PERIODICA POLYTECHNICA SER. CIVIL ENG. VOL. 40, NO. 2, PP. 127-158 (1996)

PROPOSAL TOWARDS A FAIR SYSTEM OF ROAD USER CHARGES IN HUNGARY

Csaba OROSZ* – András KOVÁCS* – György GÁLDI**

*Department of Highway and Traffic Engineering
Technical University of Budapest
H-1521 Budapest, Hungary
Phone: + 36 1 463-3805, Fax: + 36 1 463-3799
**Commercial Bank Ltd.
H-1851 Budapest, Hungary
Phone: + 36 1 266-9698, Fax: + 36 1 266-9703

Received: October 20, 1995

Abstract

The highway sector in Hungary faces serious financial difficulties. Funds available are not sufficient for reasonable maintenance and development of the highway network. While fuel taxation gives high incomes to the state budget, the Road Fund itself is poorly financed. The present order of Road User Charges is not a real system; it has developed by random decisions according to the actual financial and political needs of the government. It contains a number of inefficient measures causing unnecessary cross-subsidies and uncovered external costs. Having evaluated the international experience on road user charges this paper proposes major changes in the Hungarian system. The role of direct charges (tolls, parking fees) should be increased — these can reflect the real costs of traffic, where and when they occur – while indirect charges should be kept at fair levels. Complicated taxes, high administrative costs should be avoided. External costs of accidents, noise, air pollution are to be internalised. Goods traffic on roads is to be handled in a market compatible way.

Keywords: transport policy, user charges, highway economics.

1. Introduction. The Inherited Position of the Highway Sector in Hungary

Fair charging of road users is a major issue of the transport policy. *This paper will propose* appropriate *measures* in order to move towards a better system of Road User Charges. The main objectives were defined by the Ministry of Transport, Communication and Water Management[1] (1994b):

' ... It would be desirable to arrest and if possible to reverse the growth in road traffic by diverting it to other means of transport. In order to devise appropriate policies and actions it is necessary to determine to what extent users of the roads cover the associated expenses.

[1]This paper is based on the Road User Charges Study, made by the Department of Highway and Traffic Engineering for the Hungarian Ministry of Transport, Communication and Water Management in 1995.

Delineate *a proposal for a system of road user charges* for Hungary, taking the system that exists in the country and in the international practice into consideration, that is

- practical and economically efficient to operate
- equitable to the various types of users
- non-discriminatory.'

The inherited position of the Hungarian highway sector is ambivalent, complicated and financially difficult. However, some advantages, some steps forward may be observed:

1. The *'Road Fund'* – established in 1989 – ensures reliable financial background to the maintenance and to the development of the highway sector.
2. Some *motorways* and Danube bridges are initiated *to be constructed by concession system.* Construction costs shall be covered by tolls of future road users.
3. Some forms of *environment* related
   a) *product charges* (on petrol, tyre, etc.),
   b) *differential ecotaxes* (reduced 'weight tax' on vehicles with catalytic converters, reduced tax on unleaded petrol, etc.) are introduced, and further measures like
   c) *emission charges*
   d) *deposit – refund systems* (recycling of cars, tyres, etc.) are under legal and public preparation.
4. As a consequence of points 1, 2 and 3 *the Hungarian public opinion gradually begins to accept* (or just tolerate)
   a) *the polluter pays principle* (under item 3)
   b) *the road user pays principle* (under items 1 and 2)
   c) *the earmarking of funds* (under items 1 and 3).
5. A certain part of people (public opinion influencing academics among them) accepts and spreads the view that *roads are not pure public goods any more,* and they should be handled as *'club goods'* in the future.
   '[Club goods' are well defined by BUCHANAN (1965), ROTHENGATTER (1992, 1993) and TÁNCZOS (1994a, b).]
6. Some *'willingness to pay'* in return for better, smoother services can be observed *among road users.*

Some important disadvantages of the inherited situation:

7. The whole public transportation sector (yet far from real market) is mainly *overregulated,* and destroyed by

- unnecessary rules;
- inefficient, expensive social concessions that are difficult to finance (discounts to passengers above 70, above 60, (55), discounts to children, etc.) [MACKETT (1992)].
- company oriented, lobby dependent subsidies (Budapest Transport Company, Hungarian State Railways, VOLÁN companies; while new entrepreneurs at the market are all handled completely differently).

8. Tariffs are low, the public transportation sector is deeply *underfinanced. Public transport hardly gets the depreciation costs.*
9. *Interconnections, interdependencies with other sectors,* subsectors, are also *ambivalent.* (The railways, health insurance sector, taxation motivations, policing — enforcement – corruption; etc.) Fair proposals to internalise external costs and transfer them to another sector (health insurance, e.g.) may prove to be waste of money, as all these sectors operate inefficiently.
10. *The moral* in transportation concerning
    - parking regulations,
    - speed limits,
    - bus+taxi lanes,
    - vehicle repair, etc.

    are *worsening* or constantly *bad.*
11. Since October 1990 (the blockage of roads as a protest against radical increase in petrol prices) *hauliers and taxi drivers are* considered to be a *strong pressure group* (lobby). Politicians are afraid to internalise external costs because of that reason as well.
12. The *'vote maximising approach* [DOWNS (1968)] *of politicians'* – a coming know-how from 'Western democracies' – leads to controversial measures and inconsistency around election campaigns (Subsidy of the Road Fund in Hungary; postponement of the introduction of the Budapest Parking System, etc.)
13. The *statistical database is hardly complete* and reliable. Compatibility with EU methods and terms is not ensured. (Both for transport and for other sectors).
14. Though GDP has been decreasing for years, around one hundred thousand of prestigious *company cars* are imported year by year. Due to the too high taxation, the company car is one of the most important promotion methods. Thus
    - *out of pocket costs are* minimised,
    - public policy measures to reduce individual car traffic may not be successful in important segments of society.

The advantages and disadvantages mentioned here are not properly rated, and one might quote other relevant circumstances. Real figures, percentages have been shown in the literature, or will be highlighted later if relevant.

Section 6 makes proposals concerning the *implementation of* the *measures*. However, the detailed implementation plan, including

a) *timing* of measures;
b) *public participation*, public relations;
c) *political and social compromises;*
d) *foreign affairs* issues with the European Union, etc.

is far *beyond the scope of this Road User Charges Study.*

Similarly, *political acceptance* is a hard issue. As there is extended world-wide experience with political resistance to any form of road user charges, it is quite natural that the case of Hungary and Hungarian politicians may prove to be the same. For this reason this paper sometimes proposes alternatives, second best solutions highlighting clearly the drawbacks of these substitutional options.

The paper fully appreciates that

- theoretical, academic justification of measures and
- political acceptability

are deeply different issues. Not to make a reasonable political compromise concerning the issue may result in that the Hungarian Road Sector continues to be funded

- by the exploitation of natural resources;
- by the tax-payers and
- by the health insurance system.

2. Check List of Charges, Taxes and Duties Payable by Road Users

Fig. 1 and *2* illustrate the rationale and the techniques of road-user

- charges,
- taxes,
- duties.

