

ÁDÁM TÖRÖK, Ph.D.

E-mail: torok.adam@kti.hu

BME Department of Transport Economics

Bertalan Lajos u. 2., Budapest, H-1111, Hungary

ÁRPÁD SIPOSS, M. Eng.

Technical Committee of Road System Economics
and Social Development

Coordination Centre for Transport Development

Lövőház u. 38., Budapest, H-1024, Hungary

FERENC MÉSZÁROS, Ph.D.

E-mail: fmeszaros@kgazd.bme.hu

BME Department of Transport Economics

Bertalan Lajos u 2., Budapest, H-1111, Hungary

Transportation Economy

Review

Accepted: June 28, 2010

Approved: July 6, 2011

THE HISTORY AND THE FORESEEABLE FUTURE OF ROAD TOLLING IN HUNGARY

ABSTRACT

The main scope of this paper is to present the historical background and the foreseeable future of the Hungarian road tolling. In the introduction the authors have investigated the historical dataset of motorway constructions and analysed the unequal extension of motorway system in time and space. In this article the authors are considering road tolling as an instrument of financing road infrastructure investment and the maintenance and controlling possibilities of traffic flows.

KEYWORDS

road transportation, reduction of travel time, positive external effect

1. INTRODUCTION

Obviously, Hungary has to follow the European regulations. The current EU "Euro-Vignette" Directive 2006/38/EC, amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures contains common rules to ensure proportionality and non-discrimination, and allows the recovery of infrastructure costs only. The directive obliged the European Commission, after examining all options including environment, noise, congestion and health-related costs, to present a generally applicable, transparent and comprehensible model for the assessment of all external costs to serve as the basis for future calculations of infrastructure charges. This model shall be accompanied by an impact analysis of the internalisation of external costs for all modes of transport and strategy for a stepwise implementation

of the model for all modes of transport. The report and the model shall be accompanied, if appropriate, by proposals to the European Parliament and the Council for further revision of this Directive.

As a common principle the social marginal cost pricing is announced. A revision of the Euro-Vignette directive is an essential part of EU's Greening Transport Package of July 2008 as well as several other activities in the rail and air transport sector. The Commission's text proposal of the directive contains several new provisions, such as:

- allowing charges for the recovery of external costs from air pollution, noise and congestion;
- common methodology for the calculation of these external costs and notification;
- earmarking additional revenues for sustainable transport and the promotion of electronic free-flow tolling technologies.

To understand the current situation and future trends in Hungary after the description of the European current situation above, the authors have investigated the trend of road pricing mechanism in Hungary.

The motorway construction started from the central state budget in the early 1960s. After the economic reform in 1968 the transport policy focused on the tolled motorway scheme, which could not become reality because of the politics of that time. The speedway constructions continued on state and sovereign loan financing basis, until the 1980s when they first stopped and when the level of maintenance of these facilities dropped also dramatically. The Road Fund created in 1988 was a real help for the sector. In 1989 an attempt to introduce yearly vignette-based road user charging system failed.

In the 1990s the infrastructure development became an important issue as the vehicle fleet doubled to 2 million in the previous decade, but the motorway construction speed averaged only 10 km/year creating hardly more than 300 kms of network. Extending the road infrastructure has several positive effects: decreasing the unemployment rate, increasing the economical activity and decreasing the travel time [1]. After some legal changes the concession scheme was considered a panacea by the politicians. Although in two projects (M1/M15 and M5) the construction speed doubled but this led to extremely high toll rates. This level was 1.5-2 times higher than the average rate in the ASECAP countries. With the local incomes being 5-8 times lower, 50-55% of the cars in the traffic corridors did not even tried to use the services of these tolled motorways. However, the

real disaster was the HGVs traffic: 75-80% of these (with a large share of international transit- Fig 1.) vehicles remained on the old roads, passing through the settlements.

The central government's fiscal concerns killed the Road Fund in 1998, which resulted in the abolishment of the earmarking of gasoline taxes and cut by half the state spending for the national road network in the next years. Although in 1999 a stately created motorway company tried to copy the financial and service level examples of the concession companies mixed with considerably lower tolls (due to cheaper state loans in the background), finally the solution seemed to be the 'cheap' vignette system, which was introduced on half of the network in 2000 (cancelling the M1/M15 concession) and became a nation-wide solution by 2004 (with restructuring the M5 concession into an availability fee payment scheme and as a result of the new PPP projects on the M6).

