

TRAFFIC SAFETY MEASURES IN INDIA AND JAPAN : A COMPARATIVE STUDY

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1. INTRODUCTION

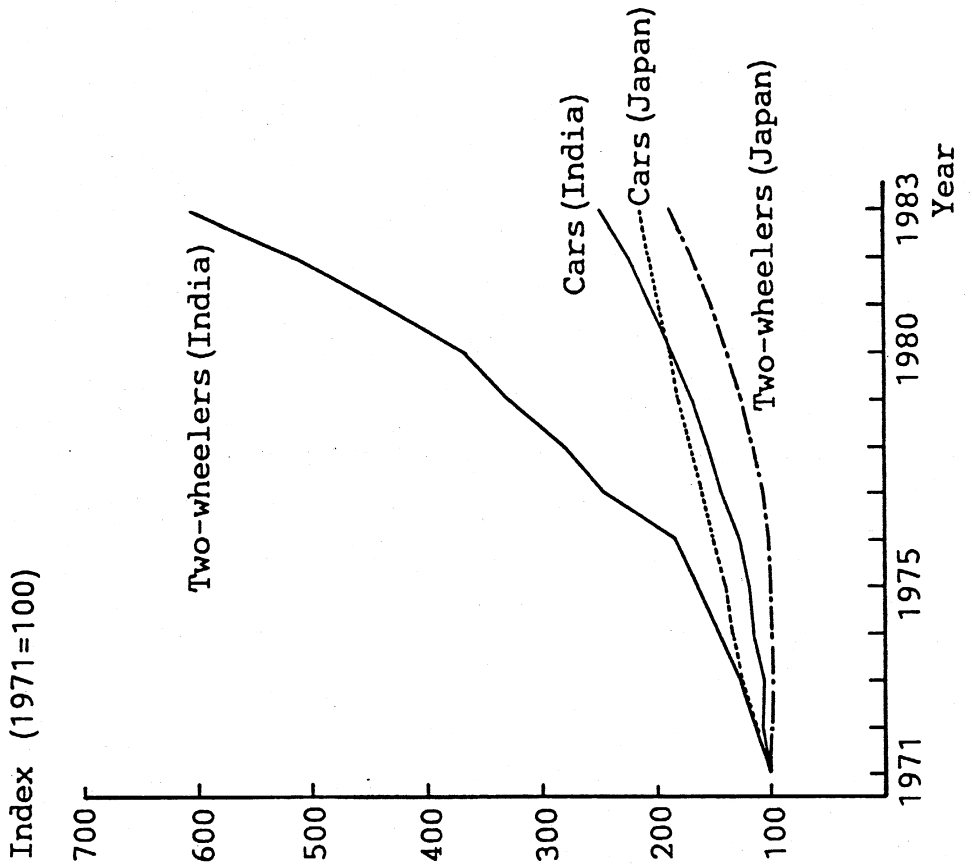
The advent of the automobile has increased our mobility facilitating transportation with improved levels of speed and comfort. However, humanity has to pay a heavy price for this facility in terms of human lives and human suffering due to traffic accidents. Currently road accident is one of the major causes of death in modern societies.

This paper examines the traffic safety measures in India as an example of developing countries and in Japan as an example of developed countries. The relationship between accident fatalities and motorisation in the two countries has been studied following the procedure suggested by Smeed (1949). From a consideration of the effects of traffic safety measures in Japan, suggestions are offered for improvement of the traffic safety situation in India.