It should also be mentioned that beside user charges

- legal requirements, and
- physical restraint

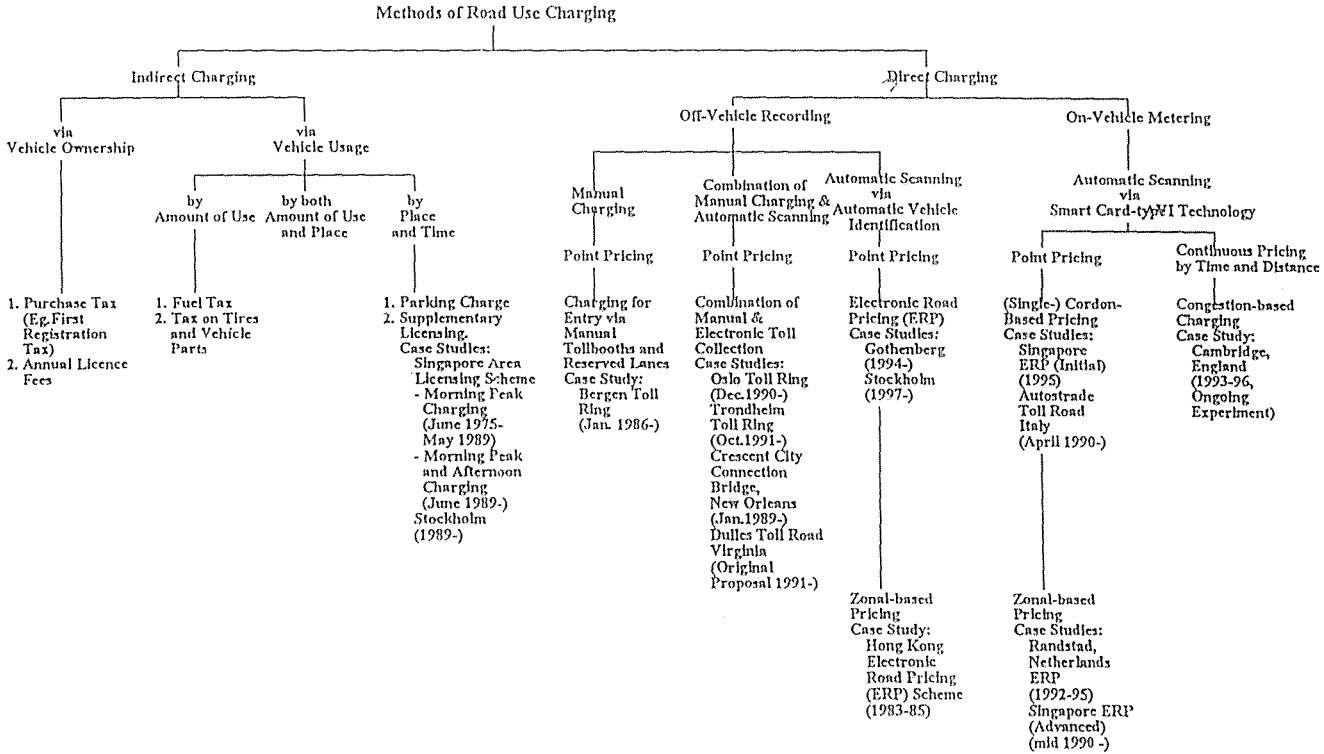
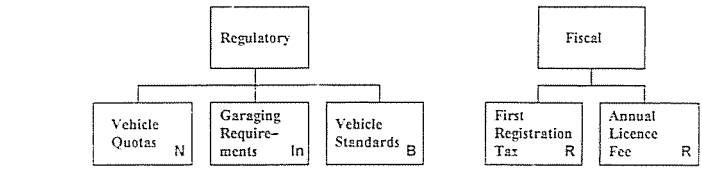
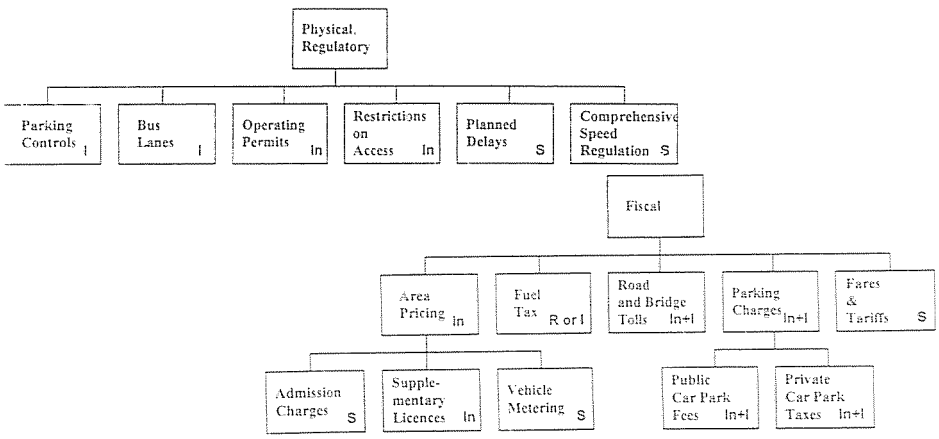


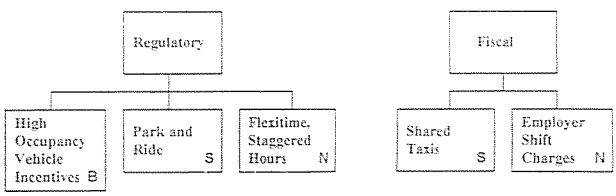
Fig. 1. Methods of road use charging [HAU (1992)]



a) Ownership Regulation



b) Usage Regulation



c) Behavioural Incentives

B - Business as usual
I - Increase
In - Introduce
In+I - Introduce + Increase
N - Not Needed
R - Keep at real value
S - Supervision needed

Fig. 2. Demand management methods for road use. Proposed measures for Hungary. *a*) ownership regulation; *b*) usage regulation; *c*) behavioural incentives
Codes: Preliminary opinion about proposed future application in Hungary. *B* – business as usual; *I* – increase; *In* – introduce; *In+I* – introduce + increase; *N* – not needed; *R* – keep at real value; *S* – supervision needed

are also influencing

- vehicle ownership (cars and trucks),
- vehicle usage (mode choice, trip timing, trip assignment, etc.)
- behaviour, attitudes, habits in transportation.

Figure 2a, b, c shows the most important regulatory (legal), physical and fiscal (user charges) methods that regulate vehicle ownership, usage and travel behaviour. That comprehensive list of methods is taken from HAU (1992) (working for the World Bank).

A comprehensive policy on land-use and transport should use these

- *regulatory,*
- *physical*
- *and fiscal*

instruments in a co-ordinated, synergetic way. All elements shown in *Fig. 2* should be analysed when creating the transport and fiscal policy of a country or a town. Most elements should be analysed twice, first for cars, then for trucks. (Sometimes certain instruments should be analysed also for buses and motorcycles). The codes at the elements of the figure refer to the possible future application.

3. Urban Traffic Problems

Table 1 shows the increase of daily traffic flows on Danube Bridges of Budapest. Looking at the lower part of *Table 1* the increase of car and goods vehicle traffic shows significant differences. As it can be seen in the last column:

- the 1994 – 1965 ratio with goods vehicles is 1.28, while
- the 1994 – 1965 ratio with cars is 5.54 (!).

The typical case for generated traffic may be observed with M0 expressway and Petőfi Bridge in years 1990 – 1994. In the same period traffic of other Danube bridges in the country decreased. These facts clearly justify that though it is always popular to blame

a) freight traffic,
b) transit traffic,
c) international transit traffic (foreigners),

however, *congestion* in Budapest is mainly caused by passenger cars (possessed by citizens of Budapest). Congestion in other larger cities is also

Table 1
Road traffic volumes on Danube bridges in Hungary
Figures in Budapest and in the country in the period 1931 - 1994
(Data when and where available) [1000 p.c.u./day; 1000 veh./day]

Bridges in Budapest	1931	1943	1954	1965	1980
Árpád Bridge /all [p.c.u./day]	–	–	4.9	17.8	55.8
Margit Bridge	7.4	13.6	10.2	25.5	57.1
Kossuth Bridge	–	–	4.0	–	
Chain Bridge (Lánchíd)	9.3	9.6	10.0	24.2	35.1
Erzsébet Bridge	3.7	7.1	–	17.9	89.4
Liberty Bridge (Szabadság)	7.3	8.0	7.7	13.6	36.5
Petöfi Bridge	–	5.6	7.6	28.3	60.0
M0 expressway (South)					
Total Traffic	27.7	43.9	44.4	127.3	333.9
Index (of Total) [1965=1.00]	0.22	0.34	0.35	1.00	2.37
Index of Goods Vehicles [1965=1.00]				1.00	1.55
Number of Goods Vehicles [p.c.u./day]				39.3	60.9
Index of Cars [1965=1.00]				1.00	3.39
Number of Cars [p.c.u./day]				65.9	223.2
Bridges in the country	1931	1943	1954	1965	1980
Dunaföldvár 1000 p.c.u./day					
1000 veh/day					
Number of cars [veh./day]					
Number of Goods Vehicles [veh./day]					
Baja 1000 p.c.u./day					
1000 veh/day					
Number of cars [veh./day]					
Number of Goods Vehicles [veh./day]					

caused mainly by cars. There are a lot of things yet to be done in *parking management* as well.

