

INTRODUCTION OF ROAD PRICING – POSSIBILITIES AND DIFFICULTIES

Mr. Dan Näsman,
Swedish National Road Administration,
Sweden

1. THEORETICAL FOUNDATION FOR ROAD PRICING

A lot of time has past since the economic theory for pricing of public commodities, such as bridges and roads, was established. Basic works on the theory of marginal cost pricing was carried out by the economist Harold Hotelling in the thirties. Hotelling did not refer at all to the development of the marginal cost pricing principle in the period just prior to that in which he wrote. Instead, he chose to refer to the works of the French engineer Jules Dupuis who wrote on the subject about the year 1844.

Dupuis defined the total benefit of a public work such as a road or a bridge as the aggregate of the maximum prices a perfectly discriminating monopolist could charge, equal to the costs of the best alternatives to its use. Applying this definition to the search for a method of maximizing the total benefit, he reasoned that charging a toll, however small, would cause some individuals to do without the services. The services of an already existing road or bridge have no real cost, so that any diminution of its use would represent a net loss of benefits.

Throughout the years the basic theory of marginal cost pricing has been refined and developed - theoretically and empirically - to take in regard external effects, peak load phenomena, etc.

I am not making this introduction in order to plunge more deeply into the economic theory of optimal pricing. My only intention is to establish as a fact that there is, and has been for a long time, a firm theoretical foundation for the topic of road pricing.

Following this theory we should for a private vehicle charge a very small amount for the use of a public road as long as the road is not congested and not sited too close to areas where people live or work. In situations when the road starts to get crowded or when the road side disturbances are substantial the charge should be drastically raised. The same reasoning goes for a heavy truck or a bus, but starting from a higher level. It is all very simple.

2. ROAD PRICING IN THE REAL WORLD OF TODAY

The question is to what extent the marginal cost theory of road pricing has influenced the existing pricing, tolling and taxing systems in the real world. Evidently not very much. What we normally have today is fuel taxes or - for trucks - distance-related taxes that do not at all take the differentiations recommended by the economic theory in regard.

Why is it so?

I think the explanation is that the taxes as well as the road tolls existing today have been motivated by almost purely financial reasons. And this is not surprising. These systems have been introduced in a period when the public road networks have been under construction and development to meet qualitative needs of surface transport of goods and passengers. The enormous financial needs to make these investment programs feasible have then resulted in no less needs to preserve and operate the networks. In this perspective the problem of the pricing of scarce road space is a recently discovered topic in the arena of administrative and political decision-making in most countries.

There are, of course, exceptions to this generalized description. In some big cities road pricing has been introduced as a means to distribute and economize with scarce road surface. The best known example is the one in Singapore.

3. ROAD PRICING IN THE FUTURE

What can we expect in the future? Generally speaking, increasing traffic is bound to result in congestion and pollution problems in more and more places and, as a consequence, bring up the subject of road pricing as a means to affect the traffic to meet specified objectives.

At the same time I think an increasing number of countries will find it impossible to allocate a sufficient amount of funding from the public budget to operate, maintain, repair and develop the road networks. These countries will also turn to road pricing as a financial means.

The self-evident, but important, conclusion is that there basically are two completely different kinds of motives for road pricing; financial and resource allocation motives. Depending on the specific situation in different countries there will be different objectives with road pricing, or at least a different order of priority. This, I think, is a basic premise that we should be aware of when discussing future use of road pricing.

An additional aspect is that the same prices affect both financing and resource allocation. In some cases this gives rise to conflicts between different goals; i.e. when a bypass road built in order to divert traffic from a congested area has to be financed with tolls to the effect that some potential users of the bypass road are reluctant to use it.

4. ROAD PRICING AS A WAY TO RAISE FINANCIAL RESOURCES

In Sweden we see road pricing primarily as a means to raise the financial resources that we lack presently. The role of road pricing for demand management is as yet of subordinate interest (with the exception of the Stockholm area).