2. URBANISATION AND MOTORISATION

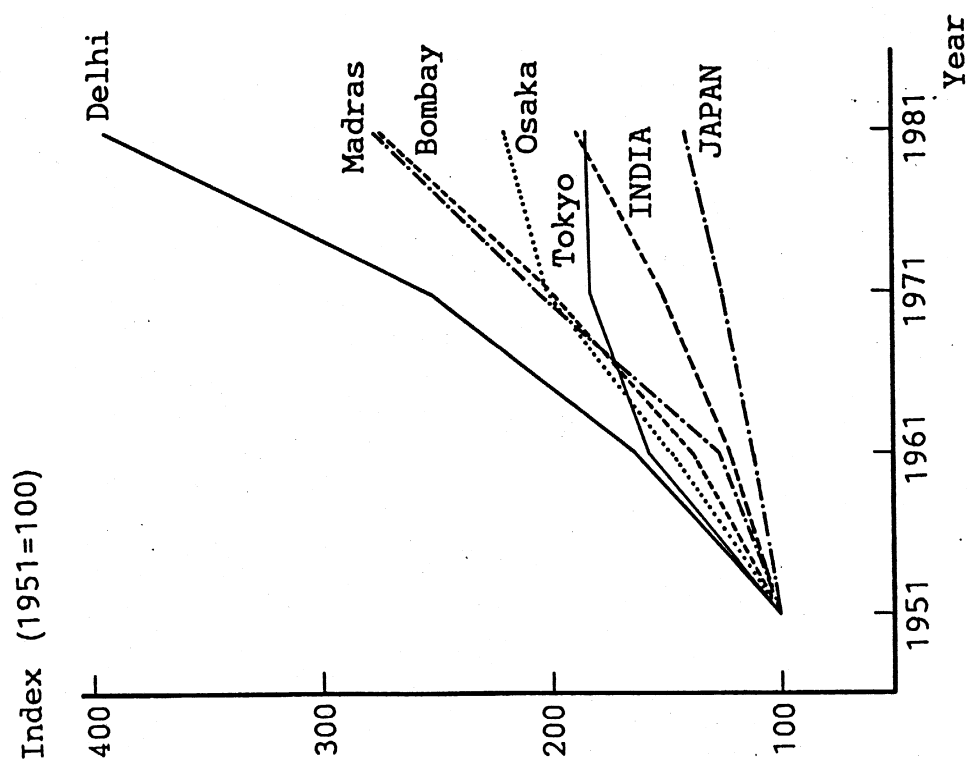
Traffic accidents in both India and Japan have been influenced by social and economic factors which are represented by urbanisation and motorisation. Subsequent to World War II, many industrialised countries emerged as developed countries. Rapid industrialisation resulted in concentration of people in urban areas.

The situation of growth of population in Japan and of major cities like Tokyo and Osaka is shown in Fig.1. The level of urbanisation in Japan now is nearly 73 per cent. It can be seen from Fig.1 that the rate of growth of population in Tokyo and Osaka has been steep during 1951-71, but the rate is now flatter as the cities have attained a mature stage.



Source: Assoc. of Ind. Auto. Manuf. , 1985
 KURUMASHAKAI '71~'86

Fig.2 Motorisation in India and Japan



Source: Census of India
 KURUMASHAKAI '71~'86

Fig.1 Population Growth in India and Japan

On the other hand, the economic growth and industrialisation are still in the stage of rapid growth in many developing countries. Thus in India, the population is increasing and the process of urbanisation is progressing rapidly. Major metropolitan cities like Calcutta, Bombay, Delhi and Madras are experiencing serious challenges due to rapid increase of population (Fig.1) caused by natural increases and also due to rural-urban migration resulting from the spread of difference in life-environment and employment-opportunities between urban and rural areas.

Motorisation, necessitated by industrialisation and urbanisation, is progressing in all countries. The increase is relatively rapid in developing countries and generally gradual in developed countries. The growth rates of cars and two-wheelers in India and Japan are shown in Fig.2. In developing countries like India, the two-wheeler has gained tremendous popularity as a mode of private transport, because of its relatively lower cost of purchase and maintenance. The increased motorisation and the proliferation of two-wheelers have increased the risk due to traffic accidents.

3. TRAFFIC SAFETY SITUATION

The rate of traffic accidents per registered motor vehicle is higher in developing countries than in developed countries. For example, in India in 1980, the number of fatalities per 10,000 registered motor vehicles was 59 and traffic accidents claimed 24,085 lives and 113,670 injury victims (Kadiyali, 1984). In contrast, the number of fatalities per 10,000 motor vehicles (excluding two-wheelers) in 1984 was 2.8 in Japan and the casualties included 12,432 killed and 644,321 injured (White Paper, 1986). The traffic safety situation is thus a cause for concern in both countries, when one considers the actual number of road accident casualties.

