased from 17 per cent before the law to between 63 per cent and 86 per cent after the law.

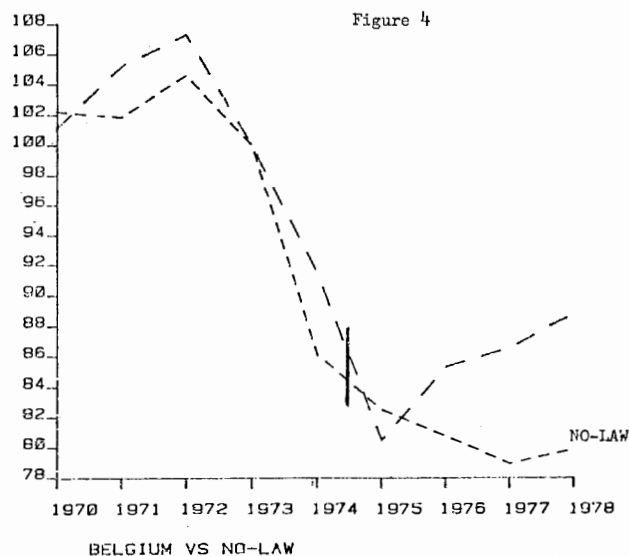
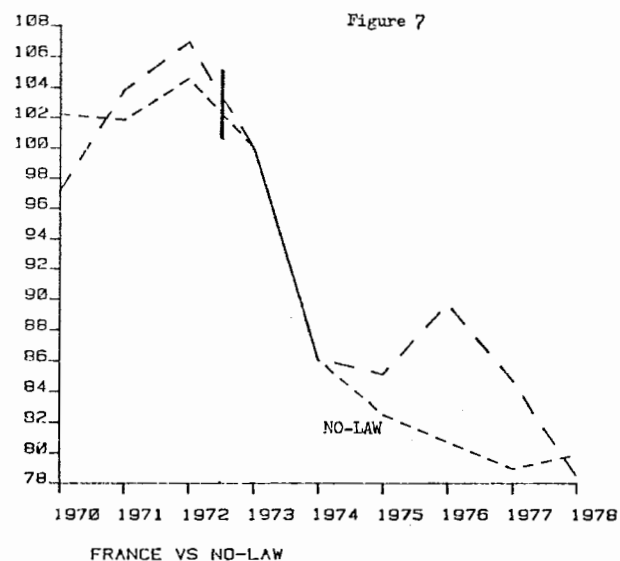
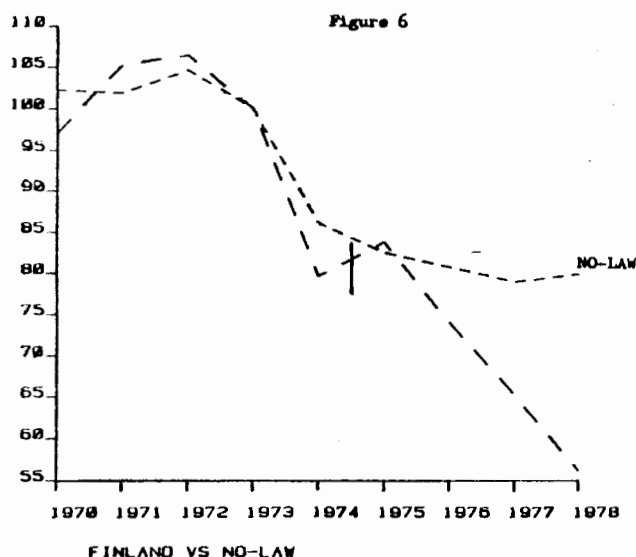
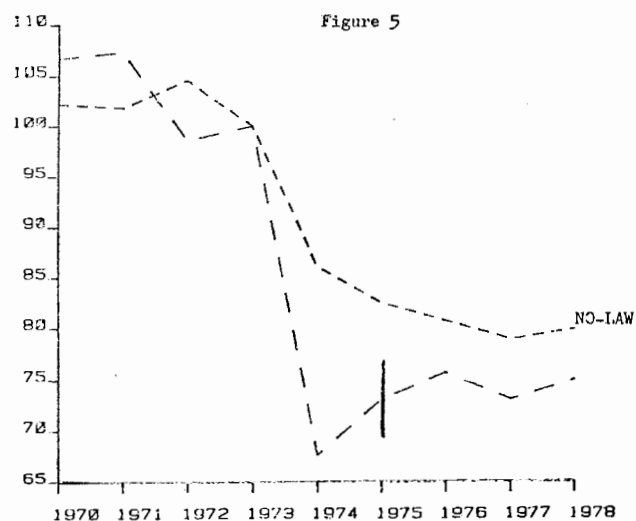


Figure 5 compares the Danish road death index with the non-law index. Denmark experienced a dramatic drop of 32.5 points in 1974. But its belt law did not come into effect until January 1, 1976; the death toll in this year increased by 2.5 points while in the non-law countries it decreased by 2 points. Belt usage is estimated to have increased from 25 per cent before the law to 70 per cent after the law.