Next, I will try to describe what I regard as a probable, and sensible, use of road pricing in countries where the financial needs are the dominating motive for introducing it. That will typically mean countries or regions without serious traffic congestion or pollution problems caused by road traffic.

Although there are some differences between the different countries, I think it is possible to describe the financing of public roads in a rather generalized way.

The bulk of the financial resources comes from the state (or federal) budget. They are normally not derived from earmarked taxes, but the result from the priorities made in the ordinary political budget process. In some countries a substantial part of the investments in new roads is financed by road tolls, but related to the total road expenditures the contributions from road tolls can still be characterized as marginal.

The question is whether the traditional financing system will be adequate to meet the future need of financial resources in the road sector. I do not think it will.

Of course I am influenced by the situation in Sweden when I say this. I understand that the situation and the political priorities are different between the countries. However, it is a substantial increase in road expenditures that is needed. I regard it as very improbable that the necessary financial resources will be provided by mere changes in the priorities in budget expenses. Only for those countries that are prepared to raise the taxes for the express purpose of spending more on the roads, does it seem realistic to expect any substantial change in publicly provided resources.

In view of this, we can expect the introduction of road user fees as a major instrument for financing not only new road projects but also to preserve the existing road capital.

This raises two strategic questions concerning the future role of road user fees.

The first one is if the use of the kind of road tolls we have today will be more and more widely spread or if it will be possible to implement more general road user fee systems.

The second question is if the fees will be introduced as a compliment to tax-financing or if there will be a complete shift from taxes to road user fees.

I think it would be unfortunate in the long run if there should be an increased use of road tolls as a complimentary means to finance new projects.

There are a number of reasons for my position:

First, road user fees should, even when the primary objective for their use is financial, be implemented in such a way that they do not interfere in a negative way with the efficient use of the road network. The drawback with present road tolls is that they divert some road users from view, safe roads with high capacity to older and less safe roads, often resulting in increased environmental impacts.

Secondly, road tolls solve only a part of the problem. They may contribute substantially to the funding of new roads but they do not help to preserve the existing road capital, the latter tending to be a more and more severe problem in many countries.

Thirdly, in the long run I see a great risk in making the funding of road expenditures dependent upon a combination of funding from taxes and road user fees. There will be a strong temptation for any minister of finance, with a budget balance problem, to cut the tax-funding to sectors with complimentary financing. In the end one will not know for sure what the net contribution from road user fees to road expenditures will be.

My conclusion from this is that the strategic achievement would be a complete switch from tax-financing to a general road user fee system. What I imply is that road expenditures should be fully financed with revenues from a fee-system consisting of an annual fixed fee for every road vehicle and a variable fee for using the roads. The way we pay for our telephone services could serve as a example of the kind of system I am thinking of.

It should be possible - from a political as well as a fiscal point of view - to make the switch in such a way that the fraction of the road taxes corresponding to the present level of road expenditures is transferred to a road user fee system administered by the road administration. In that case there will be no net effect on the state budget balance or other expenditures. The road administration would become completely indepen-

dent of budget funding.

Such a change of finance system for road administration does not immediately result in more resources. It would, however, provide the necessary long run condition for a stable and adequate financing of the infrastructure. Increasing income from increasing traffic as well as the possibility to raise the fee to pay for new or improved services would make it possible to turn to the capital market for long-term loan financing. I think this would be an adequate and necessary change of system in order to use road pricing to raise financial resources to road administration in the future.

5. ROAD PRICING AS A WAY TO ALLOCATE ROAD SPACE

What, then, can we expect about the future use of road pricing as a way to allocate scarce road space?

Whenever the aim is to use pricing as a resource allocative mechanism the prices should, as far as it is feasible, be set according to marginal cost. When we consider the many areas throughout the world that are suffering from traffic congestion we have reason to ask why road pricing has not already been used more extensively to reduce such problems. I think the answer is the difficulty to find combinations of acceptable institutional and administrative systems on one hand and adequate and feasible pricing technology on the other.