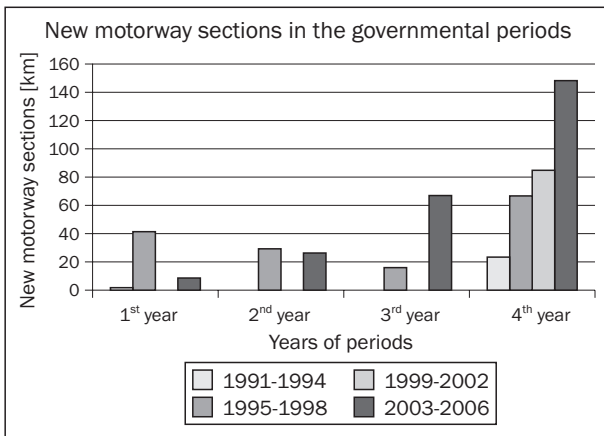


Figure 1 - Increase in the Hungarian motorway network 1990-2008

Source: KTI, Gyula GAAL

2. ACTUAL AND FUTURE TOOLS/ INSTRUMENTS

Currently there is no earmarked funding from vehicle ownership or gasoline tax. The Parliament decides every year in the budget law about the extent of possible financial sources available for the next fiscal year. The only purpose oriented and used funding is generated by the e-vignette system which is considered as service fee payment. From its introduction until the end of 2005 it was a direct income for the State Motorway Management Co. Ltd., since 2006 it has been an earmarked source for the road budget. In this way

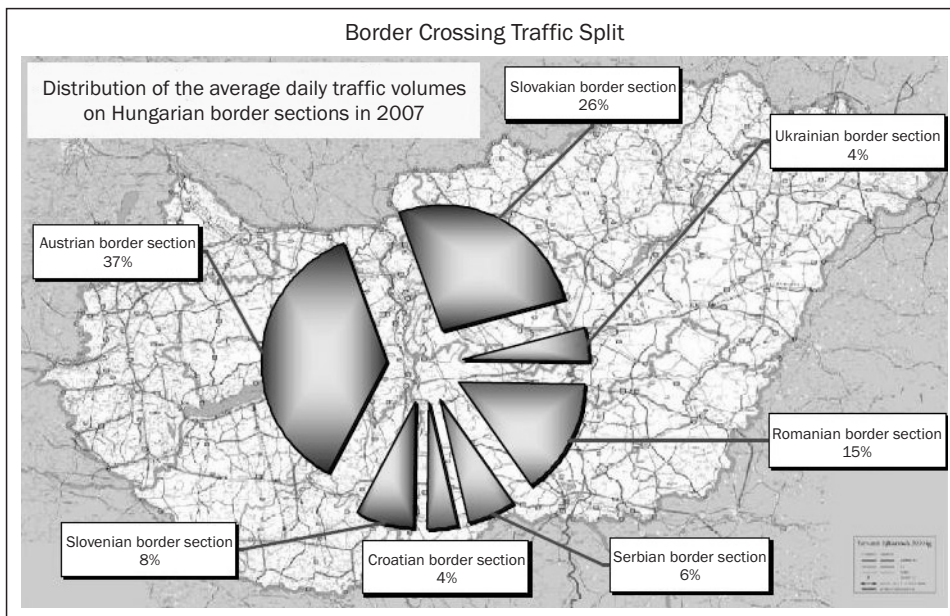


Figure 2 - Distribution of border traffic

Source: Ministry of Transport, Telecommunication and Energy

Table 1 - Price of vignettes in Hungary in 2010

EUR		Rolling 4 Consecutive Days			1 EUR = 270 HUF		
User Charge Categories	1 Calendar Day	January - April	May - September	October - December	Rolling 10 Consecutive Days	Rolling Monthly	Calendar Yearly
D1	-	4.33	5.66	4.33	9.44	15.55	137.77
D2	10.22	-	-	-	24.44	46.66	394.44
D3		-	-	-	37.77	66.66	588.88
D4		-	-	-	48.88	83.33	733.33

Source: KKK

there is no more cross financing among the availability fee payment concessions and the state operated motorways.