4. The Problem of Road Track Cost Allocation

According to the AASHO-Road Test (1960) the damage to the road pavement structure increases by the fourth power of the axle load. This fact could justify far much higher Goods Vehicle charges and car charges even lower than the present ones (weight taxes or annual license fees). However, some part of the costs must be allocated to cars as capacity cost. Careful German research resulted in the allocation method showed in *Table 2* [Source INFRAS-IWW (1994)]. The Swedish allocation method is basically the same. The only difference is in the weighting factor for Goods Vehicles: (That is 3.66 instead of 3.6).

Table 1
(continued)

Bridges in Budapest	1988	1989	1990	1991	1994
Árpád Bridge /all [p.c.u./day]	87.8	83.5	83.1	92.6	111.1
Margit Bridge	71.1	55.3	55.3	70.8	64.1
Kossuth Bridge	–	–	–	—	–
Chain Bridge (Lánchíd)	31.9	29.5	33.8	31.1	25.8
Erzsébet Bridge	78.7	72.0	69.0	84.1	88.3
Liberty Bridge (Szabadság)	25.1	23.0	28.5	30.5	31.1
Petőfi Bridge	96.0	75.1	82.1	78.7	72.0
M0 expressway (South)	–	–	–	11.9	39.5
Total Traffic:	410.5	338.3	351.9	399.7	431.9
Index (of Total) [1965=1.00]	3.23	2.66	2.77	3.14	3.39
Index of Goods Vehicles [1965=1.00]	1.64	1.35	1.56	1.47	1.28
Number of Goods Vehicles [veh./day]	64.3	52.8	61.2	57.7	50.1
Index of Cars [1965=1.00]	4.97	4.13	4.27	4.99	5.54
Number of Cars [p.c.u./day]	327.2	272.2	281.4	328.7	365.0
Bridges in the country	1988	1989	1990	1991	*1993*
Dunaföldvár 1000 p.c.u./day		12.6p	13.2p	12.4p	12.9p
1000veh/day		8.41v	9.25v	8.50v	9.05v
Number of cars [veh./day]		5.15v	6.25v	5.74v	6.25v
Number of Goods Vehicles [veh./day]		2.67v	2.43v	2.38v	2.36v
Baja 1000 p.c.u./day			7.6p	6.6 p	6.5p
1000 veh/day			5.43v	4.78v	4.90v
Number of cars [veh./day]			3.33v	3.07v	3.31v
Number of Goods Vehicles [veh./day]			1.41v	1.15v	0.96v

The United Kingdom applies another well-based approach. The U.K. method is used for about 30 years, and it is much more detailed than the German calculation. To be brief only the final U.K. ratios are shown in the last column of *Table 2*.

As the Department of Transport (1994) bulletin shows the 'Taxes to costs' ratios are

3.5:1 in case of cars, vans and taxis,
0.3:1 with buses,
1.2:1 with Goods Vehicles.

These ratios reflect that traffic of Goods Vehicles is considered to be part of normal operation of economy, while car traffic is taxed strictly. Results of *Table 2* and analysis of tax collection data prove that the ratio paid to the Road Fund by cars and goods vehicles is reasonable.

Table 2
The German allocation method to distribute road track costs

(Applied with available (1993) Hungarian data and compared with UK. results)

Weighting factor	Annual performance [10^9 ... km]	Weighted pcukm	and %	Necessary contribution to the Road Fund 10^9 HUF	U.K. ratios [%] (comparison)
1 ×	22.5 carkm =	22.50 –	57.9%	12.57	61.7
3 ×	1.0 buskm =	3.00 –	7.7%	0.97	4.1
0.33 ×	0.6 motorcycle km =	0.2 –	0.5%	0.11	0.4
3.6 ×	3.65 Goods Vehicle km =	13.14 –	33.8%	7.35	31.4
	Other				2.4*
		Total: 38.84 *'special pcukm'*	– 100%	21 × 10^9 HUF Road fund (1993)	100

* 2.4% is allocated to 'other' (crown, disabled, etc.) vehicles in the UK.
** 1 ECU = 137.86 HUF constant [Jan. 10. 1995]

5. Some Further Notes to the Future System of Road User Charges in Hungary

5.1. External Costs of Road Use in Hungary

Table 3 contains Road Transport Volume Data of 17 European countries together with Hungarian figures from years 1991 and 1993. The comparison is really useful with Greece and Portugal.

s *Table 4* gives estimate on total external road transport costs in Hungary. The figures in the first column show IWW calculations for 1991, while the second column contains year, 1993 calculations and the estimates of a Hungarian panel of experts. Major differences in the methods are the following:

a) Official Hungarian cost factors are used (9.0 million HUF/ fatality for e.g.) [SZILHÁTI (1994), TIMÁR (1992, 1994)]
b) Reduction of fatalities (2120 killed persons in 1991, 1678 killed persons in 1993) decreases accident costs as well.
c) The multiplication factor of 2.6 [European Federation ... (1993)] is not used for injury cost calculation.

As *Table 4* shows – getting a major change in accident costs – the total external cost of road transport excluding municipal road development,

Country	Vehicle km			Pass./ton km				Utilisation factor			
	Cars total	Buses	Goods Veh. [13]	Cars	Buses	total P	Goods Veh.	Cars	Buses	total P	Freight
	b veh.km/a			billion pkm/a			b tkm/a	P/veh			t/veh
Austria	42.0 [12]	0.5 [7]	5.2 [12]	72 [12]	13 [7]	85.0 [7]	13.1 [12]	1.71	27.85	2.00	2.52
Belgium	50.5 [2]	0.4 [3]	5.7 [3]	75.6 [7]	10.5 [7]	86.2 [7]	26 [3]	1.50	26.14	1.69	4.52
Denmark	30.7 [2]	0.5 [2]	6.3 [2]	55 [2]	10.4 [2]	65.4 [2]	10.4 [2]	1.79	20.80	2.10	1.65
Finland	33.1 [2]	0.7 [2]	5.4 [2]	46.4 [2]	8.1 [2]	54.5 [2]	23.8 [2]	1.40	12.46	1.61	4.42
France	325.0 [2]	4.0 [2]	105.0 [2]	599 [2]	43 [2]	642.0 [2]	148 [2]	1.84	10.75	1.95	1.41
Germany	406.0 [2]	3.4 [2]	44.6 [2]	693 [6]	71.4 [6]	764.4 [6]	203 [6]	1.71	21.00	1.87	4.55
Greece	9.4 [11]	0.5 [13]	3.4 [5]	9.1 [9]	5.3 [4]	24.4 [9]	12.3 [2]	2.03	10.24	2.46	3.64
Ireland.(Rep.)	19.7 [1]	0.2 [1]	5.0 [5]	36.4 [1]	3.83 [5]	40.2 [1/5]	5.1 [1]	1.85	15.70	2.02	1.01
Italy	259.8 [3]	4.8 [3]	45.5 [3]	528 [4]	160 [4]	688.1 [4]	167 [4]	2.03	33.05	2.60	3.67
Luxembourg	3.0 [3]	0.0 [3]	0.4 [3]	4.45 [10]	1.1 [10]	5.5 [10]	0.8 [1]	1.50	26.14	1.84	1.90
Netherlands	77.8 [2]	0.6 [2]	12.9 [2]	152 [2]	13.5 [2]	165.5 [2]	23.3 [2]	1.95	22.31	2.11	1.80
Norway	23.2 [7]	0.3 [7]	3.1 [7]	40.1 [3]	3.96 [3]	44.1 [3]	7.89 [3]	1.73	11.92	1.88	2.45
Portugal	35.0 [8]	0.6 [2]	2.0 [3]	67 [2]	10.5 [2]	77.5 [2]	10.9 [3]	1.91	17.07	2.17	5.40
Spain	76.0 [2]	2.0 [2]	24.2 [2]	145 [2]	38.6 [2]	184.0 [2]	150 [2]	1.91	19.22	2.36	6.21
Sweden	60.5 [1]	0.7 [1]	5.1 [1]	91.4 [1]	10.8 [1]	102.2 [3]	25.4 [1]	1.51	15.21	1.67	4.97
Switzerland	48.0 [1]	0.2 [1]	4.9 [1]	89 [1]	2.64 [1]	91.6 [1]	12.8 [1]	1.85	14.19	1.90	2.61
UK	329.7 [3]	4.3 [3]	60.0 [1]	568 [2]	41 [2]	609.0 [2]	125 [1]	1.72	9.53	1.82	2.08
EUR 17	1829	24	339	3282	448	3730	964	1.79	18.79	2.01	2.84
Hungary (1991)	23,7	1,1	4,0	47,4	22,5	69,9	14,1	~2,0	~20	~2,82	~3,5
Hungary (1993)	22,5	~1,0	3,65	45,0	20,4	65,4	13,2	~2,0	~20	~2,78	~3,6

