

THE COST OF ROAD ACCIDENTS IN IRAN

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Abstract This paper gives an up-to-date estimate of the costs of road accidents in Iran. Conventional methods of estimating costs are considered together with special factors which apply to Iran. An attempt is made to quantify direct and indirect costs of accidents, including considerations relating to the exercise of Shar'ia law. The overall results show that road accidents account for between 1.4 and 1.8 percent of the Gross National Product.

چکیده این مقاله مبتنی بر یک کار تحقیقاتی است که برای اولین بار در ایران اقدام به محاسبه علمی هزینه تصادفات جاده‌ای برای کشور نموده است. در این محاسبه علمی، هزینه‌های مستقیم و غیر مستقیم بر مبنای دو روش جداگانه یکی "تولید ناخالص ملی" و دیگری "قوانین دیات مبتنی بر فقه شیعه"، ارزیابی گردیده‌اند. روش اول یک روش صرفاً علمی معمول در کشورهای صنعتی جهان و روش دوم یک طریقه مبتنی بر وحی است. در عین حال نزدیکی نتایج حاصله از این دو روش کاملاً متفاوت حیرت آور است. روش اول هزینه‌های تصادفات جاده‌ای ایران را $\frac{1}{4}$ در صد و روش دوم $\frac{1}{8}$ در صد تولید ناخالص ملی کشور برآورد نموده‌اند. این محاسبات، سنگینی غیر قابل تصور این زیان ملی و ضرورت اقدام فوری را روشن میسازد. ضمناً ارقام بدست آمده در هر دو روش دقیقاً در محدوده یک تا دو در صد پیش بینی شده توسط محققین کشورهای صنعتی برای کشورهای در حال توسعه میباشد.

Introduction

Research works have established [1] that if the primary concern in transport project appraisal is to ensure an "economically efficient use of scarce resources"* (as is the case for example in a standard cost benefit analysis), then evolving criteria for assigning explicit (usually monetary) costs to accidents and explicit (again usually monetary) values to their prevention deserves serious consideration as a

* An allocation of resources (and accompanying distribution of commodities) is said to be "economically efficient" if (a) no alternative allocation of productive resources would lead to an increase in the output of some commodity (or desirable end), without reducing the output of some other commodity [3-4], and (b) no alternative distribution of commodities would increase the well-being of some individual without reducing that of some other individual(5).

real solution.

Examples presented in some research works [2], indicate quite clearly that far from being a matter of subsidiary importance, the size of accident costs and the expense of accident prevention can (and, in most cases, almost certainly will) have a marked effect both on the ranking of transport projects in terms of net present value within mutually exclusive groups and on the magnitude of net-benefits generated by any given project.

Also the importance of estimating and valuing the cost of accidents, in the process of their legal and economical analysis is undeniable.

Additionally, in finding ways to reduce the costs of accidents, it is essential to first value them, and since any system of primary* acci-

* For primary, secondary and tertiary accident cost reductions see Ref. 6.

dent cost reduction is ultimately a system for determining the desired level of accident costs, i.e. how much we want to limit or restrict otherwise desirable activities because of the accident cost they cause, any system of primary accident cost reduction must face not only the question of which acts or activities "cause" accident costs but also the double-edged question of what value to give to the accident costs they cause and who in any society would be empowered to make that determination. In short, all other possible procedures for taking account of the safety effects costs and road accident costs, other than the cost benefit approach (assigning explicit values to those costs), have been shown to lead to inconsistency and inefficiency. These include not only "ignoring the estimates and valuations" but also "relying on informal weighing of effects", (which is the case presently in Iran), to "base decisions upon imposed safety standards", or even "to use some form of cost-effective analysis".

Defining such costs, which appears to be crucial, must take place with reference to the goals and sub-goals of the overall economic and social policy of any particular community, which is limited to "national output", "macro-economics", "social welfare" or "mixed" objectives. These are based on either "general" or "specific" deterrence methods.

Previous research [6] by exploitation of definitions, discussions and results obtained by other researchers for the issue of "costs", together with results of the analysis of road accident statistics of Iran tackled for the first time the issue of the cost of road accidents in Iran. An issue, which in most (if not all) developing countries including Iran, has as yet, received no attention.

This paper is based on that work

THE COMPONENTS OF ROAD ACCIDENT COSTS

The cost of accidents can be conveniently summarized by using as a basis the following

framework developed by Reynolds [5].