There are four user charge categories:

$$D1 \leq 3.5 \text{ t} < D2 \leq 7.5 \text{ t} < D3 \leq 12 \text{ t} < D4.$$

The buses above 7.5 t are categorised one level lower. The electronically registered vignettes and the via internet and SMS available right of uses are sold for the following validities and total prices.

Users are controlled by the National Transport Authority with automatic licence plate recognition cameras on fixed gantries or in enforcement cars at entry/exit ramps and mobile patrol groups in rest areas. Above the 115 km long free-for-all speedway sections there are three extensions widening by categories. As

Figure 3 shows, for D1 only motorways (with exempted bypasses) are charged on 916 km (marked bolded).

For D2, D3, D4 category motorway bypasses and expressways are charged on 232 km (marked with dotted line), plus 42 pieces (462 km) of the trunk road network (marked with dashed line) are charged all across the country as well.

3. OBJECTIVES

According to the toll policy the income from the user charges should cover at least the operation, maintenance and reconstruction costs of the charged network. Before the HGVs extension on the trunk roads in 2007 the system met this target. As spending nearly EUR 3 billion for motorway construction doubled the

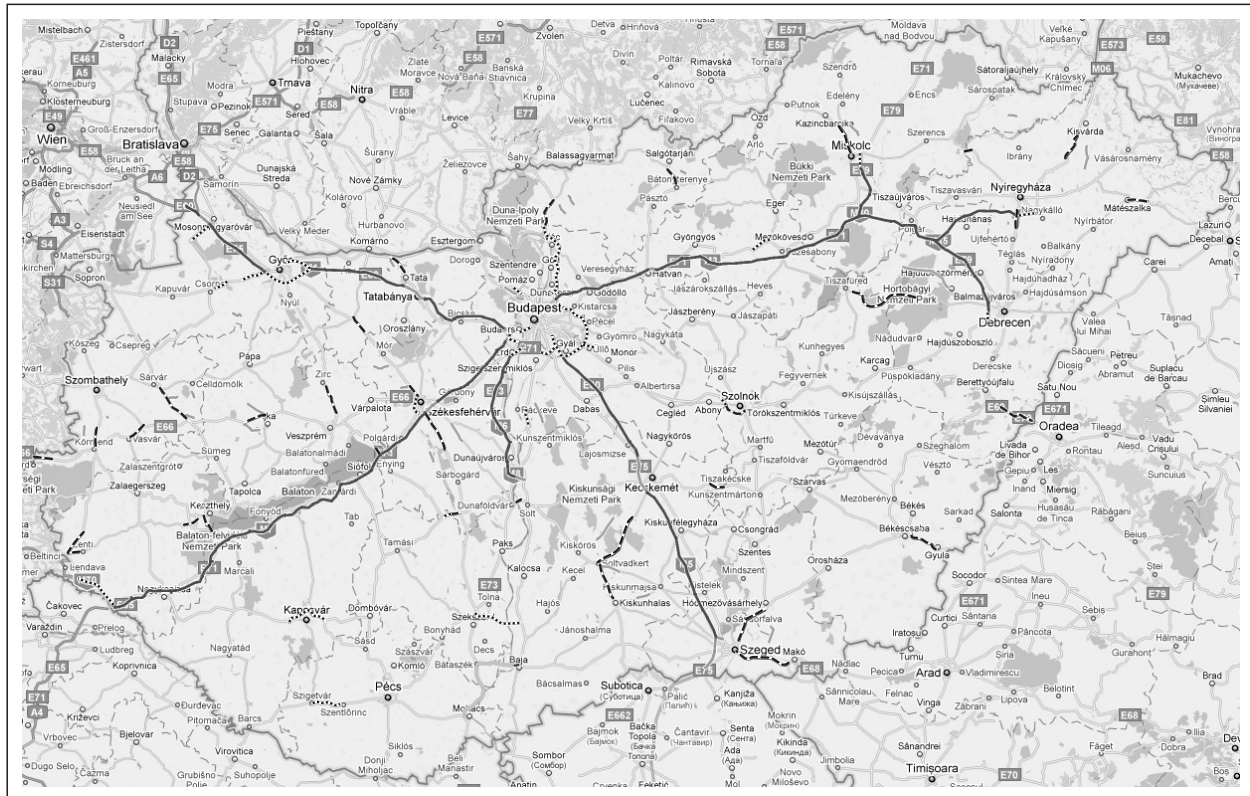


Figure 3 - Hungarian speedway network

Source: KKK

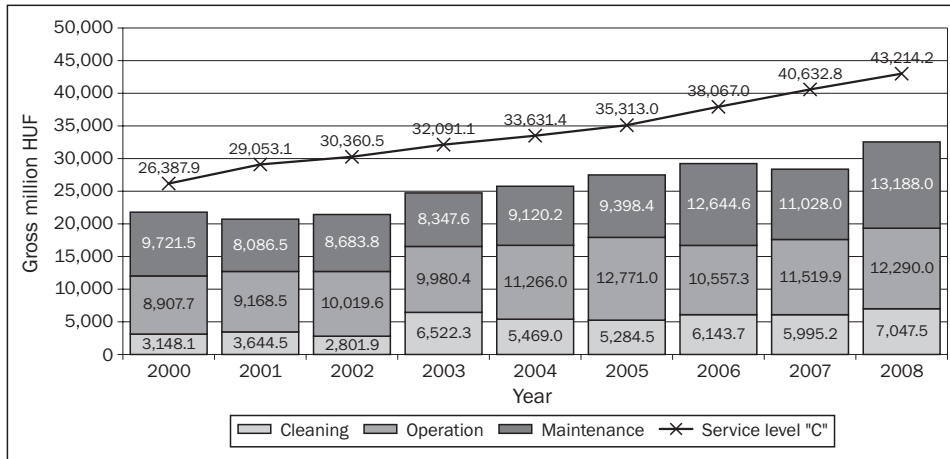


Figure 4 - Distribution of border traffic

Source: Ministry of Transport, Telecommunication and Energy

network from 2001 to 2006, plus the natural traffic growth on the network which was around 8%, it resulted in about 50% cut of the ‘virtual toll rate’ in comparable price level. This means that for the same length of usage it is considerably cheaper now than it was 10 years ago (Figure 4).

As the maximum vignette prices allowed by the EU Eurovignette Directive are applied and the frequent and long trip running trucks pay hardly more than 3 times the fees of the personal cars in the ‘virtual toll level’ the only solution can be the mileage-based tolling system. The new solution should be proportional in all dimensions, which means the application of a multi lane free flow electronic toll collection system.