It would be worthwhile at this stage to review the experience in Japan. The number of traffic casualties reached 21,535 deaths and 981,096 injuries in 1970. In this year, the Fundamental Law Related to Traffic Safety Measures was introduced in Japan. In

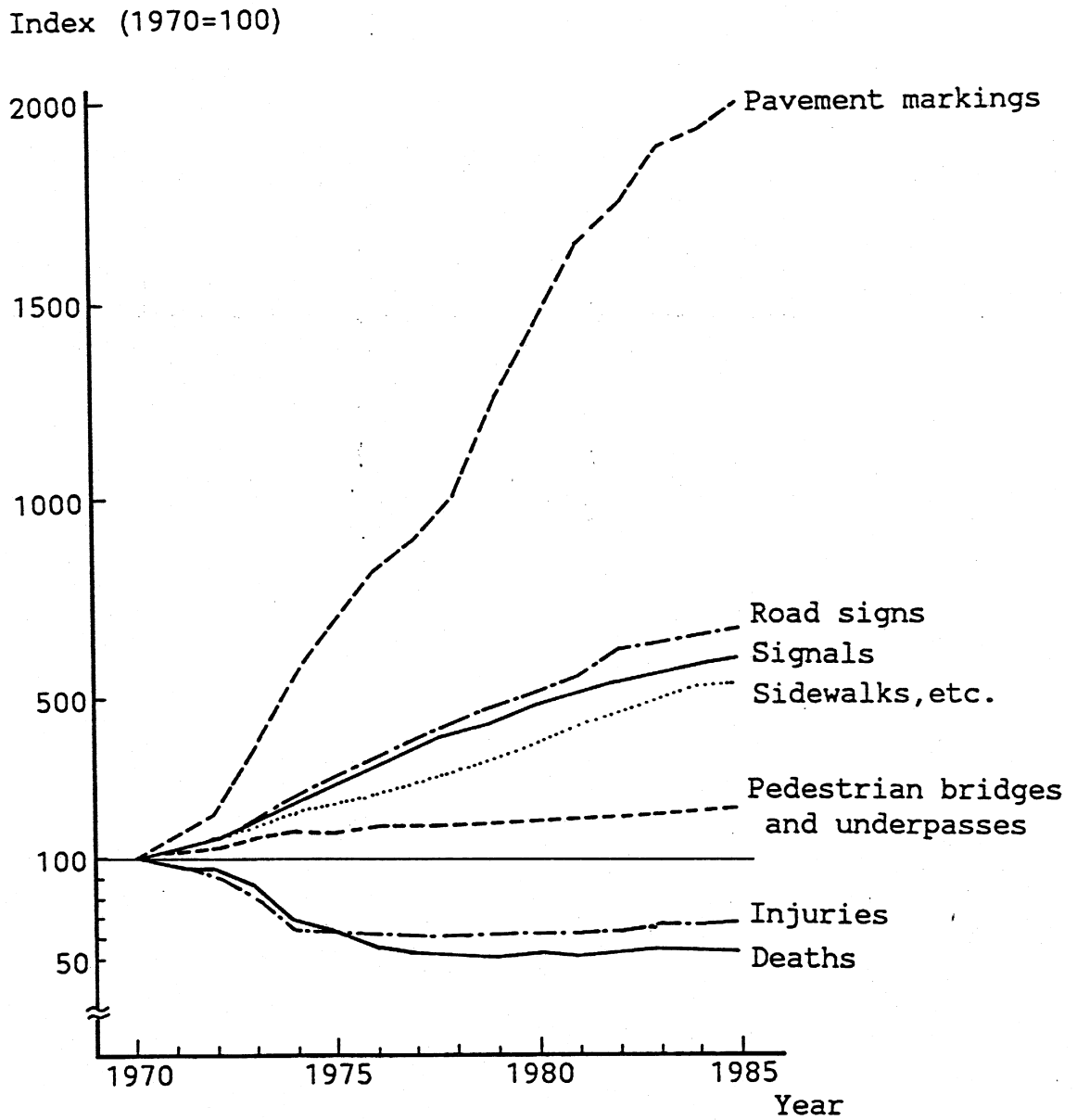
accordance with this law, major investments were directed towards engineering and enforcement measures to facilitate safe traffic operation. As a result, the magnitude of casualties decreased to 12,095 deaths and 593,211 injuries in 1977, even though the number of motor vehicles registered an increase from 26.74 million to 41.43 million (including two-wheelers) during this period. However, from 1978 the trend in accidents became steady and even showed a slight increase from 1981 onwards (IATSS, 1986).

