CONGESTION CHARGE AS THE REGULATORY TOOL OF A TRANSPORT SYSTEM

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Congestion increases private transport costs and contributes to the decline of public transport service. While these two phenomena are logically connected, in most cities they are institutionally and financially separated. In principle, vehicular users of congested urban road space should be charged a price at least equal to the short-run marginal cost of use, including congestion, road wear and tear, and environmental impacts. Charging for road infrastructure is the core of a strategy for both efficient allocation of resources and sustainable finance. Cordon pricing and tolling of specific roads can be a step in the right direction, but the long-term solution lies in more systematic fields and congestion charges are only the part of them. It is recognized that introducing these charges is quite difficult, requiring policy maturity at both city and national levels, and careful technical, administrative and political preparation.

Key words: congestion, road pricing, toll, regulation

1 Introduction

The reason for congestion charging has developed to include social, financial and environmental reasons to provide a broader base for the adoption of congestion charging as a component of transport policy. Congestion charge is a system of surcharges of users of a transport network in period with peak demand to reduce traffic congestion. This is variable pricing strategy and it regulates demand. Market economy theory postulates that users will be forced to pay for the negative externalities.

2 Why Charge?

The objective of this pricing policy is the use of the price mechanism to make users more aware of the costs that they create, when they consume transport network during the peak demand.

Congestion pricing is one of a number of alternative demand side strategies offered by economists to address traffic congestion.

The transport economics rationale for implementing congestion pricing on roads, described as "one policy response to the problem of congestion", was summarized in a testimony to the United States

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Congress Joint Economic Committee in 2003: "congestion is considered to arise from the mispricing of a good; namely, highway capacity at a specific place and time. The quantity supplied (measured in lane-miles) is less than the quantity demanded at what is essentially a price of zero. If a good or service is provided free of charge, people tend to demand more of it - and use it more wastefully - than they would if they had to pay a price that reflected its cost. Hence, congestion pricing is premised on a basic economic concept: charge a price in order to allocate a scarce resource to its most valuable use, as evidenced by users' willingness to pay for the resource". [1]

The concept of congestion charge is based on economic theory. The main reason is that traffic congestion results in insufficient use of the available road space, to the disbenefit of the society and occurs because the use of transport network is not efficiently priced.

3 Experience around the World

The application of congestion charges on urban roads is limited to a small number of cities, including London, Stockholm and Singapore. Four general types of systems are used:

- a cordon area around a city center, with charges for passing the cordon line,
- area wide congestion pricing, which charges for being inside an area,
- a city center toll ring, with toll collection surrounding the city,
- corridor or single facility congestion pricing, where access to a lane or a facility is priced.

3.1 Singapore

The Singapore Area Licensing Scheme in 1975 was the first true congestion charging scheme in the world. In the 1990s the government initiated studies for Electronic Road Pricing (ERP). The charge system consists of four key elements:

- the in-vehicle unit,
- a stored value smartcard, the CashCard,
- the roadside equipment,
- the control centre.

The ERP system demonstrates how road pricing can be used to manage flows across a network to conform with a network performance target.

Singapore's LTA together with IBM, ran a pilot from December 2006 to April 2007, with a traffic estimation and prediction tool, which uses historical traffic data and real-time feeds with flow conditions from several sources, in order to predict the levels of congestion up to an hour in advance. This technology is expected to allow variable pricing. It can improved traffic management, including the provision of information in advance to alert drivers about conditions ahead, and the prices being charged at that moment.

3.2 Stockholm

In June 2003 Stockholm City Council decided to introduce a pilot environmental charging scheme for one year. This pilot scheme started in 2005. The objectives of the scheme were to:

- reduce traffic on the most heavily used routes,
- reduce emission,
- provide an improved street environment,

- provide additional resources for public transport.

The congestion tax was implemented on a permanent basis on August 2007.

3.3 London

The reasons of the application of congestion charge in London are to reduce congestions, to reduce emissions in the city and to give support to using of public transport. London Congestion Charge (LCC) is applied from February 2003.

The LCC area includes the City of London and the West End. Daily charge for non-exempt vehicles is £8, or £7 for fleet vehicles. Any applicable daily charge must be paid for a vehicle that is driven on a public road in the Congestion Charge Zone between 7 am and 6 pm, Monday to Friday.

The scheme makes use of Close-Circuit Television cameras to record vehicles entering and exiting the zone. There are also a number of mobile camera units which may be deployed anywhere in the zone.

The effects of the congestion charge are divided in effects on congestion, traffic levels, road safety, the use of public transport, the environment, and business activity.

4 Costs and benefits of a charge

The cost of a charging system is relatively easy to determine. It consists of the cost of the technologies employed, the cost of supervision and administrative organization, plus the congestion cost caused by the system itself.