4. IMPACTS (RESULTS) OF IMPLEMENTED TAXATION OR PRICING SYSTEMS

The yearly revenue of the system grew from 40 to 159 million EUR a year from 2000 to 2008. The economic crises reduced the incomes (with same charge levels) to EUR 152 million in 2009. It became obvious that the economic growth and the EU accession of the region have much higher impact on the road transport demand than the price level, so it could not even significantly lower the growth rate of the charged traffic. These impacts are also present in the model split and just as well in the roads share growth. A virtual toll level has been calculated (Eq 1, Figure 5a and 5b).

$$VTL = \frac{\sum_{i=1}^n (i)_n}{\sum_{i=1}^n (cto)_n} \quad (1)$$

where

- VTL - virtual toll level [HUF/km]
- i - income from traffic [HUF]
- cto - charged traffic output [km]
- n - number of vehicles [pieces]

Virtual toll level has decreased by 50% since 2000 and will decrease further by 50% until 2020 if the tariff system is not changed in Hungary.

The social impact study aimed to find the optimal and acceptable level of charges applying of which would not make the users avoid the motorway. In the research scenario the involvement of public stakeholders had priority. The results have to lead decision makers to form proper communication strategy and programs which can be the basis of substantial discourse. In advance, the exact set of diversion related road sectors could not be determined, only predicted, where the changes of traffic level may cause substantial external effects. According to expert assumptions, the traffic situation of trunk roads No. 70 and No. 8, and of some local roads had to be analysed. The research addressed all the inhabitants (local citizens and holiday resort owners), the municipalities, civil groups, regional enterprises and the media. The first stage of the analysis was a study about the actual traffic situation, then traffic forecasts for years 2001 and 2008 based on two scenarios: (1) with and (2) without the charging system carried out [2].