Figure 6 compares the Finnish road death index with the non-law index. The Finnish law came into effect in July 1975. This is the only year between 1972 and 1978 in which Finland experienced an increase in road deaths. Belt usage estimates range from 9 to 40 per cent before the law, and 53 to 71 per cent after the law.

Figure 7 compares the French road death index to the non-law index. The French law came into effect on July 1,

1973. France experienced a slightly greater decline in its death rate in 1973 than the non-law countries, 7 points and



5 points respectively. But from 1974, the first full year of the law's operation, until 1978 the non-law index remained below the French index. Belt usage is estimated to have increased from 20 per cent before the law to between 50 and 95 per cent after the law.

Figure 8 compares the German road death index with the non-law index. The German law came into effect on January 1, 1976. In 1976 the German index remained at its 1975 level, 91, while the non-law index dropped by 2 points. Belt usage estimates range from 22 to 64 per cent before the law, and 45 to 85 per cent after the law.

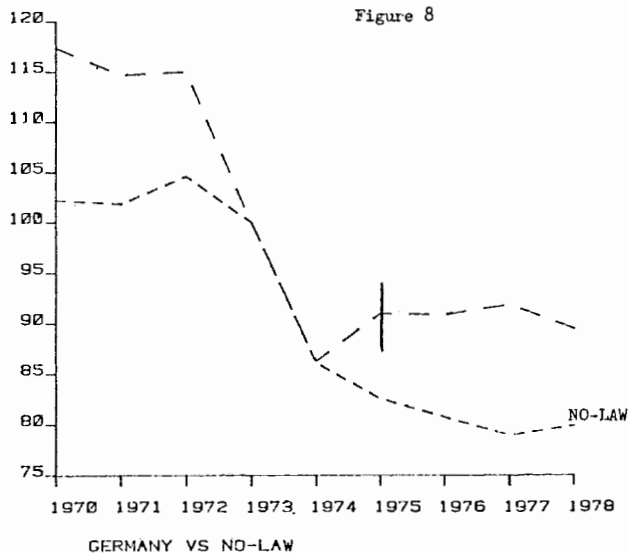


Figure 9 compares the Dutch road death index with the non-law index. The Dutch law came into effect on June 1, 1975. In 1975 the Dutch index dropped 4 points while the non-law index dropped three and a half points. In 1976 the first full year of the Dutch law's operation the Dutch index rose two points while the non-law index continued to decrease by a further two points. Because of lower speed limits and alcohol legislation implemented around the same time Dutch officials say that it is difficult to separate the effect of the belt law from the other measures.(25) Belt usage estimates range from 13 to 28 per cent before the law and 40 to 75 per cent after the law.

Figure 10 compares the Norwegian road death index with the non-law index. The Norwegian law came into effect on September 1, 1975. In 1975 the Norwegian index increased by 6 points while the non-law index dropped three and a half points. In 1976, the first full year of the law's operation, the Norwegian index dropped 13 points to 92 compared to a drop of two points to 81 in the non-law countries. Belt usage estimates range from 13 per cent to 35 per cent before the law, and 30 to 64 per cent after the law.