With regard to the benefits of a toll system, there are many misconceptions. The most commonly made mistake is to equate the benefit of the toll to the tax revenue generated, i.e. the overall amount that transport users are required to pay. But that is not true. In order to determine the social benefits of a charge, one must bear in mind why it was introduced in the first place: its purpose was to eliminate excess traffic and it does so by dissuading users whose willingness to pay for transportation lies below the social cost of transport. In other words, the charge prevents wastage in transportation.

Without a charge, transport would be supplied purely at the marginal private cost MPC. Under such circumstances, market equilibrium is attained with transport quantity M, while the social optimum is transport quantity C. The charge, however, is a means of charging for the external costs. It shifts the marginal private cost curve MPC upward, so that it coincides with the marginal social cost curve MSC. The market equilibrium now shifts to the social optimum. The overproduction M-C disappears.

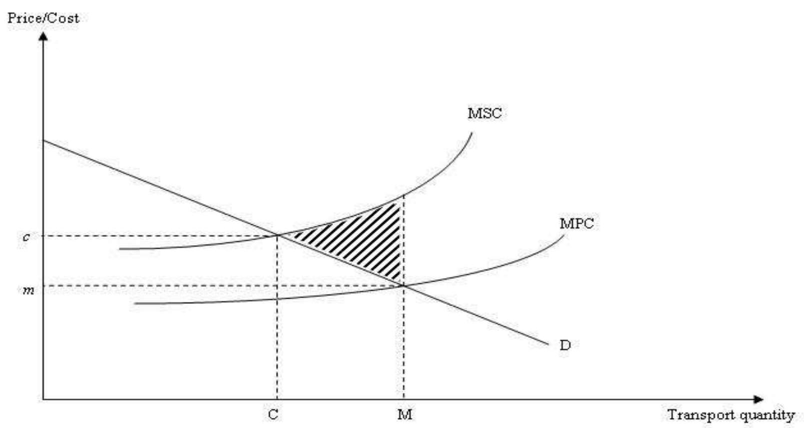

Fig.1: Market equilibrium and social optimum concerning road pricing

The benefit of the charge is the shaded area between the MSC curve and the demand curve, because this area represents the damage that the charge prevents.

Without the charge, each unit would waste the vertical distance between the MSC curve and the D curve. On the right side one can find the damage that would be caused by the first unit to be eliminated thanks to the charge. This damage is considerable. The unit would be produced at a high marginal social cost, while the user would be willing to pay no more than a modest price, shown by the demand curve. On the left side of the shaded area one can see the amount of damage that would be caused by the last unit to be eliminated by the charge. This damage would be slight, because the marginal social cost barely exceeds the price that the user is willing to pay.

The shaded area as a whole, from the first to the last eliminated unit, represents the benefit of the charge. If the demand curve and the MSC curve are both linear, then the area is triangular. The benefit of the charge thus corresponds to the product of the eliminated quantity M – C and half of the charge MSC – MPC.

The area representing the benefit of the charge differs considerably from that representing the charge revenue. The latter is represented not by a triangle but by a square. The base of that square is equal to the remaining transport quantity C and its height is equal to the charge (c-m).

5 Measures besides pricing

Charges are not the only means of reducing the transport quantity to the social optimum or combating external costs. Traffic flow can be also reduced through measures that have a direct influence on the quantity, while external costs can be combated with cost-reducing measures.

5.1 Reduction measures

Reduction measures are measures that reduce a transport quantity in other ways than by increasing its price. There are many examples:

- closing off of city centers,
- temporary driving bans,
- alternate exclusion of odd and even number of plates,
- reduction of cars use by providing more and better public transport,
- encouraging the use of bicycles and motorbikes,
- encouraging people to work from home,
- reduction of road haulage through combined transport etc.

The difference between reduction measures and pricing measures is that pricing measure reduces mobility my moving from price *m* to price *c* on an unchanged demand curve, while reduction measure will reduce mobility by shifting the demand curve to the left.

Reduction measures are often presented as alternatives to pricing, but in reality they are complementary and can be combined.

5.2 Cost-reduction measures

Another group of measures besides pricing and reduction measures consists in regulations that are intended to reduction of external costs in traffic and transportation. E.g. traffic safety measures, silent asphalt and sound screens, technical specifications of vehicles, allowing cabotage etc.

6 Conclusion

The concept of congestion charging is underpinned by a substantial body of economic theory as well as pragmatism. The simple case is that traffic congestion results in inefficient use of the available road space, to the disbenefit of the community as a whole, and occurs because the use of road space is not efficiently priced. With increases in road capacity likely to lag well behind increases in demand, congestion (together with its adverse economic and environmental consequences) is likely to become more extensive unless road user charges reflect those costs.

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