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User charges on public roads

Summaries

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User charges on public roads

Part A: Theory, practice and applicability to Finland

SUMMARY

Road construction and maintenance have been financed in Finland, as in most western countries, mainly from the Government's general budget funds or from general taxation. In addition to budget monies, road users have been directly charged in several countries in order to finance eg. large scale highway projects. In recent years user charges have become more and more popular as a means to complement or replace budget monies.

This paper studies the economic theory of marginal cost pricing, the usage of different road user charges, their social and economic impacts and applicability to the Finnish context.

The economic theory is unambiguous: the optimum is reached only when the principle "user of a commodity/service or the one who causes damage pays" is fulfilled. This is obtained only by following marginal cost pricing which minimizes the total cost to the sector and the economy. Financing based on user charges is a step towards the optimal marginal cost pricing. User charging means that road users pay in whole or partly the costs they impose on the society according to the amount, place and time of road use.

There are several different user charges applied world wide depending on the objectives set. A toll can be charged for the use of a bridge, tunnel or a road (eg. in most European countries); the use of the motorway network can be charged for (eg. Switzerland, France, Italy, Spain, etc.); there can be an area wide tolling system, sometimes based on congestion pricing (eg. Norway, Singapore, U.K., Stockholm, Hong Kong, etc.); a special "earmarked" fuel charge can be applied nationwide (eg. USA, Switzerland, Russia, Baltic countries, etc.) or areawide (eg. Tromsø, Norway); heavy vehicles can be charged for according to axle loads and distance traveled (eg. Sweden); there can be a yearly vehicle charge. The common transport policy of the European Community and its implications are also studied.

Reasons to change the current financing system in Finland based on general taxation are analyzed. These include eg. recommendations of a parliamentary transport committee, inefficiency of the actual system to match demand and supply, EC policy, need to have a more direct dialogue between clients (road users) and the producer (road keeper).

Basic principles to a financing system based on user charges are proposed. Questions concerning the organizational form, risks and impacts of a privately financed project are also studied.

As a conclusion, further research in the following topics is suggested: integration of the financing of construction and maintenance of streets which are under the responsibility of communities and cities and roads, highways, etc. which are financed by the state; assessment of the road users' response to different charging systems; definition of the marginal cost of road use including externalities; financial analysis of specific projects which are likely to succeed as toll roads eg. bridges in Puumala, Kärkinen and Raippaluoto.

User charges on public roads

Part B: Application of automatic toll collection technology to Finnish motorways

SUMMARY

In this report the applicability of automatic toll collection systems to the Finnish motorway network is analyzed. The main emphasis is on the technical properties of kilometer based charging systems. In addition, the following factors have been studied in detail: how can a minimum service level be organized for infrequent users, what requirements should the surveillance system fulfill and how to guarantee the privacy of clients. A separate report on fixed motorway charges is in the appendix.

There are already fully functional electronic toll systems in use (eg. in Trondheim). Due to rapid technological development the near future will bring about more versatile, less land demanding, user friendlier and cheaper systems. The European Community is undertaking a standardization work concerning the charging technology which should be taken into account also in Finland.

The electronic system is most efficient when used for areawide tolling but it can also be applied for bridges and other roads.

The toll system is called closed if it is possible to enter the toll road only through toll stations situated on the ramps. In an open system, toll stations are on the road between junctions. It is also possible to place toll stations between selected junctions only.

The costs and user friendliness of the system depend heavily on the principles applied to rare customers. If cash or credit card payment is offered on every toll station, additional lanes are necessary. Placing toll stations on existing ramps is extremely difficult in most cases. Alternatively, rare customer could purchase a permit in stations placed elsewhere allowing them to drive on the toll motorway within a certain time limit. In this case the toll stations consist of only two portails: one with charging equipment which, using microwave technology, charges the toll from the customer's chip card placed in the vehicle; the other with video surveillance system. The electronic tag (price about 100 FIM) could also be made compulsory to every vehicle desiring to use motorways. Those who prefer travelling anonymously can purchase a chip card which is more expensive.

The application of a tolling system to the Finnish motorway network would require 330-640 toll stations depending on the chosen alternative. The investment cost would vary from 750 to 2200 million marks respectively. The estimated revenues would vary between 420-840 million marks per year. Break even point would be reached only after 2-5 years whereas the Oslo and Trondheim area toll systems began to produce profits after 5 months and the planned system for Stockholm city is estimated to pay back the investments in only 3 weeks.

The motorway toll has several disadvantages:

- * due to high density of junctions in Finland, the number of toll stations (and thus investment and running costs) would be extremely high and the rate of return low
- * the handling of rare clients is problematic
- * motorway tolls will shift part of the traffic to alternative routes causing problems in safety, environmental damage and congestion.

The latest charging technology will be in commercial use within a couple of years. The city of Stockholm will most probably be the first user of it. When the technology is widely applied, its price will decrease.

The role of user charges in the financing of road traffic sector should be discussed in detail in Finland: what charges should be applied, on what basis and why. The application of user charges necessitates political will and new legislation.

Technology will not hinder the application of road tolls. But the cost of technology will require careful consideration. Electronic charging system is not the cheapest way to charge for the use of roads with low traffic volumes. The limitations and costs should be taken into account when making decisions.

User charges on public roads Part C: Toll road feasibility study

SUMMARY

The objective of this study is to examine the feasibility of financing the construction of motorways from Helsinki to Turku and Lahti with revenue generated from tolls. Starting a toll road is by no means a simple task, as it involves many issues which deserve quite a bit of attention and even other studies. For example, what is the intended purpose of the toll road? Who would own the toll road? How would the financing be taken care of? What kind of toll collection technology should be used? etc.