1) Questionnaire 1991
2) IRF World Road Statistics, Edition 1993. Figures 1991.
3) IRF World Road Statistics, Edition 1993. Figures 1990.
4) IRF World Road Statistics, Edition 1993. Figures 1989.
5) IRF World Road Statistics, Edition 1993. Figures 1988.
6) BMV; Verkehr in Zahlen 93. Figures for 1991.
7) ECMT Statistical Trends in Transport 65-89. Figures 198.
8) Assumption: same p/veh. in cars as Spain
9) Assumption: same p/veh. in cars as Italy
10) Assumption, same p/veh. in cars and public service buses as Belgium
11) Intercity Traffic only
12) Statistisches Amt Österreich
13) incl. al kinds of goods vehicles
14) ERU (Ireland) 1990

Table 3
Road transport volume data in some countries (1991)

Table 4
Estimates on total external road transport costs in Hungary

Costs (1991) Source IWW (1995)		Costs (1993) Source Panel at BUT	
	[Mill. ECU/a]	[Mill. ECU/a]	[Billion HUFa]
Accidents	2.267	208 (–416)	29 (–58)
Noise	363	263	50
Air pollution	162	162	22
Climate change	227	227	31
Total	3.019 (414 bn HUF)	960 (–1268)	132 (–161)
Comparison: Greece	3.240		
Portugal	5.445		

administration and police costs may be estimated as:

$$\mathbf{132\ (-161)\ billion\ HUF \approx 0.96 - 1.27\ billion\ ECU.}$$

As FI (1994) refers to it further research is needed to get more precise figures both for roads and for the whole transport sector. PAVICS and KISS (1991) gave higher external cost estimates in their survey. Having great emphasis on health diseases caused by Road Transport, they published a value of 7.5% of Hungarian GDP. That is:

$$0.075 \cdot (\approx)4000\ \text{billion HUF} \approx \mathbf{300\ billion\ HUF} \approx \mathbf{2.2\ billion\ ECU.}$$

[Different methods naturally give different values. However, to remain in reasonable range it should be noted that the total budget for Health Insurance was 280 billion HUF (2.04 billion ECU) in year 1993.]

5.2. The 'Overkill' of Internalisation Policy

While section 5.1 showed the very different estimates on external costs, a further crucial issue should also be considered. When trying to internalise by '*t*' taxes, it is important to consider the functions shown in *Fig. 3.* In the INFRAS-IWW (1994) study ROTHENGATTER thinks about the famous IRU-Aberle-Engel (1993) document like that:

' ... But all of these effects are processed through markets yielding benefits directly to each actor in the chain of markets involved. Therefore no technological externality can be identified in the listing of the above effects. What can be concluded from this reasoning about 'extra social

benefits', 'technological externalities' and the 'cost savings approach' is that there is a fuzzy mix of technical terms, theoretical Marshallian arguments on pecuniary effects (consumer or producer surpluses) and practical direct cost estimations which are used to argue that the external costs for road transport are compensated by 'whatsoever' benefits such that pricing the external costs is welfare decreasing.

Trying to find the economic rationale of the IRU study one could define the problem as follows: An internalisation policy would increase the transport costs of road haulage, thus reduce its volume and increase the cost of all economic activities which use road transport as an input factor. This would be detrimental to economic welfare if the external cost factors are too high, thus leading to an overkill of the internalisation policy. *Fig. 3* exhibits such a situation. If the situation without considering external costs is denoted by A then a welfare loss ('dead loss') of ABC occurs which can be removed by introducing a tax t_1.

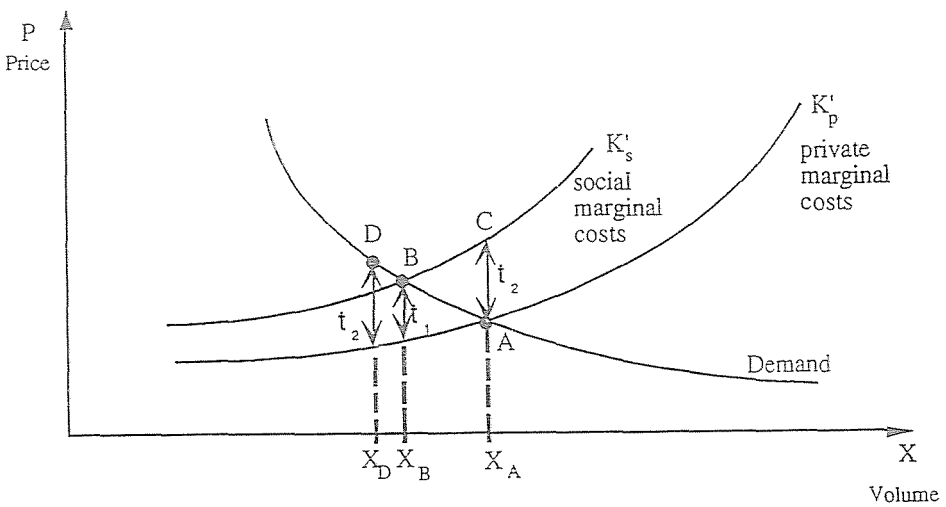


Fig. 3. The overkill of internalisation policy [ROTHENGATTER (1992)]

Note that this measure is improving net welfare. But if instead of t_1 a higher tax t_2 is chosen, motivated for instance by an analysis of externalities at the production level x_A, then the resulting cost burden for the producer of externalities is too high. Instead of the optimal level x_B the production is reduced to the level x_D. In this case the net welfare effect may come out negative. The summing up the positive message of the IRU study is that a careful analysis of the optimal size of external costs is necessary. Over-

stressing this message with the argument of positive externalities, however, means leaving the platform of welfare theory and entering into a world of fuzzy terminology which makes scientific discussion extremely difficult.'

Thus, after externality calculations calibrating good internalising taxes may prove to be a hard issue as well. The challenge is especially difficult looking at the complicated social and economical situation of Hungary. Cheating the tax system, cheating traditional and new legal regulations is a common behaviour of people and companies. Thus real effects and side effects, reactions to measures may be forecasted with great errors.

5.3. Railway Transportation and Combined Transport as Potential Alternatives

Though this paper is about road user charges it is necessary to summarise briefly some approaches with respect to the modal split between the road transport, the railway transport and the combined transport.

The choice of the mode of transport on demand side is basically influenced by:

- the accessibility of the different modes (availability of fixed and rolling assets)
- the required time for the service (waiting and transportation) time, uncertainties (flexibility),
- costs (price)
- character of the goods to be transported.

The Hungarian Railways (MÁV) has lost 60% of its transported goods since 1990. This number is mainly caused by the:

- decrease of relative transportation demand of the production lines,
- the termination of the international co-operation with huge export-import-transit raw material demand (including UN sanctions against Small Yugoslavia)
- better performance of some competitive railways with respect to transit services.

There are a couple of comparative advantages and disadvantages of the railway transportation compared with other modes of transit. *Some major advantages are:*

- high safety,
- low air pollution,
- preferable noise parameters,
- energy efficiency,
- low relative demand for space.

It is obvious that although such facts are important, only an environmentally sensitive pricing system of other modes of transport may persuade the customers to choose rail services.

The main disadvantages of railways are:

- longer time of transport, lower level of punctuality (not suitable for just in time services),
- higher cost of transport,
- lower level of commercial service quality,
- smaller geographical accessibility.

Investments may reduce some of these disadvantages, but others are caused by the basic characteristics of the given transport mode. Combined transport could be a part of the solution to find the appropriate form in realising the mutual advantages of modes.