- a) The direct tangible costs, such as damage to vehicles, etc.
- b) The indirect costs to the community, such as reduction of output, etc.
- c) The intangible social costs such as pain, etc.

The National Safety Council of the United States has based its evaluation on these components [7]:

- a) wage loss, b) medical expense, c) insurance administration cost and, d) property damage.
- The author's evaluation for the cost of road accidents in Iran is based on the following components:

1. The costs of destroyed or damaged objects
2. The costs of physical injuries (excluding permanent disabilities).
3. The cost of time wasted in road accidents.
4. The costs of pain, suffering, psychological injuries and sentimental damages.
5. The costs of lives and permanent disabilities.
6. The costs of administrative expenditures.

For computation of the above costs, the real system price adopted by the Central Bank of Iran [3] which is a combination of all three kinds of prices existing in the country (state, preferential and free prices) has been chosen. For a detailed explanation of different price systems in Iran see Ref 6.

THE COST OF DESTROYED OR DAMAGED OBJECTS WITH A MARKET VALUE

The essential cost evaluation deals with damage of those objects that have a fairly definite market value. Generally speaking, this is the area of property damage.

- a) The cost of destroyed or damaged vehicles is shown in Table 1.
- b) There are no data available for the cost of other objects destroyed such as, the road itself, traffic barriers, property beside the

road, etc. Therefore, a few percent of item (a) takes into account these data in Reference 6.

THE COST OF PHYSICAL INJURIES (EXCLUDING PERMANENT DISABILITIES)

The problem of finding adequate valuations of physical injuries is a complex one. There are elements in most physical injury situations that can be valued reasonably well by extrapolating from market values determined in non-injury situations, e.g. working hours lost. There are also elements that can be valued in a market way because they can be satisfactorily repaired and the cost of repairs (such as medical expenses [8]) are, on the whole, good market indications of their minimum value. However, elements for which there are no ready market values, and virtually all included in physical injury situations such as "pain and suffering" or "loss of dignity", will be discussed separately. But the costs for severe injuries include some partial or provisional disabilities.

There is no record of medical costs spent for road casualties available in Iran but the author in his previous work presents the figures summarized in Table 2 based on his investigations and judgements but with the clarification that these are only approximations [6]. It was assumed that 80-90% of the total "police recorded" number of injuries are slight to medium injuries and 10-20% severe ones*. From this 10-20% who are severely injured, one third have been thought to have been permanently disabled (which are excluded from this part), and the remaining two thirds were "to some extent" disable (which are included in this part).

Also, the value of one average working hour exposed to the risk of being lost in a road accident is calculated (6) to be 238 Rials per hour in 1983. Thus the total cost of medical expenses and working hours lost in road accident injuries in Iran in 1983 is summarized in

Table 2.

THE COST OF TIME WASTED IN ROAD ACCIDENTS

The cost of working hours lost due to injuries was discussed earlier. The cost of administrative post-accident times will be discussed in another section. Here only the cost of time wasted is considered. Such a cost, mainly because of "the importance of unemployment" is usually neglected in developing countries [9] but as this author has established [6], the behavior of road users in developing countries, in a cost benefit study of highway investment, cannot be treated as something different. The method selected as the theoretical basis is the one developed by Nouredin [10] and presented to the 17th World Road Congress in Sydney in 1983. This is based on the national behavior of a road user in selecting the least consuming road and to use the time saved in the best possible way to increase 1) output, 2) consumption, or 3) leisure. Thus, the cost of time wasted in road accidents in Iran in 1983 is determined as follows:

$33,351$ (the number of road accidents) X 6 (the average number of people involved in each accident) X 5 (the average hours wasted in each accident) X 0.556 (World Bank ratio, [9]) X 238 Rials, (the average price of one working hour wasted in Iran in 1983) = $132,398$ thousand Rials.

THE COST OF PAIN, SUFFERING, PSYCHOLOGICAL INJURIES AND SENTIMENTAL DAMAGES

These are elements for which there is no ready market value. The object is to monetize the non-monetizable, thus enabling market choices for or against accident-causing activities to be made. But monetary values are not necessarily an adequate representation of these types of damages. There are basically two possible approaches to this problem. The

Table 1. The Total Cost of Destroyed or Damaged Vehicles in Millions of Rials (1983)

	Slightly to Partly Damaged	Severely Damaged	Destroyed	Total
P. Car	771	356	263	1390
Bus	320	89	180	589
Mini-bus	407	111	185	703
Van	236	108	83	427
Truck	1821	343	600	2764
Trailer and other types of long vehicles	948	144	250	1342
Other (inc. Motor cycles)	81	44	36	161
Total	4584	1195	1597	7376

* Real Prices, see Ref. 6.
Source: Ref 6.

first possibility is to derive from a bargaining situation market valuations of the risk of such damages which could then be applied in non-bargaining situations. In the second approach, it is recognized that no adequate direct extrapolation can be made from those few market values available and, therefore, by a collective judgement, a guess is made as to what value a true market would give to various injuries.