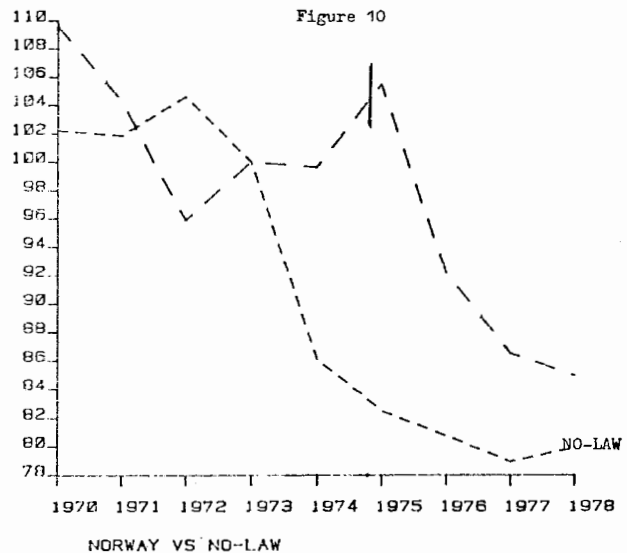
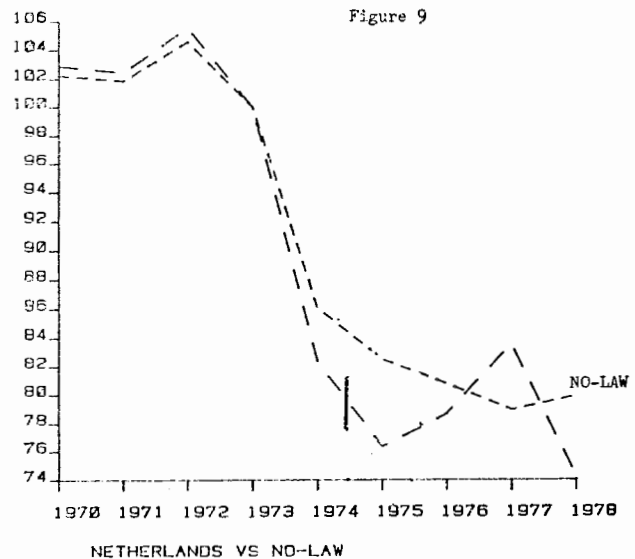
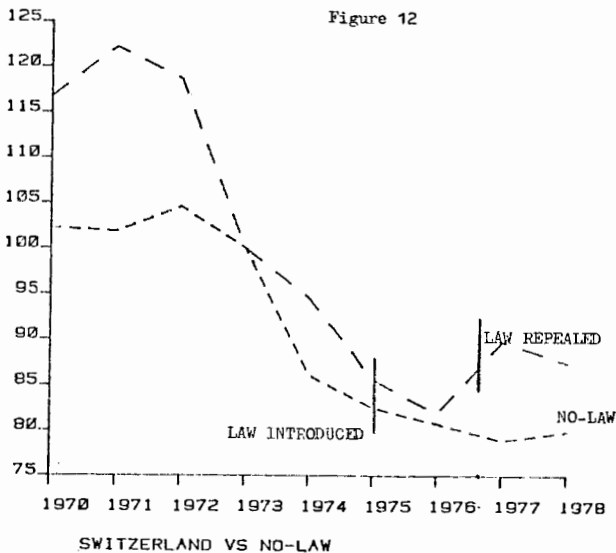
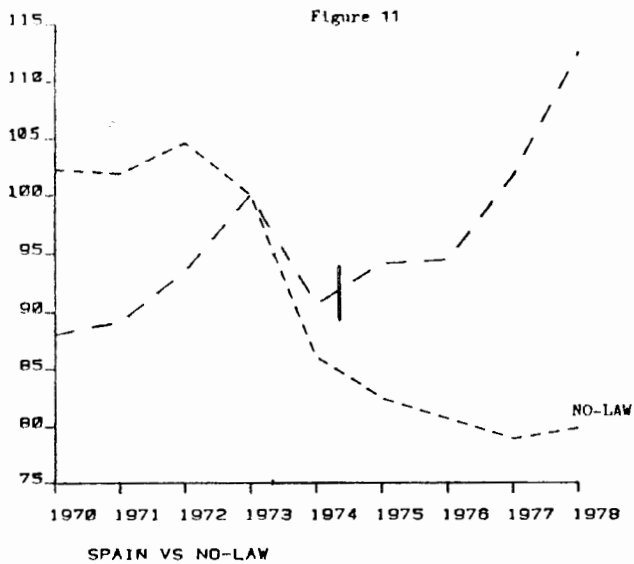


Figure 11 compares the Spanish road death index to the non-law index. The Spanish law came into effect in April 1975. In 1975 the Spanish index rose 3.5 points and continued to rise thereafter. Pre-law belt usage estimates are not available; after the law usage is estimated at 67 per cent.

Figure 12 compares the Swiss road death index to the non-law index. The Swiss law came into effect on January 1, 1976 and was repealed in September 1977. In 1976 the Swiss index dropped four points compared to the two in the non-law countries. In the following year, during nine months of which the law was in force, the index increased by eight points compared to a decrease of a further two points in the non-law index. In the first full year after the law was repealed the Swiss index dropped by more than two points, while that of the non-law countries increased by one point. Belt usage estimates range from 19 to 42 per cent before the law, and 78 to 92 per



cent after the law; post-repeal usage is estimated to have dropped by one-third.

Figure 13 compares the Swedish road death index to the non-law index. The Swedish law came into effect on January 1, 1975. In 1975 the Swedish index dropped two points compared to a drop of 3.5 points in the non-law countries. Also in 1975 there was a campaign against drinking and driving which was reported to have had 'some positive effect'.(26) In Sweden for the three years before 1975 the number of car accident claims filed with insurance companies had been decreasing slowly. In the three years after the law was passed the number increased sharply, by 15 per cent in 1975, a further 7 per cent in 1976, and a further 9 per cent in 1977.(27) Belt usage estimates range from 8 per cent to 33 per cent before the law and 85 per cent to 90 per cent after the law.

Figure 14 compares the Israeli road death index to the non-law index. The Israeli law came into effect on July 1,

1975. In 1975 Israel experienced a drop in its index of 10 points from 1974. But Israel has the distinction of being one of only two countries among those surveyed in this paper to have experienced an increase in road deaths in 1974 (the other was Sweden). In 1974 its index increased by five points, while that of the non-law countries decreased by 14 points. The Ministry of Transportation reports 'an actual, as well as proportional, decrease in the number of driver and passenger fatalities in the face of a relatively stable, even increasing (in 1977), accident and injury incidence.'(28) Belt usage is estimated to have increased from 8 per cent before the law to 80 per cent after the law.