The only example I know of a successful implementation of road pricing, in order to reduce road traffic in a whole area, is the one in Singapore. (This does not mean that there are not more examples. I have not made any covering research on this.)

Probably it is easier to find examples of more or less advanced plans to implement allocative road pricing that have been abandoned or postponed. Hong Kong and The Netherlands are two examples of this. In both cases there were advanced plans to implement general road pricing systems - in The Netherlands in combination with an investment program to upgrade the road network - that was rejected. I am not familiar with all the reasons for this, but one of them certainly was the unwillingness or anxiety amongst the road users to run the risk of being registered whenever using the public roads.

If, for a moment, we forget the worries about personal integrity, I think the problem very much has to do with the difficulty of finding feasible debiting systems that to a reasonable extent fulfills the objective of charging a price corresponding to marginal cost. We should take in regard that the objective more often would be to affect the traffic in a specified area rather than on a specific link, to affect it differently at various hours of the day and various days of the week. Effective road pricing in a complex traffic environment would, against this background, be better characterized as a kind of fine-tuning system than a rough and insensible single-rate fee. Furthermore - as one wants a more smoothly flowing traffic - it would be a serious drawback if the charging in itself causes the traffic flow to a halt (which is the case with manually served road tolls).

As long as the predominating technique to charge a price for the use of a road has been the manually served road tolls it is quite understandable that road pricing more often than not has been rejected as an effective mechanism to allocate road space. I think, however, that we now are at a point of time when new possibilities are evolving. I refer to all the different activities that presently are taking place - in the EC countries, in Japan and elsewhere - to develop and implement means of communication between the vehicles and fixed elements of infrastructure (RTI-technology). This opens possibilities not only to charge the road users a very specific and differentiated price for the use of road space but also to give information about traffic disturbances, road-side facilities, road conditions etc.

I am not an expert in this field, but to the best of my knowledge these technologies are well under way against maturity and implementation. There is for instance, presently a field experiment carried out in Sweden that we call Test Site West Sweden.

It is also possible to solve the problem of personal integrity in a satisfactory way. Those road users who don't want to be identified can "load" an electronic credit card ("smart card") with a specified sum of money in advance. As they travel they are charged electronically without being identified. Road users who don't bother about this could instead choose to open an account that is debited periodically according to how much they have used the road network.

In summary this means that we now, or very soon, have a technology that will meet any reasonable requirement to charge prices for road use in a specific and differentiated manner. I am convinced it will be possible to implement this technology successfully also in complex big-city-traffic environments.

There are a number of studies and reports that argue that there is a great potential to improve the traffic environment in a way that - given the dimensions of the road or street network - reduces the environmental impact of the road traffic and at the same time reduce travel time and travel cost.

6. CONCLUSION

All this gives support to the forecast that we in the future should expect the introduction of more and more sophisticated, not to say intelligent, road pricing systems. The extent to which the mainspring will be financial shortcomings or unacceptable traffic congestion will differ between countries and regions.

An interesting aspect is that the new debiting technology I have indicated makes it possible to reduce or eliminate the conflict between financial and resource allocative objectives in using road pricing. This also fortifies the forecast.

Finally, we have to remember that the question of implementing road pricing on a greater scale is certainly not only a technical one. On the contrary, I am convinced this will be a subject for many agitated political debates as well as spontaneous or organized protests amongst the road users. This means, at least, that it is very difficult to foresee the time-table for its implementation.

But, at last, something has to be done to deal with both financial problems and traffic congestion. Whatever is done, it will be criticized from one point of view or another. To my mind it is difficult to find a better alternative than road pricing along the lines I have tried to indicate. That is why I believe that the question marks concerning future development is more a matter of time than of direction.