The effect of traffic safety facilities on the number of fatalities and casualties in Japan is shown in Fig.3. It can be seen that the engineering improvements such as pavement markings, signs and signals, pedestrian facilities and grade-separated crossings evidenced immediate returns during the period 1970-77; but massive continued investments on these facilities did not show marked effects in further reduction of accidents after 1978. Herein lies a lesson for developing countries like India. A developing country need not be discouraged by lack of funds to match the high financial cost of improvements finally achieved in Japan by 1985. Even modest, but concerted, efforts would pay rich dividends in terms of enhanced traffic safety as obtained in Japan during 1970-77.

4. TWO-WHEELER SAFETY

The trends of accident fatalities during 1975-85 categorised according to the road user are shown in Fig.4. The countermeasures initiated since 1970 have been effective in reducing fatalities for pedestrians, bicyclists and car riders till 1977 and then in preventing significant increase later. But the accident fatalities to riders of two-wheelers have been increasing rapidly since 1977 and currently constitute a serious challenge to traffic planners. The slight increase in total accident fatalities noticed after 1980 is mainly attributable to accidents suffered by two-wheeler riders.

The break-up of two-wheeler accident fatalities in Japan in 1985 according to the age group of the victims is furnished in Fig.5. About 58 per cent of the two-wheeler fatalities involve