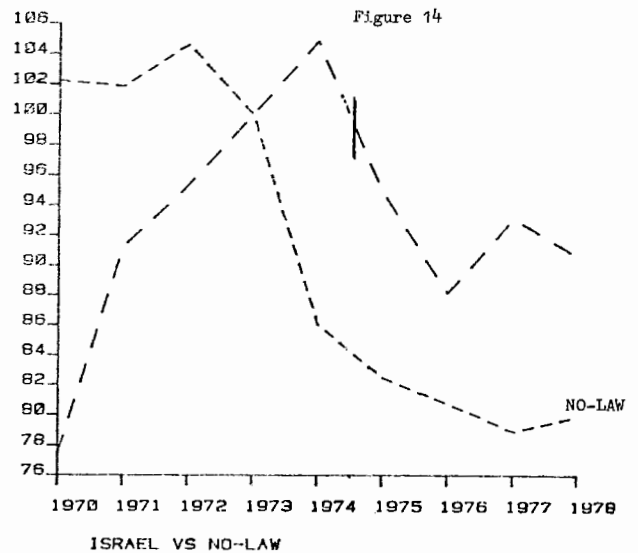
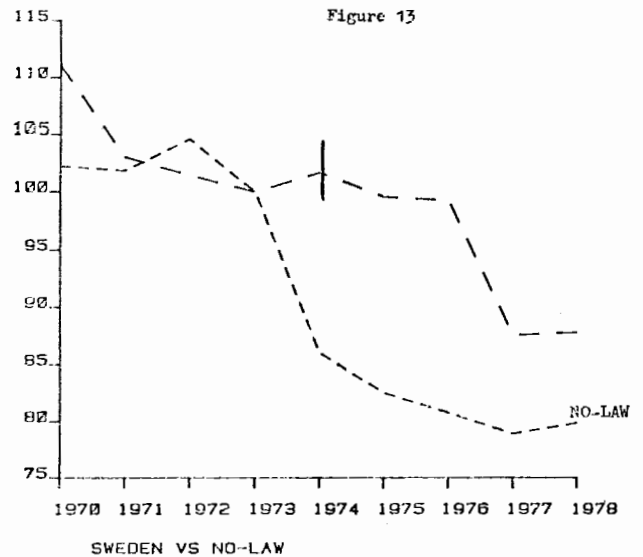


Figure 15 compares the Australian road death index to the non-law index. The law came into effect in the various states of Australia between December 22, 1970 and January 1, 1972. Between 1970 and 1972 the Australian index dropped 10 points while that of the non-law countries increased by two. But in 1973

the Australian index increased seven points while that of the non-law countries dropped 4.5. Between 1973 and 1978 the Australian index remained virtually unchanged while that of the non-law countries dropped 20 points. A report of the Australian House of Representatives Standing Committee on Road Safety noted that while car occupant deaths had decreased in the early 1970s non-occupant deaths had increased. It observed 'This strongly confirms the contention that vehicle occupants were being affected by a measure not operative so far as other road users are concerned.'⁽²⁹⁾ Belt usage estimates range from 19 per cent to 37 per cent before the law, and 69 per cent to 94 per cent after the law.

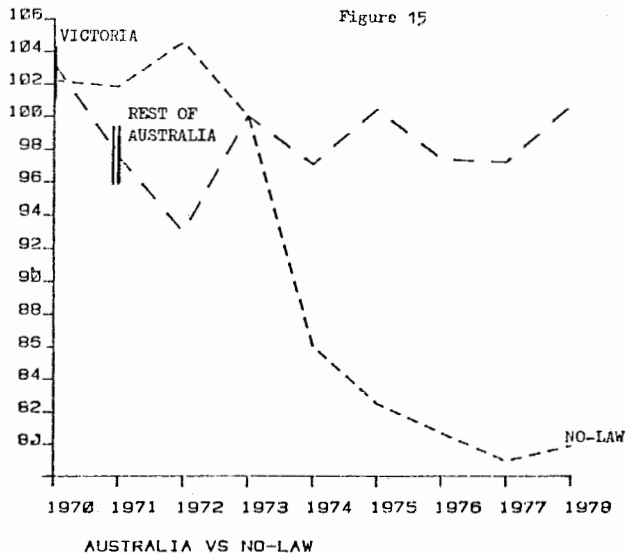
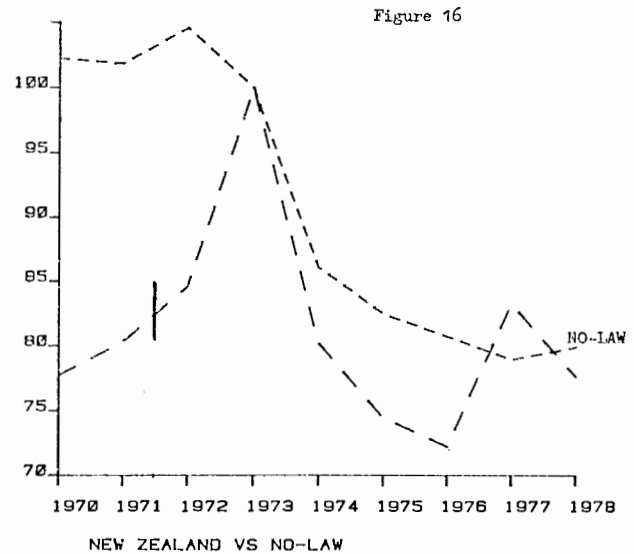


Figure 16 compares the New Zealand road death index to the non-law index. The New Zealand law came into effect on June 1, 1972. In 1972 the New Zealand index rose four points while that of the non-law countries rose by 2.5. In 1973, the first full year of the law's operation, the New Zealand index jumped 15.5 points to an all-time high while that of the non-law countries dropped by 4.5 points. Belt usage estimates range from 33 to 51 per cent before the law; usage after the law was estimated at 85 per cent. In New Zealand, as in Australia and Israel, a decrease has been observed in the ratio of occupant to non-occupant fatalities. As in Australia and Israel this has been construed as evidence in favour of seat belts: '... this slight increase [in occupant fatalities] was accompanied by a considerably sharper rise in fatalities of other road users, suggesting certain savings from increased belt use subsequent to passage of the law'.⁽³⁰⁾ Apparently an alternative hypothesis, that seat belt use might have encouraged riskier driving, has not previously been entertained.