Taking the rather arbitrary average values [2] for subjective costs, these costs for 1983 for Iran have been estimated to be 11,930 million Rials.

COST OF LIVES AND PERMANENT DISABILITIES

Here again, converting non-monetizables into money terms is, after all, simply a convenient way of reducing different items to the same scale of values, so that they can be compared and values chosen.

Monetization is necessary to any market choice among the different items and the comparison must be made if an intelligent collective decision is to be obtained. Regardless of who bears the burden of the losses of the accidents, "so long as it is not the victim", an evaluation of his or her loss must be made in order to remove it from the victim.

It is accepted, however, that human life is not something on which a monetary value can be placed. Some people even go so far as to argue that it is morally repugnant to attempt

Table 2. The Cost of Medical Expenses and Working Hours Lost in Rural Road Accident Injuries in Iran (1000 "1983" Rials).

	Medical Cost	The Cost of Working Hours Lost
Slight to Medium Injuries	820,190	892,367
Severe Injuries	9,649,50	1,653,538
Total = 13,015,595		

*For definitions, see Ref 6.

explicit evaluation of the safety of human beings. But it has been shown [6] that any decision by governments for or against the projects which are in any way related to safety, means putting a value on human life.

At least six different methods have been proposed [2] for defining the cost of accidents or the value of accident prevention. These are:

1. The "gross output" (or "human capital") approach.
2. The "net output" approach.
3. The "life insurance" approach.
4. The "court award" approach.
5. The "implicit public sector" approach.
6. The "willingness to pay" approach.

There are not enough estimates or data available in developing countries to be able to make a judgment about the implications of different accident cost and evaluation methods for project appraisal. But from available estimates in developed countries, two points are well established:

1. Different methods yield significantly different numerical costs and values.
2. To the extent that significant differentials emerge, such differences "matter" for project appraisal.

Reference 5 presents a table demonstrating the extent of relevancy of each of the methods for any objective or a mixture of objectives. Thus, the author in his previous work, [6] adopted two of the methods, i.e. "gross output+subjective costs", and "court award" for the cost of lives and permanent disabilities of rural road accidents in Iran as follows:

1. The "gross output approach": 48,471 million Rials.
2. The "Court award approach" based on Islamic rules (Shieea- Fegh'h): 78,222 million Rials.

THE COST OF ADMINISTRATIVE EXPENSES

It is well-known that the handling of after-accident legal procedures and compensation to the victims always represents administration

expenses. The most important expense is the cost of police administration, the cost of the legal system -- whatever it may be -- and insurance. It must be noted, however, that those parts of the administrative costs that are designated for safety improvement are not considered as accident costs and are excluded here. In fact, they are distinguished as the cost of accident prevention which is hoped to be dealt with in further research work.

These costs are calculated as being equal to 22,550 million Rials [6].

TOTAL COST AND COMPARISON WITH THE COUNTRY'S G.N.P.

The results of different components evaluated in preceding sections yield the following amount for the total cost of road accidents in Iran in 1983.

1. "gross output" approach: 104,214 million Rials
2. "court award" approach: 121,930 million Rials

The second approach yields a 17% increase in comparison with the first approach, which is a good indication of the compatibility and reasonability of the assumptions made by the author [6], in the process of those evaluations. For the extent of the existed disparity between the results of different research works in developed countries see Reference 2.

Reference 4 gives the country's total gross national product to be 6831.44 billion Rials. The similar figure for 1983 is not available, therefore, assuming the same figure for the year 1983, the percentage of road accident costs to the country's G.N.P. would be 1.5 and 1.8 per cent, respectively. These are exactly inside the limits indicated by TRRL for developing countries [11] for the cost of road accidents as 1-2% of their G.N.P.

CONCLUSION

Although Iran possesses one of the lowest records of road accidents among developing

countries [6] nevertheless, its cost of road accidents is extremely high, i.e. between 1 to 2 per cent of the country's total gross national product. This shows the importance and necessity for a continuous and extensive effort for the implementation of remedial measures in developing countries.

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