Toll road studies also involve many uncertainties. One of the main uncertainties is how to conduct a good and reliable traffic forecast. For example, driver responses to tolls have never been studied in Finland, yet as this study indicates, they can either make or break a road project.

The first part of this study raises some questions which are critical to possible toll road projects, and thus deserve more attention and investigations. This is followed with a brief description of various toll collection system technologies and their effectiveness. The main part of the study focuses on the Turku and Lahti motorways. An example toll road configuration is presented, and the possibilities for financing both motorways with toll revenue is examined. The payback time used in this study is 20 years.

The Turku motorway project is too expensive to finance entirely with toll revenues. The study of this road is based on the idea that only half of the necessary funds would be raised through tolls, and the other half would be taken, for example, from the Road Administration budget. With this type of financing the Turku motorway has possibilities to succeed, but as the interest rate and traffic forecast sensitivity analyses demonstrate, even this kind of toll financing has its uncertainties.

The Lahti motorway project costs only about 1/3 of the Turku Road, thus its chances for success are also greater. However, this case is by no means a "sure win" either, as the interest rate, driver reaction, toll price, and other sensitivity analyses conducted will explicate.

In both the Turku and Lahti motorway projects there are various possibilities for strengthening their financial stability. For example, in the Lahti Road project, it would be possible to fund half of the project from the Road Administration budget, as is necessary with the Turku project. Both cases call for the construction of a new road, in addition to currently existing old roads. Thus, it would be possible to offer a "package solution", which would mean building the new motorway only with the stipulation that both roads (both new and old) become toll roads. Toll collection could even begin on the old road during the construction of the new one. This type of project financing would lessen the need for loans, and also allow for lower toll prices on both roads.

Toll financing is a very interesting and promising solution for the funding of road projects. However, before implementation, it calls for more studies and analyses. Citizen participation and other forms of interaction between the toll road planners, politicians and car owner would also be of use in this type of projects.

User charges on public roads

Part D: Parainen - Nauvo bridge or tunnel as a toll road

SUMMARY

The starting points for this feasibility study are the preliminary engineering for ground access and the following claim for implementing the ground access as a toll road:

The implementation of the ground access as a toll road between Parainen and Nauvo is feasible and verified, if the municipalities in the area of influence will approve the obligations related to toll roads and if the government will benefit through future savings in maintenance costs of the ferry operations.

The preliminary engineering indicated that according to the analysis of transportation economy, it is verified to evaluate either a bridge alternative or a tunnel alternative for ground access. Both alternatives are environmentally and technically feasible for implementation. The construction cost is 246,9 million FIM for the bridge alternative and 165,5 million FIM for the tunnel alternative.

According to this study, the ground access between Parainen and Nauvo can be implemented as a toll road providing that:

1. Bridge Alternative

A A company will be established to implement and finance the project having the government and the municipalities in the area (Parainen, Nauvo, Korppoo and Houtskari) as shareholders. The capital stock of the company will be 99 million FIM. In addition to the capital stock, a 15-year bond loan at 11.5 % interest secured by the government is necessary for investments. The sum of the bond loan is about 180 million FIM.

The government (the Road Administration) share of the capital is 81 million FIM which equals to the rolling stock investments of the ferries purchased during 1995-2001.

The municipalities' share of the capital is 1 million FIM which is divided according to the population of the municipality.

Beginning 1.1 1994, about 17 million FIM of user fees will be collected from the existing ferry service as advance payments for the capital stock.

B After the construction of the ground access, the following user fees will be collected for payments of loans and other costs:

- 10 FIM/crossing/permanent resident
- 20 FIM/crossing/temporary resident
- 50 FIM/crossing/truck or bus not in regular service
- 20 FIM/crossing/bus in regular service

- C The established company will be subsidized by the government. The subsidy will equal to the ferry operating costs for the year of 1994 (12,1 million FIM). It will be reduced to equal to the prevailing ferry operating costs (9,8 million FIM) in the year of 2002. The subsidy will be suspended in 2011 after full repayments of loans and interests. The subsidy will pay for the administrative costs of the established company as well as the maintenance costs of the ground access.
- D User fees will be collected until the year of 2019. At that time they will add up to the capital stock which allows for the return of the capital to the shareholders and discontinuation of the company. After that the ground access will be transferred to government possession with no charge.

2. Tunnel Alternative

- A A company will be established for implementing and financing the project having the government and the municipalities in the area as shareholders. The capital stock of the company is 99 million FIM and the required loan is 100 million FIM.
- B After the construction of the ground access, the following user fees will be collected for payments of loans and other costs.
 - 5 FIM/crossing/permanent resident
 - 15 FIM/crossing/summer resident
 - 25 FIM/crossing/truck
 - 25 FIM/crossing/bus not in regular service
- C The company will be subsidized by the government. The subsidy will equal to a minimum of 75 % of the prevailing ferry operating costs until full repayments of company loans.
- D User fees will be collected for the repayment of the capital stock until the year of 2015.

The following facts will favor the implementation of the ground access as a toll road:

- a profitable project by transportation economics can be implemented more rapidly than a project verified by the budget.
- the rolling stock investments for maintaining existing ferry operations (81 million FIM) can be used for the implementation of a permanent solution.
- the proposed investment will be refunded to the government through user fees.