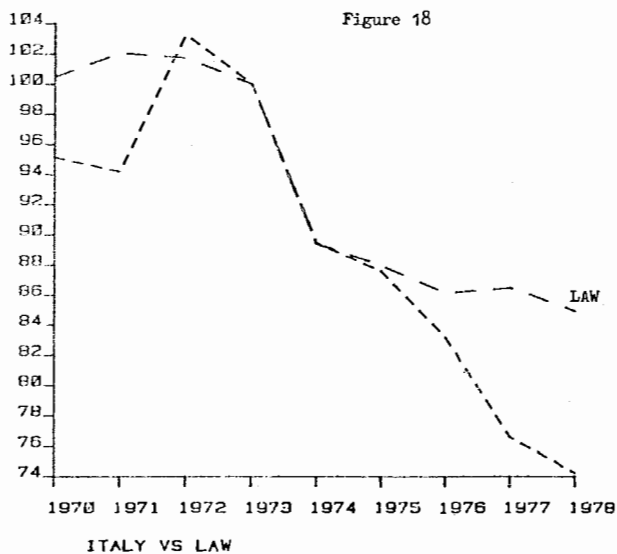
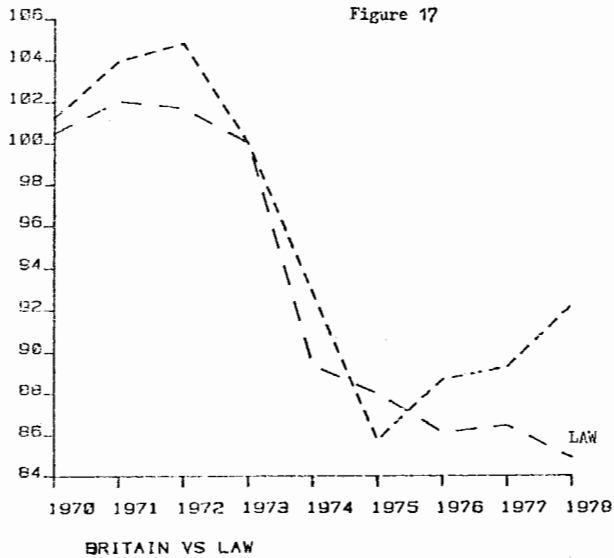


Figures 17, 18, 19, 20 compare the road death indices of Great Britain, Italy, United States and Japan to the average of the indices of the belt-law countries. In every case the 'energy-crisis drop' (1972-75) in the indices of the non-law countries is greater than that of the belt-law index. In Italy and Japan the decline continued to 1978 while in Britain and the United States the indices began to rise again after 1975. Belt usage in Britain is estimated to range from about 20 per cent in urban areas to over 40 per cent on motorways.⁽³¹⁾ In Japan usage estimates range from 14.5 per cent for drivers on motorways down to 5.8 per cent for passengers on other roads.⁽³²⁾ Estimates are not available for Italy and the United States.

The most dramatic decrease in the road death toll of the 17 countries surveyed in this paper was in Japan, 55 points between 1970 and 1978. Japan was also the country to experience the most rapid increase in car ownership over this period. With the possible exception of the United States and Italy, for which seat belt use statistics are not available, Japan has the lowest rate of usage of the countries surveyed.