The plans about phased implementation of the nationwide charging (vignette) system on the State operated motorway network called for the investigation of the expected environmental impacts [3] of (especially freight) traffic diversion from the M1 motorway. Objectives were determining the current traffic levels on the entire related road network, predictable environmental (noise and vibration annoyance, air pollution) situation in selected urban areas (where forecast changes in traffic levels exceeded 5%) along the traffic corridor, and forecasts about expected impacts for preparing the required environmental mitigation plans. Three scenarios have been tested in the analysis: “O” the entire sector is free of charge; “A” the entire sector is charged; “B” the sector is charged except the “Tatabánya west-Tata” and “Győr east-Győr west”

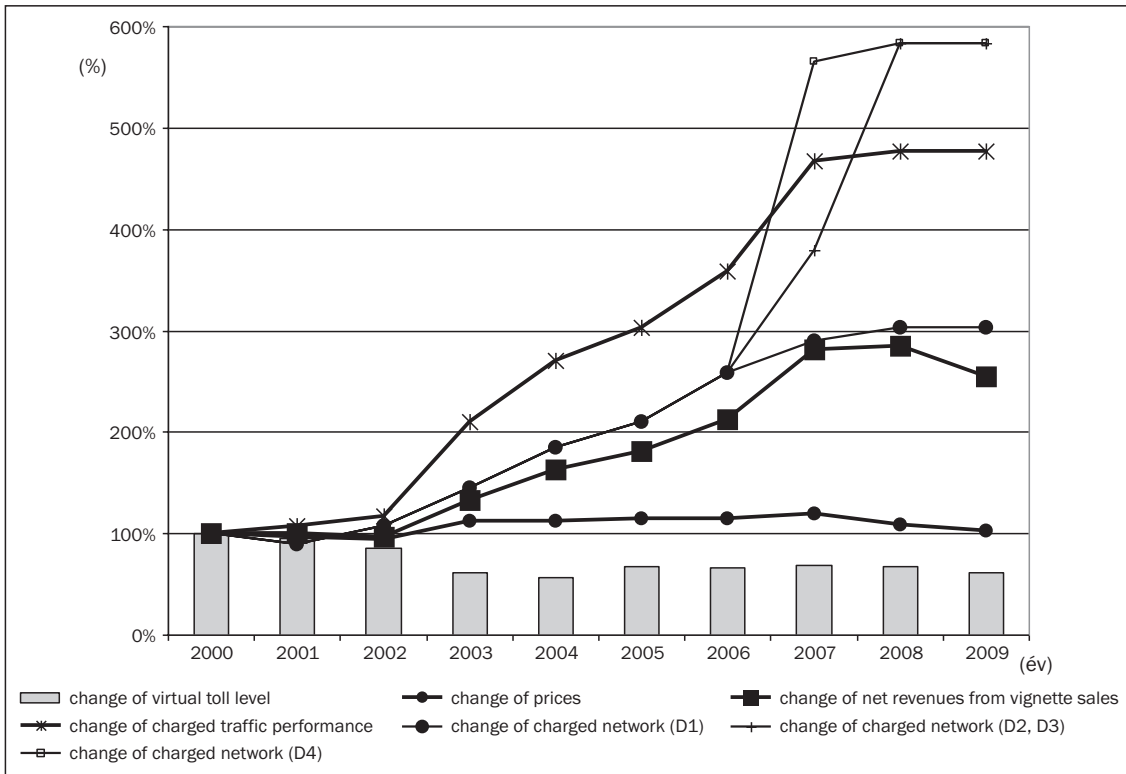


Figure 5a - Virtual toll level in Hungary

Source: KKK

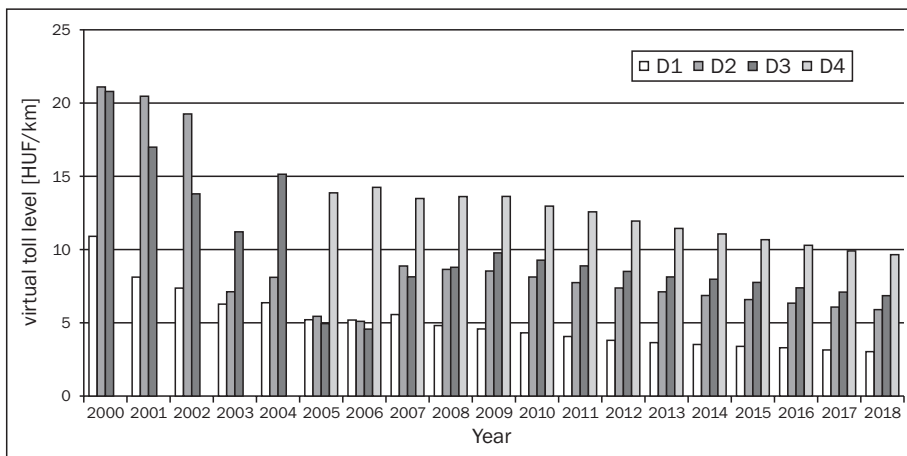


Figure 5b - Forecast virtual toll levels in Hungary (price level of January 1, 2007 [HUF/km])

Source: BAUCONSULT

sections. The results of traffic analysis showed that sections near Budapest bore a traffic diversion of 10-15%, far from Budapest this number was 5-10% on the average; and in all cases mostly the trunk roads suffered from larger traffic loads. The traffic level on urban transit sections of trunk roads grew substantially (besides the so far existing high traffic load); due to road safety reasons this impact should be mitigated by traffic control and assistance action, but no other impacts required prompt and direct intervention. The planned free-of-charge sections positively influenced the traffic loads on trunk roads (due to the high num-

ber of regional traffic), but they were neutral towards the traffic load of the M1 motorway. The traffic levels on the "Győr-state border" sector, where an open toll system was in operation, due to the substantial fall in toll levels, grew by 75%, and meanwhile the traffic load on the trunk road No. 1 decreased by 45% [4].

The objective was monitoring the impacts of the implemented charging (vignette) system in traffic on the M1 motorway and trunk road No. 1, regarding the verifiability of effectiveness for the applied mitigation measures, and the changed living conditions of the citizens concerned. The analysis handled separately

Table 2 - Price elasticities of different user groups in Hungary

User groups	Elasticity functions	Correlation