In Hungary a form of combined transport has existed since the middle of the seventies: the carriage of containers. However, less than 5% of total transported goods is carried by containers. There are some fast target trains for the transport of containers. On the other hand, some other sophisticated techniques have been started recently:

a) The *huckepack* transport (mainly Austrian and German orders, terminals at Budapest, Szeged, Debrecen), around 10000 transported 'bodies' per annum. The spread of this method is limited by the lack of the suitable bodies;
b) The *Ro-La transport* since 1991. Currently in operation between Szeged–Wels, Sopron–Wels and planned in other directions. The construction of the terminals is supported by governments (in case of Sopron, Austrian) and the PHARE program. Other major costs of the establishment of such service is not completely solved, the lack of the purchased, leased (from Austria) special rolling stock is a barrier of widening the service. However, the potential capacity of the service is relevant, e.g. the offered capacity of the Szeged-Wels relation with 4 pairs of trains (24 trucks per train) is close to 10% of the number of entered lorries into Hungary. This service has been used mainly by Turkish, Romanian, Bulgarian, Greek hauliers for rational reasons: taking into account the provided preferences with respect to road permit requirements and applied taxation system in Hungary and in Austria. When the economy of Ro-La service is approached, it is necessary to take into account the operation related costs in each of the involved countries. The reduction of the charging level for road transport in Austria (e.g. for a lorry over 18 ton gross weight between

Hegyeshalom and Passau 240 ATS must be paid now instead of the previous 2814 ATS) has certainly a negative effect on the competitiveness of combined transport in general, though because of the lack of permits and other reasons the services between Hungary and Austria have a higher occupancy rate than in other relations flowing through Austria. When there are proposals to renew the charging structure, the high elasticity has to be taken into account regarding to combined transport usage.

c) The *Ro-Ro service* between Budapest and Passau is in operation since 1991 with a capacity of about 100 lorries per week. The service has a successful level of occupancy. In order to make this service more accessible, attractive and useful it would be reasonable to equip some other ports (Baja, Győr) with the required technology.

5.4. Parallel Application of Tolls and User Charges in Case of Hungary

According to the EC Directive of 03/89/EEC there is no possibility for the application of tolls and user charges in one Member State except tolls on bridges, tunnels (Article 7).

However, taking into account this regulation it can be considered that the partners will be willing to accept that in Hungary this regulation could be applied in a particular way.

Whereas:

- there is serious need for a well developed motorway network,
- the Ministry of Transport has issued a BOT for extension all of the motorways under a BOT scheme for strictly private investors,
- there are 2 concession agreements in force (M1-M15, M5 motorways) which oblige the state,
- other tendering procedures have reached sophisticated status,

it can be stated, that Hungary – having a pioneer role – has implemented meaningful efforts to establish a privately operated motorway network. The tolls under concessions are unquestionable. On the other hand, only limited development of the network could be realised with these exclusively private investments. Approximately additional 150 km motorway will be constructed by 2000. Having seen the indebtedness of the Road Fund for the forthcoming years, it has to be realised that (with the real value keeping method) only insufficient development and maintenance of the road network will be reached.

The (road) user charge, if it is implemented may become a major tool for collecting some additional revenue for:

a) proper maintenance and development of the state owned road network, especially on the intensively used main roads (and probably for state operated remaining parts of the motorways)
b) providing acceptable circumstances for international flows in/out/through the country, replacing the existing bottlenecks with improved facilities, and bettering routes with high accident ratios (bypasses, additional lanes, etc.)
c) for improving the situation caused by road users in city centres and other congested areas.

The user charge – based strictly on the usage of the asset – can be applied according to the territorial principle, being

- non-discriminatory on nationalities ,
- reflecting the cost of the usage of the given vehicle category,
- in harmony in its principle with the relevant regulations of the EC.

Section 5.5 contains four (A, B, C, D) possible scenarios to introduce a vignette/disk system.

5.5. The Potential Scope of the Introduction of Road User Charge (Vignette/Disk) System

Taking into account the terms and conditions of Council Directive 93/89/EEC of 25 October 1993 the potential geographical scope of the application of the vignette/disk type road user charge instrument may have A, B, C, D scenarios:

Scenario A

Scope: The vignette/disk is compulsory for any of vehicles with gross weight above 12 tons on the state operated motorways, expressways and on the primary road network. (Trunk roads: 1, 2, 3, 4, 5, 6, 7, 8, 10, 15, 21, 30, 40, 42, 43, 70).
The vignette/disk is not applied on the tolled motorways where the concession right has been awarded for private concession companies. Such motorways are operated as tolled ones.

Advantage: Many of the motorways and trunk roads with heavy traffic flow become subject of the system. The private investments under BOT schemes are not effected at all. (On the M1 motorway between Budapest and Győr no vignette system can be applied in the next decade according

to the Concession Agreement in force). Main bridges could be charged additionally.

Disadvantage: Some of the roads are categorised as part of the secondary road network having heavy (international) flows are not effected by the introduction (Roads 44, 52, 53, 55, 62, 81, 86). There is no way to introduce tolls on the state (owned company) operated motorway network (if any remains after the concluding of the tendering procedures). Inclusion of the primary road network requires diplomatic efforts.

Scenario B

Scope: As like in case of Scenario A and some elements of the secondary road network as additional. These complementary roads could be defined as the currently suggested transit roads (44, 52, 53, 55, 62, 81, 86) and/or roads with 'E' logo (as like road 86 as a part of E65 route).
The vignette/disk is not applied on the tolled motorways where the concession right has been awarded for private concession companies. Such motorways are operated as tolled ones.

Advantage: All of the roads having heavy traffic flows (internal and international ones) are touched with the system. The privately developed and operated motorways are not effected by the introduction (the M1 Budapest–Győr section could not be charged until 2005). The main bridges could be charged additionally.

Disadvantage: There is no way for toll collection on the state (owned company) operated motorways (if any). Huge diplomatic efforts are needed before implementation in order to assure the foreign partners that the wide scope of implementation is well-based.

Scenario C

Scope: All elements of the inter-settlement road network are subject of charging except the privately operated/developed motorways under the BOT scheme which continue their activity as tolled motorways.

Advantage: The potentially collectable amount from disk/vignette system charging reaches its maximised level. Bridges could be operated as tolled ones.

Disadvantage: The introduction of the system as such could cause serious concerns and increases the tensions while the lorries are mainly the ones that also could be charged in case of Scenario B or A. No way to introduce toll of the state operated motorways (if any).

Scenario D

Scope: Lorries using Hungarian motorway-expressway network, except the privately operated tolled motor ways.

Advantage: No significant internal or international objection raising is expected.

Disadvantage: The collected revenue will be on a relatively low level. Real implementation could be imagined only if significant state operated motorway network will remain after the tendering procedures for BOT. M1 Budapest–Győr section (125 km) cannot be place of charging until 2005.

Conclusion: According to the appraisal of the BUT Panel Members, if any of the scenarios will have become applied, the *Scenario B seems to be the most advantageous solution.*

Beyond options A-B-C-D, there is an additional question: what categories of lorries shall be the subjects of charging depending on their gross weight. From harmonisation point of view the 12 ton should be applied as bottom line of the charged categories. In charged categories further differentiation could be based on number of axles and ordering system.

6. The Proposed Elements of the Hungarian System of Road User Charges

6.1. Ideas and Practice

Most countries try to work out systems of ambitious, fair and transparent Road User Charges. However, achieving an ideal system (earlier symbolised by *Fig. 1* and *Fig. 2*) is very difficult. Series of political, social and fiscal decisions usually lead to the lower, double framed system of *Fig. 4*. Systematic long term activity may lead to an almost ideal system. The proposals coming in Section 6.2 follow the principles of the Ministry of Transport (1994a) and of SCHARLE (1994).