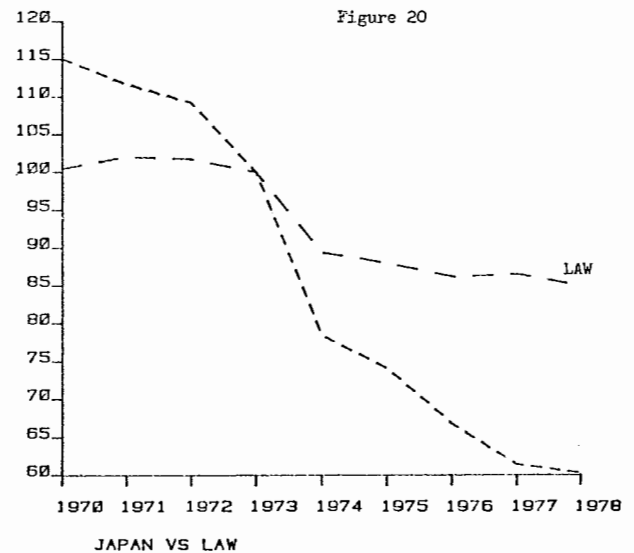
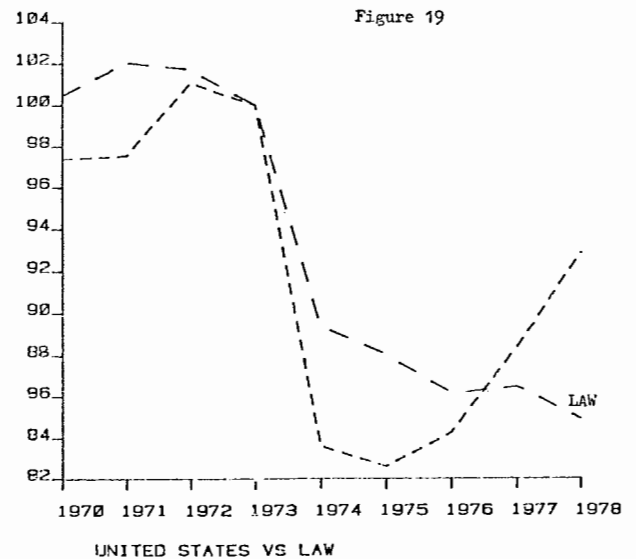
Puerto Rico and Ontario also passed seat belt laws in this period but the road death statistics available are not strictly comparable with the national time series data displayed in the above graphs. Puerto Rico's law came into effect on January 1, 1974 and seat belt use is reported to have increased from 4 per cent in 1973 to 35 per cent in 1974.⁽³³⁾ While the United States as a whole (including Puerto Rico) was experiencing a decrease of 16.5 per cent in its road death toll in 1974, Puerto Rico experienced a decrease of only 2.7 per cent.⁽³⁴⁾ In Ontario a seat belt law came into effect in January 1976. At the

same time speed limits were lowered on expressways from 70 to 60 mph and on most other provincial highways from 60 to 50 mph. A study by the Ontario Ministry of Transportation and Communications concluded that the reduction in fatality rates for vehicle occupants associated with these two safety measures combined was 'not statistically significant'.(35)



INTERPRETING THE EVIDENCE

In Britain the evidence most frequently cited by the advocates of compulsion is a Transport and Road Research Laboratory report published in 1979 entitled *The Protection Afforded by Seat Belts*. The report reviews 16 studies of the effect of seat belts. But it states 'For direct evidence on deaths, however, it is necessary to rely on recent Australian data'. In other words, of all the evidence marshalled in the TRRL report, only that from Australia is relevant to the hypothesis of this paper. All the other evidence relates only to estimates of the way in which seat belts affect chances of surviving a crash.



The claims made in the Australian studies are based on a simplistic statistical analysis. In Australia as in most other countries deaths and injuries had been increasing rapidly throughout the sixties. In the early 1970s the Australian trend levelled-off. The dramatic savings claimed for seat belts in Australia rest upon the assumption that the steeply rising trend of the 1960s would have continued unabated in the 1970s, had it not been for the seat belt legislation. The claims rest upon the gap between the number of deaths and injuries that actually occurred, and the number that the statisticians speculated would have occurred had it not been for the seat belt law. As Figure 15 shows the number of road deaths in Australia merely levelled off at a level slightly below its all-time peak of 1970, while in most of the other countries surveyed in this paper the number fell dramatically. The number injured in road accidents in Australia did not reach its peak until 1973, two years after the seat belt

legislation became effective throughout the whole of Australia. In 1977 Australia had a road death rate per head of population exceeded amongst the countries in this survey only by that of France.

The debate over seat belt legislation has been going on for many years. But only relatively recently has the statistical evidence been available to permit an examination of the effect of legislation over a sufficient number of countries and years to permit a reasonable test of whether the promise of legislation has been fulfilled. It appears not to have been.

But most legislators with an interest in the question already have an established position in the debate. People who have adopted a highly publicized stance on an issue are often reluctant to change it in the face of new evidence.

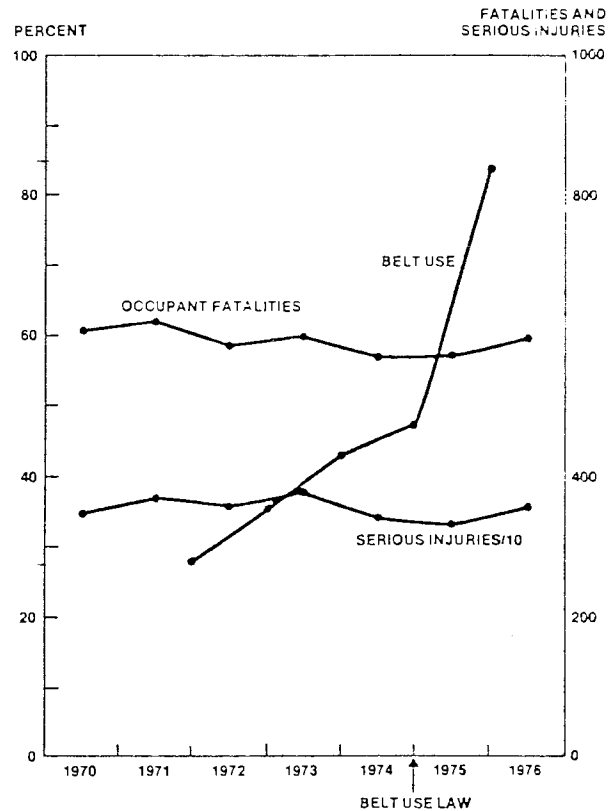
Figure 21 was presented in evidence to the 1978 U.S. Congressional Inquiry along with other evidence which cast doubt upon the efficacy of road safety legislation. It was not sympathetically received. It earned its presenters the following rebuke from Congressman Fary '... there seems to be a negative attitude in the statement where you hold that safety belt efforts have been failures. This continues to puzzle me. How can we possibly expect to generate an interest and desire on the part of the motoring public if we continue to publicize reports that efforts to achieve higher usage have been failures?' (36)

At present the prospects for seat belt legislation in the United States do not appear high. The chairman of the House of Representatives inquiry, Congressman Ginn remains a fervent, and frustrated, believer in the efficacy of compulsion. He concluded his committee's hearings with this announcement: 'There is a memo going out from me today to my family and to my staff, that as long as they eat at my table and work for me, we are going to wear safety belts in the future'. (37)

The president of the American Seat Belt Council was one of the principal witnesses at the U.S. Congressional hearings. In a letter dated December 4, 1980 (38) he described the reduction in car occupant fatalities in Sweden as the 'most dramatic' of all the reductions claimed by respondents to their international survey. But the reduction he refers to can only be a reduction in the death rate of those involved in crashes. As Figure 21 clearly shows, in the two years after Sweden's belt law came into force the total number of car occupants killed did not decrease at all, it increased by 6 per cent.

Figure 21

Belt use compared to motor vehicle occupant fatalities and serious injuries in Sweden



CONCLUSION

Perhaps those countries which passed seat belt laws were subject, during the 1970s, to a set of influences which, in the absence of seat belt legislation, would have caused many more people to be killed on their roads. Or, perhaps, the countries which did not pass seat belt laws were subject to a powerful set of accident-reducing influences that were not operative in the countries that passed laws.

The foregoing comparison of national road accident death statistics does not prove that seat belt legislation has failed. But it strongly suggests it.

NOTES AND REFERENCES

- 1 Hansard, March 22, 1979, col. 1720.
- 2 Hearings on Safety Belt Usage, U.S. House of Representatives Investigations and Review Committee, 1978, U.S. Department of Transportation evidence, cited p. 130.

- 3 Ibid. U.S. Department of Transportation evidence, cited p. 152.
- 4 Ibid. American Seat Belt Council, p. 229
- 5 Ibid. American Seat Belt Council, p. 235.
- 6 Ibid. American Seat Belt Council, p. 238.
- 7 Ibid. B. J. Campbell, Director of Highway Safety Research Centre, University of North Carolina, p. 361.
- 8 Hurst, P.M. (1979) Compulsory Seatbelt Use: Further Inferences, Accident Analysis and Prevention, Vol. 11, p. 27.
- 9 Grime, G. (1979) The Protection Afforded by Seat Belts, Transport and Road Research Laboratory, Crowthorne, Berks. SR449.
- 10 Royal Society for the Prevention of Accidents (1981), Seat Belt Sense.
- 11 Hansard, January 13, 1981, col. 1272. He is reported in Hansard as saying that one is six times more likely to die when wearing a seat belt. But it is clear from the context of his speech that he said, or meant, the opposite.
- 12 Japanese Prime Minister's Office (1980) White Paper on Transportation Safety, Table 21, p. 32.
- 13 American Seat Belt Council (1980) International Seat Belt and Child Restraint Use Laws, Suite 460, 1730 Pennsylvania Avenue, Washington D.C. (mimeo).
- 14 National Road and Traffic Research Institute of Sweden (1978) Effekter av vidtagnatrafiksakerhets-atgarder under perioden 1968-1976, Nr 156, p. 6.
- 15 U.S. Congressional Hearing (2), p. 189.
- 16 See reference 10.
- 17 Swedish Committee for Future Oriented Research (1978) Health and Society 1, Accidents and Violent Death, p. 45.
- 18 This argument is developed at greater length in my book Transport Planning: Vision and Practice, Routledge and Kegan Paul, 1981.
- 19 In 'The Risk Compensation Theory of Accident Causation and its Practical Consequences for Accident Prevention', a paper presented at the 1976 meeting of the Osterreichische Gesellschaft fur Unfallchirurgie, Salzburg. G.J.S. Wilde concludes: 'There is basically only one independent variable which controls the number of accidents and that is risk tolerance.'
- 20 The thirteen countries with effective laws are Belgium, Denmark, Finland, France, Germany, Netherlands, Norway, Spain, Switzerland, Sweden, Israel, Australia and New Zealand. The four countries without effective laws are Britain, Italy, United States and Japan. 'Effective' legislation is legislation that has been followed by a substantial increase in the wearing of seat belts.
- Japan has not been included amongst the countries with seat belt laws because, although it has a law, it is not enforced, and wearing rates are reported to be less than a third of those in Britain.
- The choice of countries included in this study has been constrained by the availability of relevant information. Bulgaria, Czechoslovakia, Greece, Hungary, Ireland, Luxembourg, Malaysia, South Africa and the U.S.S.R. are all reported to have passed seat belt laws but insufficient is known about enforcement, effect on wearing rates or changes in road death rates to include them in the study.
- Austria was also excluded because as in Japan, its law is not enforced and seat belt usage rates are roughly comparable to those in Britain.
- 21 The source of data for Figures 1 and 3 is World Road Statistics, International Road Federation, Table VII for relevant years.
- 22 Source, World Road Statistics, Table VI.
- 23 Unless otherwise indicated, legislation dates and belt usage rates in this section are taken from American Seat Belt Council (1980), International Seat Belt and Child Restraint Use Laws, Suite 460, 1730 Pennsylvania Avenue, Washington D.C., (mimeo).