Passenger car	$N = 8,462.667 - 907.88 \cdot d_{PC} + 13.363 \cdot d_{PC}^2$ [ADT]	-0.7847
Bus	$N = 140.264 - 1.5459 \cdot d_{BUS} - 0.0387 \cdot d_{BUS}^2$ [ADT]	-0.9669
Lorry	$N = 0.194 + 60.354 \cdot d_{LR} - 2.7816 \cdot d_{LR}^2$ [ADT]	-0.8406
Heavy Goods Vehicle	$N = 1,133.53 + 60.354 \cdot d_{HGV} - 2.7816 \cdot d_{HGV}^2$ [ADT]	

Source: [6]

the “Budapest-Győr” and the “Győr-state border” sectors, because the latter had formerly had a different tolling system. The traffic share between the M1 motorway and trunk road No. 1 in the transport corridor showed that getting far from Budapest led to an even higher share on the motorway. Near Budapest 2-2.5 thousand vehicles per day decided to leave the motorway and use the trunk roads; on the “Győr-state border” sector significant traffic realignment happened (daily 4-5 thousand vehicles more on the motorway), consequently this changed the former 50-50% traffic share in the transport corridor to 80-20%; the main reason for realignment was the change in the charging system (from open direct tolling to the vignette system) [5]. Table 2 demonstrates the results of price elasticity analysis [6] conducted in the investigated time period.

The freight traffic was less price elastic than the passenger traffic towards the charging system. The traffic share on the road sectors in the entire transport corridor has been normalised.

5. EQUITY ISSUES AND ACCEPTABILITY

At the beginning of the three different categorisation and toll level operated toll motorway projects it was considered that only the newly built sections can be tolled. But after the first years of real tolling the question was raised why give a ‘free ride’ to those who are so fortunate to live near an old motorway? This

pushed the nation-wide vignette solution. But now, frequent users pay much less per kilometre than occasional users (Figure 6).

Although local people are glad that there is not so big through-traffic in the settlements, the users feel this is not fair. Moreover, there is cross financing between the vehicle categories. This distortion is mainly caused by the above explained big differences in the virtual toll levels. The following comparison shows the “vignette price equivalent trip lengths” for three price levels (see Figure 7):

- a) virtual toll rates,
- b) initial toll rates (that are planned in the year of introducing the mileage-based toll system),
- c) maximum toll rates (based on the calculation method reported by the amended 62/1999/EC “Eurovignette” Directive).