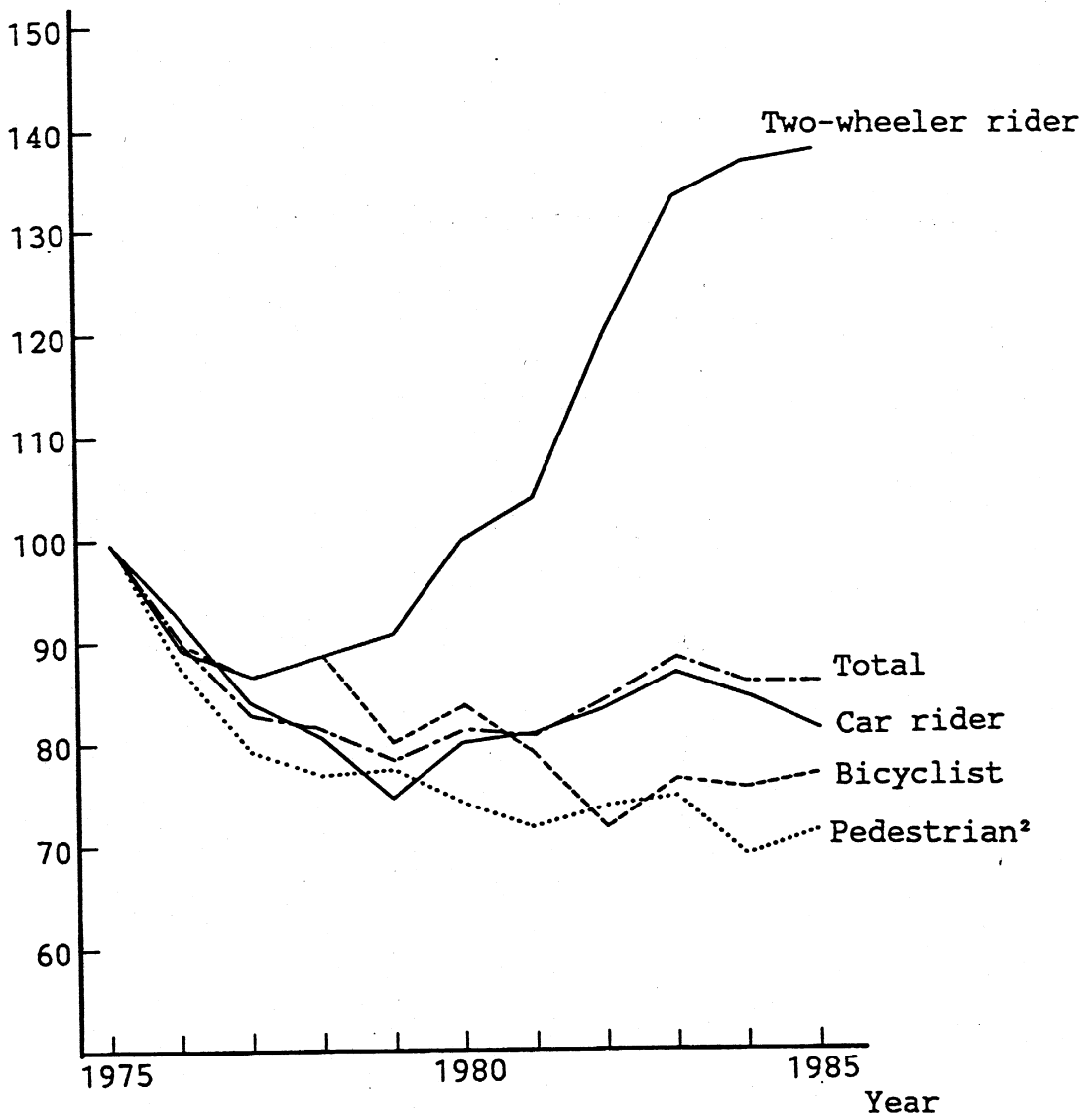


Notes:

1. Source: WHITE PAPER ON TRANSPORTATION SAFETY IN JAPAN '86
2. The number of traffic safety facilities are as of end of March of each year.
3. Sidewalks, etc. include bicycle paths.

Fig.3 Effect of Safety Facilities on Traffic Accidents in Japan

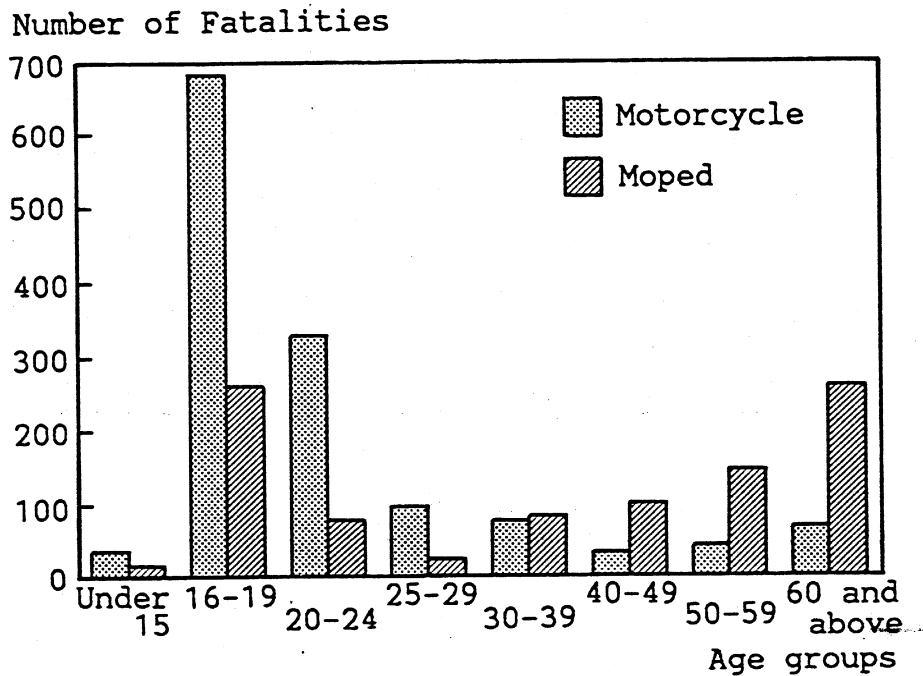
Index (1975=100)



Notes:

1. Source: WHITE PAPER ON TRANSPORTATION SAFETY IN JAPAN '86
2. Including walking and playing on a road

Fig.4 Fatalities in Japan by Road User Categories



Source: WHITE PAPER ON TRANSPORTATION SAFETY IN JAPAN '86

Fig.5 Fatalities of Two-wheeler Riders in Japan
by Age-group Categories

young people in the age group 16 to 24 years, who presumably tend to overlook caution while attempting thrill from speed on the road. The economic loss to the country due to loss of these potential contributors to the nation can be significant. Moped riders of over 60 years of age account for 11 per cent of two-wheeler fatalities, possibly due to decline of driving capabilities.