- 24 Hearings of the U.S. House of Representatives Investigations and Review Committee, June 6, 1978, on Safety Belt Usage, written evidence of the American Seat Belt Council, p. 223.
- 25 Reference 24, p. 231.
- 26 Reference 14, p. 19.
- 27 Trafiksakerhetsverkets (1980) Anslags framställning for budgetaet 1981/82, graph p. 20.
- 28 Reference 23, p. 10.
- 29 Report of the Australian House of Representatives Standing Committee on Road Safety (May 1976) p. 163.
- 30 Reference 8, p. 27.
- 31 Reference 9, Figure 4.
- 32 Reference 24, p. 230.
- 33 Reference 23, p. 37.
- 34 Reference 2, p. 18.
- 35 Ontario Ministry of Transportation and Communications (1980) Safety Benefits of the Seat Belt Legislation and Speed Limit Reduction in Ontario, p. 12.
- 36 Reference 2, p. 275.
- 37 Reference 2, p. 491.
- 38 Personal communication.

APPENDIX

Since the foregoing paper was first published as a discussion paper in January 1981 it has been argued by the defenders of seat belt legislation that an analysis based on total road user deaths is misleading because the 'seat belt effect' in such an analysis is obscured by a large number of uncontrolled variables.

The graphs presented below show the statistical history of car occupant fatalities for 14 countries during the 1970s. They compare the car occupant fatalities of countries that have passed belt laws with those which have not. In an attempt to control for differing experiences of the energy crisis, the number of fatalities in each country in each year has been divided by that

country's petrol consumption. The scale on the vertical axes of the graphs measures the ratio of occupant fatalities to petrol consumption of each country or set of countries. Where countries are grouped the axes measure the average of the ratios of the countries in the group. The bars on the graphs indicate the dates at which belt laws came into effect. Figures 1,2,3,5,6,8 and 10 (Belgium, Denmark, Finland, Germany, Netherlands, Spain, and Switzerland) all show impressive decreases in the early 1970s. But these decreases have no apparent connection with seat belt legislation. In all these countries the downward trends levelled off or turned up around the time that belt laws were passed. Figures 7 and 9 (Norway and Sweden) manifest no effect at all. The law in New Zealand (Figure 11) came into effect midway through 1972. The ratio decreased in 1972 by 12 per cent. In 1973, the first full year of the law's operation, the ratio increased by 6 per cent. In France (Figure 4) the law came into effect midway through 1973, the year of the energy crisis. The ratio decreased in this year by 16 per cent. The law in France at this time applied only in rural areas. The following interpretation of the French evidence is taken from a paper by J.P. Chodkiewicz and B. Dubarry (1977) presented to the 6th Conference of the IAATM in Melbourne entitled 'Effects of Mandatory Seat Belt Wearing Legislation in France':

'...the seat belt seems to be an indispensable tool in reducing the number of car accidents however, it is insufficient alone. On the highways in France, the death rate, which was not affected by the compulsory use of the belt, decreased in a few months by 57 per cent when a complementary measure limiting speed was introduced.'

The obscuring-variables hypothesis is, by its very nature, impossible to refute conclusively. But acceptance of the hypothesis involves acceptance of an extraordinary measure of coincidence. The hypothesis requires that in every country that has passed a law, the law's enormous beneficial effect has been countered with remarkable timing, by a set of variables acting to produce a large increase in fatalities. Proponents of the obscuring-variables hypothesis have yet to name these variables. They have yet to measure them. They have yet to show, using accepted statistical methods, that they are independent of the legislation whose effect they are supposed to be obscuring. And they have yet to explain why the same variables have not operated at the same time to produce substantial increases in road deaths in the 'no-law' countries.

Data Sources

Petrol Consumption - World Road Statistics, International Road Federation, Geneva. Petrol is measured in thousands of tonnes.

Occupant Fatalities - New Zealand, Motor Accidents in New Zealand: Statistical Statement, Ministry of Transport, Calendar Year 1978. Japan, Statistics '79 of Road Traffic Accidents in Japan, Traffic Bureau, National Police Agency, Japan. All other countries, Statistics of Road Traffic Accidents in Europe, U.N. Economic Commission for Europe, Geneva.

Car occupant fatalities are not available for Belgium for 1973 and New Zealand for 1979. Petrol consumption was not available for Belgium for 1976. To facilitate computing, the missing values for Belgium were interpolated by taking the average of the adjacent years. For New Zealand the 1978 car occupant figure was used for 1979.

Japan is included only in Figure 13.