The heavier vehicles above 3.5 tons pay only 40-45% of the total income [7] although they should pay 45-50% of the yearly running costs. The enforcement solutions create some concerns, and the cheating foreign drivers are much harder to catch than the local ones. The planned mileage-based system with the raised toll levels aims to normalise this disproportion between vehicle categories; consequently, the buses, lorries and heavy goods vehicles will cover much more costs than what has been raised.

In the last 15 years of the tolling history it was easy to recognise that the most important component

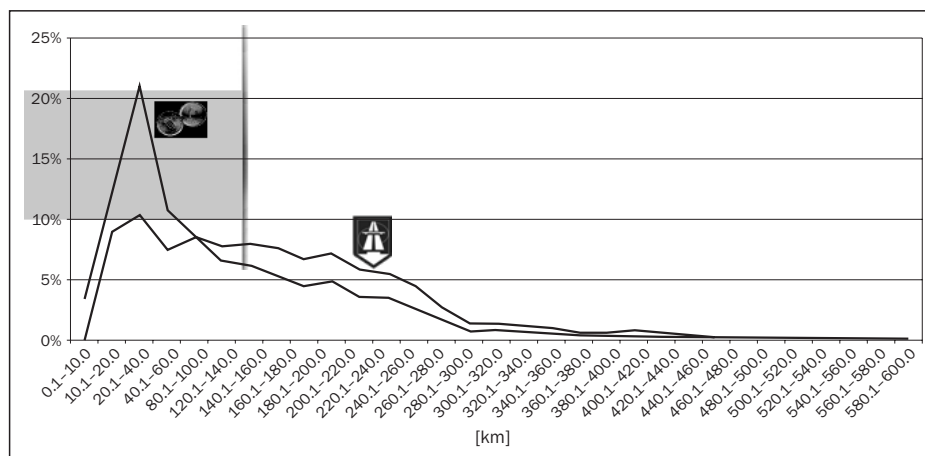


Figure 6 - Average distribution function for the mileage charging and the vignette system

Source: Transman Ltd.

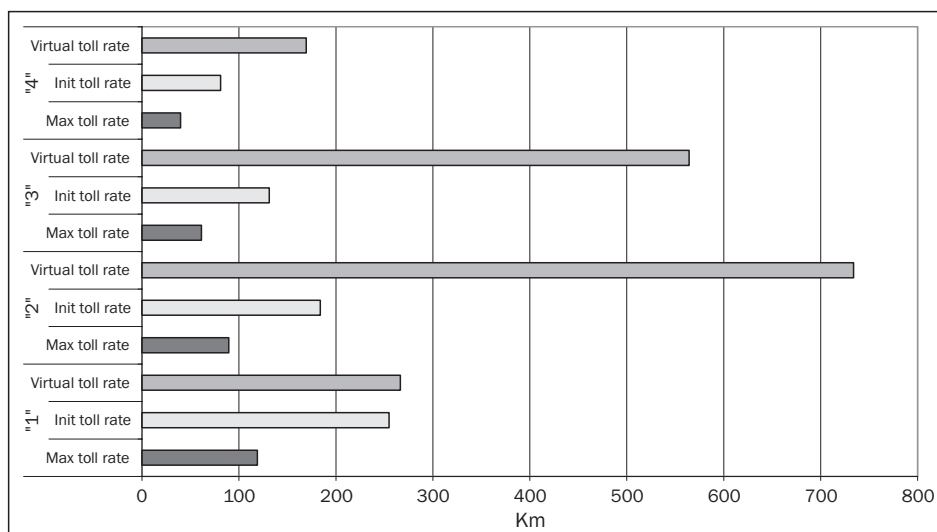


Figure 7 - Vignette price equivalent trip lengths

is acceptability. The local affordability of the toll level which keeps the majority of the traffic on the speedway network easing the life of the vicinities, the nationwide equal tariff solution and the visible impact of the charging on the service level are the major parameters. After a very strong society-wide opposition in the beginning, for 4-6 years, nowadays two-thirds of road users are in a way happy to pay for the better roads. The reason of this very positive result is obviously that through the centralised taxes the road users get back in road services less than 15% of their payments, which can be easily recognised driving around the national or local roads. The market research shows another interesting aspect. Although the e-vignette system gives a relatively cheap access to the services it is obvious for the majority that it is not proportional. While only 6% of the local personal cars have yearly vignettes, the infrequent users are not very happy to buy a short-period right of usage for a higher unit price. They would prefer to pay by the length travelled.