The share of two-wheelers in the vehicle composition is rising rapidly in developing countries. There were 3.51 million motorised two-wheelers registered in India in 1983 as compared to 1.06 million cars (TCPO, 1986). The accidents to two-wheeler riders are therefore increasing in India and typically constitute about 16 per cent of the total accidents in a metropolitan city (Victor, 1985). It is likely that the accident situation in India will worsen in the near future unless major efforts are made towards ensuring safety.

Motorised two-wheelers are vulnerable to deficiencies in road maintenance, and are at a disadvantage in a traffic stream composed of heavy vehicles. While the increase in two-wheelers in the country cannot possibly be halted, their presence on congested urban roads could be reduced by simultaneously improving public transport and providing parking facilities at bus terminals and railway stations located away from the inner city areas. The importance of traffic safety education in enhancing the overall traffic safety situation cannot be over-emphasized (Victor, 1980). With regard to safety of two-wheelers, both Japan and India are yet to evolve effective countermeasures.

5. TRAFFIC SAFETY SCENE VIEWED IN SMEED FORMAT

Smeed (1949) formulated that the rate of traffic fatalities per motor vehicle decreased as the vehicles per person increased in a country. The 'longitudinal' data for the traffic accident situation in India and Japan for the recent years are plotted in Fig. 6 following the familiar log-log representation for the relationship between the fatalities per 10,000 vehicles and the vehicles per 10,000 population, using data for Japan from White Paper (1955-86) and for India from Motor Transport Statistics (1972-83). In this figure the number of vehicles includes two-wheelers. The relationship for Japan is represented by three straight lines corresponding to three time-periods to facilitate better appreciation of the phenomenon.

A study of Fig. 6 leads to the following inferences:

- (a) For any given set of longitudinal data, the fatalities per motor vehicle decrease with the increase in vehicles per population as indicated by the following equation due to Smeed (1949).

$$\left(\frac{F}{V}\right) = c \left(\frac{V}{P}\right)^n$$

where F = number of fatalities
V = number of motor vehicles
P = population
c = constant
n = exponent