6.2. Proposed Measures. The New System of Road User Charges

The explanation to the proposed system of road user charges (referring to *Tables 5* and *6*) is the following:

1. In 1995 the government proposed the increase of *consumption tax on purchase* by 10%. The law has been changed by 1st May 1995.
   With this further tax increase the renewal of the old car fleet will slow down considerably. However, this measure may be kept.
2. To raise *Vehicle Excise Duty* by 200% is really radical. However, since 1992 the 2000 HUF/ton basic rate did not increase with inflation, so this measure means only 50% increase on the originally determined

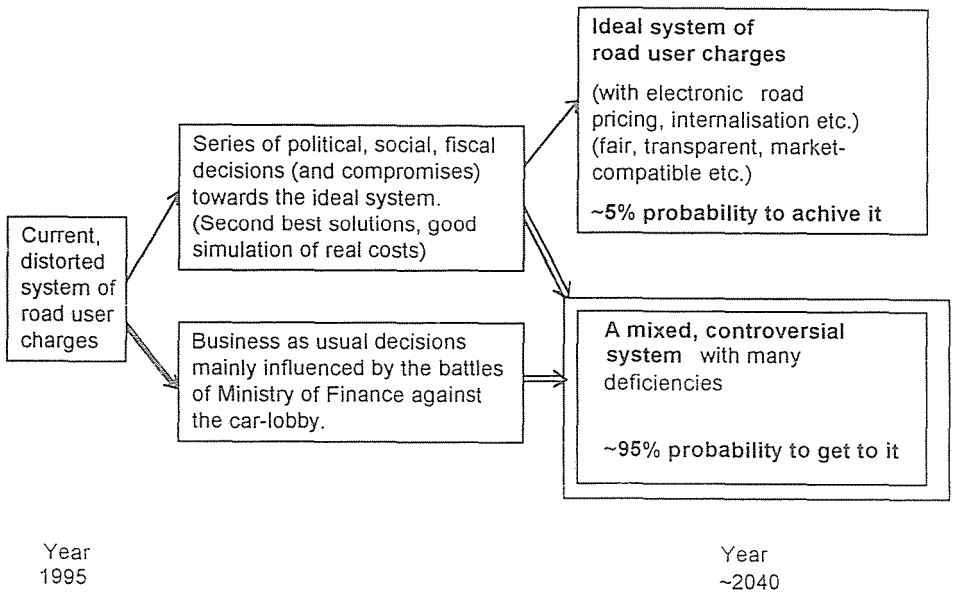


Fig. 4. The development process of the systems of road user charges

taxation level. It may become a social problem that families will be forced to sell their cars, but these are the last years to do so; old, useless almost 0 value cars are reexported to Romania and Ukraine. This way fixed cost of motorisation should be raised as well, taking into account the low level of the resources available for the Road Fund and for municipalities to ensure suitable maintenance and development activity.

3. To reflect costs of local road handling (including also the using of public space) a *Vehicle Excise Duty II.* component is proposed as a non-obligatory possibility for the local municipalities to collect additional revenue. This is for road handling as a joint administrative procedure with the generally applied VED. This additional duty could be levied by the municipality according to the general location of the vehicle upon its decision as a Local Tax. The duty in principle should depend on the general location of the vehicle. (Public space, private space, city centre, outskirts, etc.). What amount is required for the reliable handling of the road network in a given settlement?
To a reasonable extent land-use and social considerations may justify discounts

- to cars of handicapped persons
- to private cars (not to company cars)
- to first cars of families, etc.

4 – 5 – 6. *Petrol price* was considered to be the major tool for demand management of car traffic. As it is known, high fuel price may deter socially beneficial journeys (with low external costs, typically in the countryside) while socially disadvantageous journeys may continue in big cities. This would justify keeping fuel prices at real terms. However, petrol tourism seems to cause serious loss to the country.

Though this is strange, Hungarian fuel price index should be smaller than consumer price index during the forthcoming years. Travel demand will not increase, if on the other hand *appropriate charges* are introduced *where and when they are justified by externalities.*

With this principle the total fuel tax – without VAT —, need not be increased in real terms. Charges are proposed with the following inner rates:

(4.) the fuel tax must slightly decrease in real terms,
(5.) the Road Fund Tax must increase quickly,
(6.) the environmental product charge must increase.

State budget losses from (4.) will be counterbalanced by internalising external costs, by extra VAT revenues on parking etc. and by rows 11 – 12.

7 – 8. Municipal taxes on *public parking spaces and private car parks* may contribute both to substantial revenues and to comprehensive land-use and transport policy.

9. In a longer term, in 10 – 20 years *electronic road pricing* must come to practice. Without it, prices and real costs (with external costs) become totally independent from each other.

A market based supplementary licensing may be an efficient second best solution during the time of transition.

10. a *Tolls on bridges* are also good and fair second best solutions. The theory was based by DUPUIT (1844, 1849). It has a tradition till 1918 (FRISNYÁK (1987; HUNFALVY (1856)) in Hungary. Looking at the present value of the existing Danube Bridges, paying attention to 20 – 30% inflation rate, it is clear that several billion HUF (8 – 12) annual revenue would be needed to cover maintenance and depreciation costs.

It may well be the case that with certain conditions the Danube and Tisza Bridges should be privatised. Detrimental land-use effects may be reduced by season tickets and/or tax deduction schemes. Even if only 30 – 50% ownership and responsibility remain at the state,

Table 5
Proposed future road user charges for cars in Hungary
* 1 ECU = 137.86 HUF constant [Jan. 10. 1995]

Cars (and/or Goods Vehicles)	*Indirect* or *direct charge*	Charge *via*	Code	*Identification of Charge*	Charge or tax/unit [ECU** or %] [1995] → [1997]
a	*b*	*c*	*d*	*e*	*f*
1. *Cars*	Indirect Charge	*Vehicle ownership*	A1	*Consumption Tax* (Purchase Tax or First Registration Tax)	0% → 10% 10% → 20% 12% → 22% 22% → 32%
2. Cars	Indirect Charge	Vehicle ownership	A3	*VED I* Vehicle Excise Duty (Weight Tax= =Annual License Fee)	~14.5 → 44 ECU/ton, year 2.000 HUF/ton → 6.000 HUF/ton
3. Cars	Indirect Charge	Vehicle ownership	—	VED II as Public space utilisation fee	theoretically 0 – ∞ ECU/ton, year practically 0 – 400 ECU/ton, year
4. Cars (and GV together)	Indirect Charge	*Taxes by vehicle usage; by amount of use*	A5	Fuel Tax	~0.25 ECU/l [36 HUF/l] → 0.19 ECU/l [26 HUF/l] (1993 value)
5. Cars (and GV together)	Indirect Charge	Taxes by vehicle usage; by amount of use	A6	Road Fund Tax	0.07 ECU/l of petrol [9.5 HUF/l] → 0.105 ECU/l [14.25 HUF/l]
6. Cars (and GV together)	Indirect Charge	Taxes by vehicle usage; by amount of use	A9	Environmental product charge [on petrol, tyres, batteries, etc.]	0.01 ECU/l → 0.02 ECU/l

Table 5
(continued 1)

a	*b*	*c*	*d*	*e*	*f*
4 – 5 – 6 Together		A5+ A6+ A9		Total tax decrease from 0.33 ECU/l to 0.315 ECU/l> >0.245 ECU/l [ECU limit] +0.14 ECU/l 19.6 HUF/l VAT	
7. Cars (and GV together)	Indirect Charge	Amount of *use* and *place* and *time* (!)	A13	Municipal tax on public parking charges	— from 0 to 10 – 20% on public parking charges
8. Cars (and GV together)	Indirect Charge	Amount of *use* and *place* and *time*	A14	Tax on private (city centre) parking spaces	0 — 2 – 5% of potential yearly revenue
9. Cars (and GV together)	Indirect Charge	Place and time	A15	*Supplementary licensing (urban road user charge)*	—
			To cover direct costs		
10.a Cars (and GV together)	*Direct Charge*	Price setting of operator	B16	Tolls on bridges of Danube, Tisza etc.	[0.25 – 1.50 ECU [35 – 200 HUF] may be introduced]
10.b Cars (and GV together)	*Direct Charge*	Price setting of operator	B16	Tolls on private concession motorways, and on state owned motorways	~0.04 – 0.10 ECU/km for cars 0.16 – 0.35 ECU/km for Goods Vehicles
11. Cars (and GV together)	Indirect Charge	According to safety record of vehicle	—	*consumption tax on (net) third party insurance*	20 – 62 ECU/vehicle 25% consumption tax on (net) third party insurance

Table 5
(continued 2)

a	*b*	*c*	*d*	*e*	*f*
To cover state budget loss in fuel tax revenue					
To cover external costs					
12. Cars (and GV together)	Indirect Charge	According to safety record of vehicle	C17	*Health* insurance fee on third party insurance	80 - 250 ECU
13. Cars (and GV together)	Indirect Charge	as A9	C18	Environmental protection tax	—
14. Cars (and GV together)	Indirect Charge		C19	Recycling Deposit	~140 ECU/car ~20.000 HUF/car
15. Cars (and GV together)		Penalties	C19	Penalties for violation of the Highway Code	—
15/T Cars together)					
Cars and/or Goods Vehicles	*Indirect* or *direct charge*	Charge *via*	Code	*Identification of Charge*	Charge or tax/unit [ECU** or %] [1995] — [1997]

privatisation could result in more efficient operation and relief to state budget.

10. b *Tolls on motorways* (except some sections with bypass character) are considered to be necessary tools for development and for demand management.

11 - 12. Externalities mean the greatest problem concerning *road accidents*. As *Table 4* and section 5.1 show, some 20 bn HUF (140 m ECU) health care cost is covered by tax payers (health insurance payers) and not by road users.

25% health insurance fee should be levied on third party insurance to cover accident costs partly.

25% consumption tax should also be levied on third party insurance. The collected 6.9 - 7 bn HUF may partly cover costs of Road Adminis-

tration with transport related costs of Police. Though the third party insurance system is not sophisticated yet (it is still independent from mileage, conditions of car-use, potential risk, etc.), the bonus-malus system slightly reflects the potential danger. Both health care and policing costs are in weak correlation with the frequency of accidents, only damage accidents.

13 – 14. Environmental externalities are partly financed by the *environmental product charge*. The simplest method is to increase that factor and increase the sum to be used for environmental purposes.

Table 6

Proposed future road user charges for goods vehicles in Hungary
* calculated by: net weight + 50% of loading capacity
** 1 ECU = 137.86 HUF constant [Jan. 10. 1995]

Goods Vehicles (and/or Cars)	*Indirect* or *direct charge*	Charge *via*	Code in table 6.3.	*Identification of Charge*	Charge or tax/unit [ECU** or %] [1995] — [1997]
a	*b*	*c*	*d*	*e*	*f*
16. *Goods Vehicles*	*Indirect charge*	Vehicle ownership	A2	*VAT* on Vehicles	normal 25% VAT but refundable
17. Goods Vehicles	*Indirect charge*	Vehicle ownership	A4	Vehicle Excise Duty	14.5 — 44 ECU/ton EU system on axles and ordering system
18.a Goods Vehicles (and cars together) similar to row 4	*Indirect charge*	*Taxes by vehicle usage; by amount of use*	A5	Fuel Tax	—
18.b Goods Vehicles (and cars together) similar to row 5	*Indirect charge*	Taxes by vehicle usage; by amount of use	A6	Road Fund Tax	

Table 6
(continued 1)

a	*b*	*c*	*d*	*e*	*f*
18.c Goods Vehicles (and cars together) similar to row 6	*Indirect charge*	Taxes by vehicle usage; by amount of use	A9	Environmental product charge [on petrol, tyres, batteries, etc.]	—
19. Goods Vehicles	*Indirect charge*	Vehicle usage; by amount of use	A7	Tax according to annual mileage	—
20 – 21. Vehicle excise duty, and a vignette system. (See also row 17)					
20. Goods Vehicles	*Indirect charge*	Amount of use	A11	*VED for foreign Goods Vehicles*	0.023 ECU/tonkm 3 HUF/tonkm → 0.023 ECU/tonkm /remains
21. Goods Vehicles	Indirect Charge	Place	A12	Supplementary licensing *(vignette)* for motorways+ given categories of roads for residentials and foreigners above 12 to. – – – – – 'Road User Charge'	—
To regulate urban goods traffic and manage demand and congestion					
22. Goods Vehicles (and cars together) similar to row 9	Indirect Charge	Place and time	A15	*Supplementary licensing (urban road user charge)*	—
To cover direct costs					
23. Goods Vehicles (and cars together) similar to row 10	*Direct Charge*	Price setting of operator	B16	Tolls on bridges of Danube, Tisza etc.	[0.25 – 7.00 ECU 35 – 900 HUF may be introduced]

Table 6
(continued 2)

To cover external costs					
a	*b*	*c*	*d*	*e*	*f*
24. Goods Vehicles similar to row 12	Indirect Charge	According to safety record of vehicle	C17	Third party insurance	
25. Goods Vehicles similar to row 13	Indirect Charge	Amount of use	C18	Environmental protection tax	
Complementary measures					
26. Goods Vehicles (and cars together)	Indirect Charge	Various	—	All administrative and technical charges, fees, taxes	not relevant
27. Subtotal Goods Vehicles					
28. Total Cars and Goods Vehicles together					

However, a clear earmarking is justified in case of recycling of cars. A sum of 140 ECU could be asked as a deposit at the technical inspection when the cars are 6 years old. Refund can be made when the owner proves that his/her car was carried to a recycling site.

15. Stricter enforcement of the Highway Code could result in better morals, and more revenue for better purposes.

Goods vehicles (Table 6)

16. To keep the right for *reclaiming VAT* when purchasing Goods Vehicles is reasonable. However, as goods vehicles are often used for other purposes, as the limit between LGV's and cars is so small, further control is needed after the refunding of VAT in case of some vehicle categories (i.e. LGVs).

17. *Vehicle Excise Duty* should be levied basically from 1997 according to EU regulation, taking into account – beyond the gross weight – the number of axles and the ordering system as well. The charge in average will be approximately in the range of 42 – 44 ECU/ton. This level should be reached as with row 2. However, through a period of transition only half of the carrying capacity should be charged. This would ensure that Hungarian VED on trucks will be above the minimum level required by the EU for most categories from 1997. If it is not the case in a given category the minimum EU required level may be charged.
18. *Fuel price and fuel taxation* is to be the same as in *Table 5* rows 4–6.
19. *Odometer* is clearly needed in a long term, in order to levy realistic *infrastructure cost.* As row 17 'VED' levies a very high duty on goods vehicles, it can be an option for smaller entrepreneurs to register their mileage (infrastructure usage) officially, and pay a reduced VED. Later odometers will be needed to everybody. Without odometer – based on the existence of a possible disk/vignette system – (a part of) the VED could be deductible from the haulier's payment for vignette.

20 – 21. *To charge foreign goods vehicles* has different considerable options. All solutions containing indirect charges may cause foreign affairs (EU)-, administrative and/or financial problems.

a) *To keep the present administrative system*, and charge (a small part of goods vehicles) with significant level of 0.023 – 0.03 ECU/ton km while other foreign users of the infrastructure are not obliged to pay. It conserves the current not properly balanced handling of the operators with different nationalities.

b) Replacing the whole existing system *introducing a disk or a vignette*, and live together with the difficulties as like:
   - foreign affairs problem,
   - disadvantages to Hungarian hauliers as a response in foreign countries,
   - significant administration and enforcement costs (as HEGGIE (1991, 1992) shows the net revenue is 42 – 58%),
   - additional demand for using the underdeveloped Hungarian infrastructure by the hauliers having reduced fees,
   - decreasing the total revenue potential according to Section 5.5 and the figures of the currently collected VED.

International political concerns can be handled with the geographical scope determined in scenario B, but lowering the collected revenues may not be allowed in the present situation of the country.

c) *To keep the present administrative system;* to charge (a small part of the goods vehicles) VED with a significant level of 0.023 – 0.03 ECU/ton km and *simultaneously to introduce a disk/vignette system.* If a haulier of a given country is obliged to pay VED, he/she may reclaim (a part) of the road user charge paid in. Before introduction some efforts should be made in order to provide the necessary political acceptance from the foreign partners of Hungary. With *Scenario B* it could be reached with a reasonable effort if Hungary keeps the generally applied charging rate being in force in the EU countries.

The final decision on this subject is optional and mainly political. However, the revenue potential is only 8 – 12 million ECU; less than 1% of revenues collected in the highway sector.

22 – 23. *Supplementary licensing in towns* is the same as row 9 in *Table 5.* The problem of tolls is the same as row 10 in *Table 5.*

24. The same as row 12.

25. The same as row 13.

26. Technical inspection environmental inspection overweight control and other official steps require considerable costs. Technical and administrative (central and local) costs should be fully covered by the vehicle owners.

Tables 5, 6. show a total revenue potential of 1.10 – 1.24 bn ECU (154 – 171 bn HUF) compared to the former 1993 values of 0.98 bn ECU (135 bn HUF).

The proposed measures are reasonable and fair. The main danger is that municipalities will not levy the additional charges listed in *Tables 5 – 6* (lines 3, 7, 8, 9). Similar problems occur with tolls (rows 10a, 16), with policing and with health care costs (rows 11, 12, 24, 25) at government level.

7. Proposed Further Research Topics

There is a number of fields where Hungarian practice and documentation seems to be poor in international comparison. These fields are to be identified as *proposed topics for further research:*

1. *The allocation of infrastructure costs to various vehicle/user categories* (cars, trucks, motor-cycles and buses).
2. The *analysis of* the main *effects* (and side effects) *of present Hungarian taxation practice on transportation.*
3. *Proposal for a reasonable Hungarian general taxation policy concerning transportation.* [Major issues to be included:

- incentives or taxation on commuting;
- rail-road competition in freight traffic;
- harmonised measures, subsidy and/or tax on public transport and on individual transport;
- social equity;
- company car as a major instrument to cheat the tax and social insurance system.]

4. *The share of black economy in the Hungarian transportation sector.* Three kinds of data sets should be compared:
   a) Data given by hauliers/taxi drivers to the tax authority.
   b) Data derived from earlier statistics/statistical methods.
   c) Realistic data based on surveys, traffic surveys, statistics, interviews, etc.
5. The evaluation of external costs of transport with the
   - rail
   - shipping and
   - aviation

   subsectors of Hungary. The INFRAS-IWW methodology should be used for Hungary again, in order to get comparable data with 17 European countries [for these countries the calculation has already been completed. Look INFRAS-IWW (1994)].
6. The detailed analysis of health care costs caused by accidents in the
   - road,
   - rail,
   - shipping and
   - aviation

   subsectors of Hungary.

References

ABERLE, G. – ENGEL, M. (1993): The Social Benefits of the Long-Distance Road Transport of Goods. ('The Famous International Road Union Study') Gießen.

American Association of State Highway Officials (AASHO) (1960): Road User Benefits for Highway Improvements. A Report by the Committee on Planning and Design Policies. Washington, D.C. p. 152.

BUCHANAN, J. M. (1965): An Economic Theory of Clubs. *Economica*, Vol. 32. pp. 1–14.

DOWNS, A. (1968): The Economic Theory of Democracy. Wiley & Sons. (with 'vote maximising approach of politicians').

DUPUIT, J. (1844): On the Measurement of the Utility of Public Works. Annales des Ponts et Chaussées, 2nd series 8. Translated from the French essay 'De la mesure de l'utilité des travaux publics' by R. H. Barback for *International Economic Papers*, No. 2, 1952. pp. 83–110. Reprinted in Transport, ed., Denys Munby, Penguin Modern Economics. London, 1968. pp. 19–57.

DUPUIT, J. (1849): On Tolls and Transport Charges. Annales des Ponts et Chaussées. 2nd series, 4th part, pp. 207–248. Translated from the French essay 'De l'influence des peages sur l'utilité des voies de communication' by Elizabeth Henderson for *International Economic Papers.* No. 11. pp. 7–31.

European Federation for Transport and Environment [T&E] (1993): Getting the Prices Right. A European Scheme for Making Transport Pay its True Costs. Edited by Kageson, P. Stockholm-Brussels. p. 197.

FI, I. (1994): A környezeti hatásokról és csökkentésük módjáról. (Environmental Effects and their Reduction.) *Scientific Revue of Civil Engineering.* Vol. 44. No. 12. Budapest. pp. 483–486. (in Hungarian).

FRISNYÁK, ZS. (1987): Út-, híd- és révvámok Magyarországon (1853 – 1890) (Tolls and Charges on Roads, Bridges and Ferries in Hungary in the Period of 1853 – 1890.) *Bulletin of the Transport Museum 1985 – 1987.* Budapest, pp. 241–267. (in Hungarian).

GÁLL, I. (1984): A budapesti Duna-hidak. (The Danube Bridges of Budapest.) Published by Műszaki Könyvkiadó, Budapest, p. 148. (In Hungarian).

HAU, T. D. (1992): Congestion Charging Mechanisms for Roads: An Evaluation of Current Practice. World Bank, Transport Division. Infrastructure and Urban Development Department. Washington, D.C. p, 99.

HEGGIE, I. G. (1992): Selecting Appropriate Instruments for Charging Road Users. The World Bank Policy. Research and External Affairs. Report INU 95. Washington, D.C. p. 21.

HUNFALVY, J. (1856): Magyarország és Erdély eredeti képekben, történelmi és helyirati szöveggel (Hungary and Transylvania in Historical Pictures and Texts.) Darmstadt. pp. 75– 81.(in Hungarian).

INFRAS – Institut für Wirtschaftspolitik und Wirtschaftsforschung [IWW] (1994): External Effects of Transport. Project for the UIC. Final Report. Zürich - Karlsruhe. p. 337.

KISS, K. – PAVICS, L. (1991): Motorizáció-költségvetés-környezet. (Motorization-State Budget-Environment) Hungarian Traffic Club. Budapest p. 82. (in Hungarian).

MACKETT, R. (1992): Transport Planning and Operation in a Changing Economic and Political Environment: The Case of Hungary. *Transport Reviews.* Vol. 12. No. 1. pp. 77–96.

Ministry of Transport, Communication and Water Management Hungary (1994a): A magyar közlekedéspolitikai koncepció. 'S' munkaközi változat. (The Concept on Hungarian Transportation Policy. Interim Report. Version 'S', Budapest, p. 209. (in Hungarian).

Ministry of Transport, Communication and Water Management, Hungary (1994b): Road User Charges. Invitation to Tender. Budapest. p. 30.

OROSZ, CS. (1994): Közúthálózat-fejlesztésekkel kapcsolatos időszerű dilemmák. (Actual Alternatives with the Development of the Road Network.) *Scientific Revue of Civil Engineering.* Vol. 44. No. 12. Budapest. pp. 526–529. (in Hungarian).

PÁPAY, ZS. – LUKOVICH, P. – OROSZ, CS. (1991): Area-wide Traffic Demand Management by Road Pricing. *Periodica Polytechnica,* Vol. 36. No. 1. Budapest, pp. 57–75.

ROTHENGATTER, W. (1992): Externalities of Transport. Karlsruhe.

ROTHENGATTER, W. (1993): Obstacles to the Use of Economic Instruments in Transport Policy. In: Internalising the Social Costs of Transport, ECMT/OECD, Paris. pp. 113–152.

SCHARLE, P. (1994): A közutak szerepe és fejlődése a magyar közlekedési koncepcióban. (The Role and the Development of Public Roads in the Hungarian Transportation

Concept.) (in Hungarian) *Scientific Revue of Civil Engineering.* Vol. 44. No. 12. Budapest. pp. 463–486.

SZILHÁTI, S. (1994): Közúti csomópontok fejlesztésének hatékonyságszámítási módszere világbanki elemzések számára (Cost-Effectiveness Analysis with the Development of Road Intersections: A Method for World Bank Evaluations) Lecture at the Course of the Hungarian Road Directorate. Lecture Notes. Balatonföldvár, p. 5. (in Hungarian).

TÁNCZOS, C. (1994a): Az európai közlekedési miniszterek konferenciájának módszertani ajánlásai a közlekedési beruházások tervezésére és értékelésére. (ECMT Proposals for Planning and Evaluation of Transport Investments.) (In Hungarian) *Scientific Review of Communications,* Vol. 8. pp. 281–289.

TÁNCZOS, C. (1994b): A közlekedés társadalmi költségeinek internalizálása. (Internalising Social Costs of Transport.) (In Hungarian) *Scientific Review of Communications,* Vol. 11. pp. 389–397.

TÍMÁR, A. (1992): Financial Self-Help Measures: Taxation and User Charges. *Proceedings of the OECD 'Seminar on Technology Transfer and Diffusion for Central and East European Countries'.* [Budapest, 12 - 14. October 1992] OECD Publications Service, Paris. pp. 358–366.

TÍMÁR, A. (1994): Attracting Private Capital to Finance Toll Motorways in Hungary. *Transport Reviews,* Vol. 14. No. 2. pp. 119–133.

WILLEKE, R. (1992): Benefits of Different Transport Modes, ECMT, Economic Research Centre, Round Table 92, Köln.

INDEX