6. LESSONS LEARNED AND FUTURE PLANS

It became obvious that without a long-term toll strategy which is not integrated into the transport policy and which does not have a wide social acceptance and political agreement, the different kinds of 'tolling lessons' can be painful and very expensive. In the future, proper data collection and country level analysis are needed to make possible real life-based cost, traffic and revenue forecasts. But perhaps the clear and target-oriented handling of the generated income is the key for long-term availability and acceptability of the tolled schemes in Hungary. The planned system needs to be compatible with the European system as a common principle social marginal cost pricing needs to be announced as the basis of the road usage pricing.

7. ACKNOWLEDGMENTS

This work is related to the scientific program of the "Development of quality-oriented and harmonized R+D+I strategy and functional model at BME" and "Modelling and multi-objective optimization based control of road traffic flow considering social and economical aspects" project. These projects are supported by the New Szechenyi Development Plan (Project ID: TÁMOP-4.2.1/B-09/1/KMR-2010-0002) and by program CNK 78168 of OTKA. The contributions of anonymous reviewers are gratefully acknowledged. The paper has been supported by Bolyai János fellowship of HAS (Hungarian Academy of Science).

ÁDÁM TÖRÖK, PhD

E-mail: torok.adam@kti.hu

Ütügyi Rendszerek Gazdasági Kérdései Bizottság

BME Közlekedésgazdasági Tanszék

Bertalan Lajos u. 2., Budapest, H-1111, Magyarország

ÁRPÁD SIPOSS, M.Eng

Ütügyi Rendszerek Gazdasági Kérdései Bizottság

Közlekedésfejlesztési Koordinációs Központ

Lövőház u. 38., Budapest, H-1024, Magyarország

FERENC MÉSZÁROS, PhD

Email: fmeszaros@kagzd.bme.hu

BME Közlekedésgazdasági Tanszék

Bertalan Lajos u. 2., Budapest, H-1111, Hungary

ABSZTRAKT

AZ ÚTDÍJSZEDÉS TÖRTÉNELME ÉS VÁRHATÓ JÖVŐJE MAGYARORSZÁGON

A cikk fő témája a magyarországi útdíjszedés történelmi háttérének és várható jövőjének bemutatása. A szerzők a bevezetésben megvizsgálták az autópályaépítések történeti adatait és kiértékelték az autópályarendszer időben és térben egyenlőtlen fejlesztési folyamatát.

Ebben a cikkben a szerzők az útdíjat mint a közúti infrastrukturális beruházások és az útfenntartás finanszírozása és a forgalmi áramlatok befolyásolhatósága egyik eszközének tekintik.

KULCSSZAVAK

közúti közlekedés, utazási idő csökkentése, pozitív externális hatás

LITERATURE

- [1] **BERTA, TÖRÖK:** *Travel Time Reduction due to Infrastructure Development in Hungary*, PROMET 2010/1 pp. 23-28.
- [2] **VÁTI:** *Summary of environmental, social and economic impact study about implementing charging system on the M7 motorway – first results*, research report, September 1998
- [3] **TÖRÖK, Á.:** *Developing the implementation strategies on which the modernisation of road transport pricing schemes are based*. Ph.D. thesis, BME Department of Transport Economics, April 2008
- [4] **UVATERV:** *Summary of social, economic and environmental impact study about implementing charging system on the Budapest-Győr sector of M1 motorway*, research report, October 1999
- [5] **ÁKMI:** *Traffic monitoring on the M1 motorway and trunk road No. 1.*, research report, June 2000
- [6] **MÉSZÁROS, F.:** *Theoretical foundation of usage based price setting on the Hungarian road network*. Ph.D. thesis, BME Department of Transport Economics, October 2007
- [7] **KKK (Coordination Center for Transport Development):** *Reports on User Charges and Tolls*, (<http://kkk.gov.hu/pages/index.jsf?p=2&id=3285>)