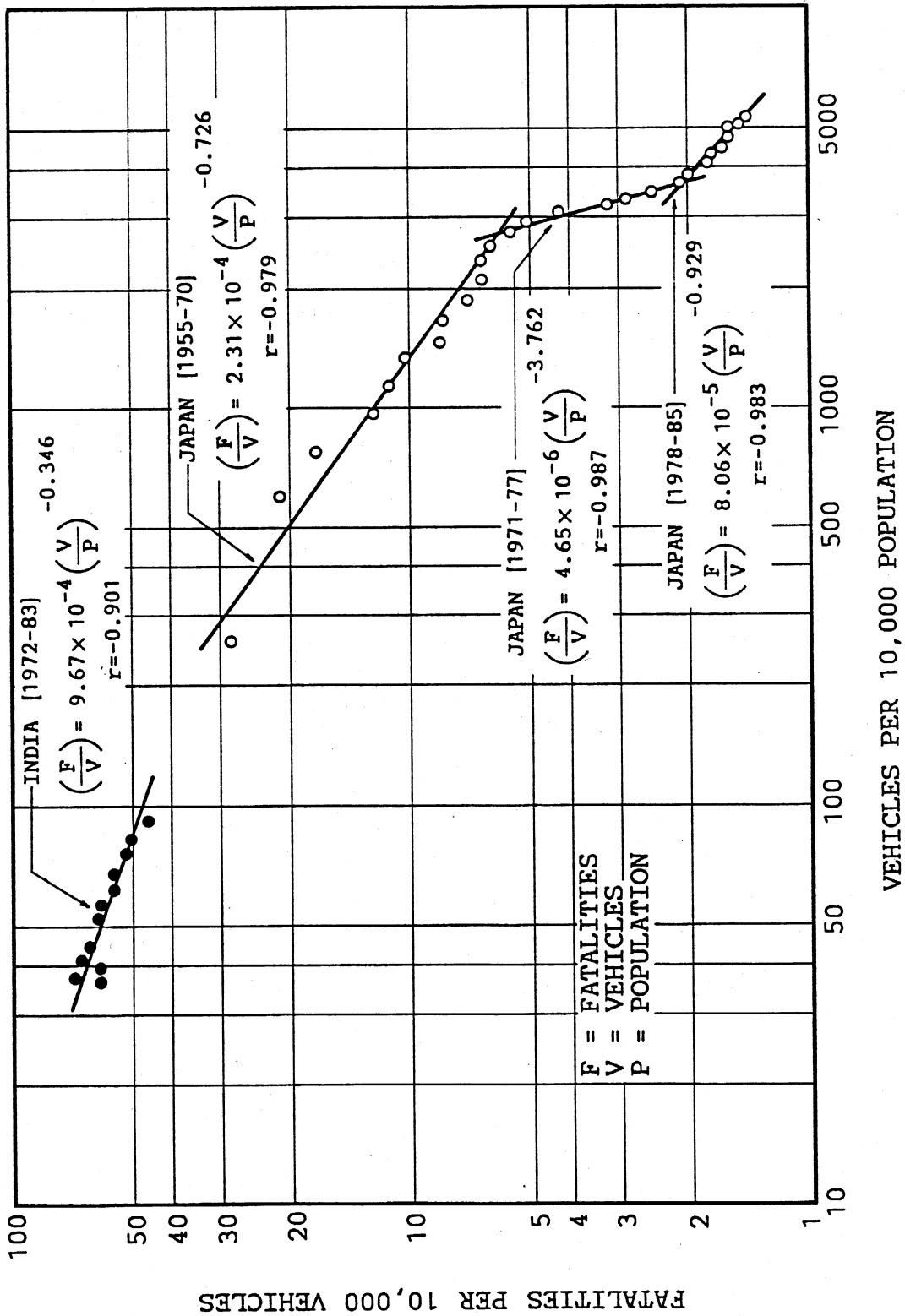


Fig.6 Accident Trends in India and Japan

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The values of c and n are dependent on the demographic and socio-economic conditions of the country concerned during the period under review. (This view differs slightly from the original formulation, which considered 'cross-sectional' data for a number of countries and attempted to evaluate generally applicable values for c and n .)

- (b) The accident fatality rate per motor vehicle would decrease gradually with increase in vehicles per person, due to 'learning' of the society to adjust to motorisation, as seen from the trends for Japan during 1955-70 and for India till now.
- (c) The fatality rate per motor vehicle could be lowered very significantly by intervention through improvements in engineering and enforcement, as evidenced in the case of Japan during 1971-77.
- (d) Below a limit of about 2 fatalities per 10,000 vehicles, additional investments in engineering and enforcement improvements lead to a relatively lower rate of decrease in fatalities per vehicle, which rate is only marginally better than the rate prior to the major intervention, as seen from the trend for Japan during 1978-85. At this stage, further attempts towards enhancement of safety have to be concentrated in the area of traffic safety education and driver training as also pointed out by Koshi (1986).

6. CONCLUSION

The experience of Japan in successfully reducing the rate of traffic accidents is worth studying for adaptation in India. The major countermeasures adopted in Japan are in engineering improvements to roads by providing signs, signals, road markings, better sidewalks and grade-separated crossings, besides enhancing the efficiency of enforcement. As mentioned already, even a modest investment on safety improvements, if planned and coordinated well, would lead to a remarkable

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reduction in the number of accidents in India. Additional efforts are needed in the area of traffic safety education in both countries and there is scope for further research on the management of two-wheelers in traffic to ensure their safe operation.

ACKNOWLEDGEMENT

The authors record their gratitude to Prof. Akira Konno, Department of Regional Planning, Toyohashi University of Technology, Toyohashi for his encouragement.

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SUMMARY:

Traffic safety situations in India and Japan are reviewed. Using the Smeed format, the effect of intervention on the relationship between accident fatalities and motorisation in Japan has been studied. Japan achieved a remarkable reduction in accident fatalities during 1971-77 through substantial investments in engineering and enforcement improvements. It is suggested that even a modest investment on traffic safety improvements could lead to dramatic decrease in deaths due to accidents in India. Additional efforts are needed in both countries to evolve effective countermeasures to enhance safety of two-wheelers and to expand facilities for traffic safety education.

RESUME: