Road Pricing - a practical option?

Lee (Eoin) Costello

Introduction

If economics is that branch of study which concerns itself with the allocation of scarce resources among competing needs, road pricing is that area of transport economics concerned with the allocation of road space, an increasingly scarce commodity. Road congestion, particularly in urban areas, is rapidly becoming a severe social problem. The number of private cars registered in the Dublin area has increased sixfold since 1951, car ownership in the Dublin area could be in excess of 300,000 by 1991.(*1) Traffic speeds in the city centre can be as low as 2.2 m.p.h.

Present charges on private vehicle holders include fuel, vehicle and expenditure tax. These comprise a potential two part road charge, the fixed charge (car tax) is a payment for admission to the road system, while the variable charge (fuel tax) is a payment for the use of that system. Currently the rates of tax are not set with any pricing principle in mind, and it is agreed that these taxes do not provide an instrument to restrict the use of the roads in the right places at the right times.(*2)

Before I proceed to discuss the nature of the congestion problem a word of caution is necessary with regard to the title of this article. The words road pricing may lead to the misconception that the imposition of a congestion tax is in a way an attempt to use a normal price system in selling road space. A price for road space arrived at by the normal process of the market would not include the major constituent of a congestion tax, the charge for externalities.

Congestion

The aim of a congestion tax is to obtain a more efficient use of road space. In so far as this is a question of estimating the optimal use of the existing capacity the economist is explicitly concerned with conventional marginal analysis. Imposing a congestion tax involves marginal social cost pricing but in a special and limited sense. The only social cost considered is that imposed on other road users.
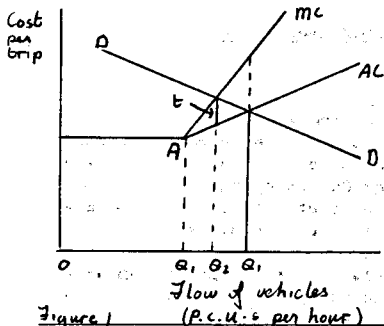

Figure 1   (P.c.u.s per hour)

Looking at figure 1, we see the demand for and the user cost of a link in a road system(*3). It assumes vehicles are homogenous and that an ideal pricing system is available. Up to the point A user costs remain constant, indicating that until this level of usage is reached, users do not impede each other. However beyond A not only does every additional motorist raise the cost to himself, but by raising the A.C. he also causes each of the motorists already

*1   The Transport Consultative Commission Report on Dublin Bus Lanes.

*2   Smeed Report, 1964, H.M.S.O.

*3   Harrison, A. J., The Economics of Transport Appraisal.

using the road to bear this additional cost. It is this effect on other motorists' costs that creates the externality.

Once the A.C. curve begins to rise the M.C. curve also rises but more steeply. Beyond the flow OQ2 the value of the trip to the consumer (shown by the height of the demand curve) is less than the marginal cost.

In the absence of any restriction the volume of traffic will settle at OQ1. At this volume of traffic each motorist finds the marginal value of this trip to be equal to the cost of his trip. Once the cost of his trip is revised to include the additional cost the motorist imposes on others , we have to be guided by the M.C. curve.

Employing the marginal cost priciple of choosing as optimum the volume at which M.C. is equal to marginal value (price) volume OQ2 is chosen. This optimal flow of traffic can be brought about by 'extraordinary restraint (taxes) which remove the divergence between private and social costs'.(*1) The optimal tax, t, on each vehicle using the road is calculated by multiplying the A.C. of the journey by the inverse of the point elasticity,

$$t = (1 + 1/E)A.C. - A.C. \quad \text{or } t = (1/E)A.C.$$

This tax could then be imposed using methods discussed below.

However the above analysis is subject to a flaw, that identified by the second best theorem. Whereever the usual optimum conditions are not met in the rest of the economy, one cannot in general justify employing the M.C. pricing rule to determine ideal outputs in a particular sector. In order to identify a constrained maximum under more complex conditions (as identified in the second best theorem) it is necessary to forsake the optimum conditions that are strictly relevant only to the simple case of a single and familiar constraing on the social welfare function. However, according to Mishan (*2) we may be able to discover circumstances which enable us to derive guidance from the usual optimum rules even though those rules are not universally met.

I assume (for the purposes of this article) that the above is the case and I will now move on to a discussion of the alternative methods for levying the tax discussed above, and alternatives to it.

Instruments for achieving optimal amount and allocation of traffic

Traffic Restraint Approach

Uses administrative (parking facilities, traffic management controls) devices to force a particular division of traffic by route, mode or time of day. This approach is usually used in conjunction with area licensing and road pricing. Looking at parking policy in the Dublin area, in the Dublin area there are six radial routes which carry the most traffic. These are the roads to Malahide, Swords, Lucan, Naas, Stillorgan and Blackrock.

It has been empirically demonstrated (Neutze *1) that four lane roads have slower flows than two lane roads due to traffic management policies which

---

*1   Pigou, A.C. The Economics of Welfare.

*2   Mishan, E. J. 'Second Thoughts on Second Best'. Oxford Economic Papers, 1962.

allow road side parking and thus
the capacity of roadside lanes is
severely restricted. Despite this
evidence the Dublin Corporation and
Dublin County Council allow
extensive parking along two of the
most congested radial routes
(Ballsbridge into Stephens Green
and in Donnybrook Village), the
Blackrock and Stillorgan roads.

Figure 2
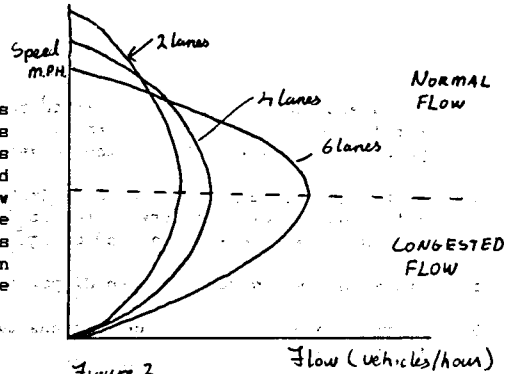
The Road Pricing Approach

Here we raise the cost of using congested facilities. The case for a
pricing device which relates the charge for the use of congested road
facilities to their marginal social cost was set out by the Smeed Committee
in 1963. It discussed the two main methods of direct charging.

1. Off vehicle recording systems: analogous to telephone charging
    methods.

2. Vehicle metering systems: analogous to taxi meter methods of
    charging.

In view of the 'impeccable academic pedigree' of road pricing and the wide
range of apparently feasible technical methods available for operating it,
why are road pricing schemes not widely used? I discuss some of the
reasons below.

The Public Transport Subsidy Approach

In this case the cost of using uncongested facilities is lowered. Buses
could be subsidised on the grounds that bus passengers contribute less than
car passengers to traffic congestion.(*2) It can be better to price mass
transit below its marginal social cost simply because car transit is priced
below its marginal social cost.

There are numerous reasons quoted for the nonintroduction of a system of
road pricing (*3) which include the following:

1. The difficulty of devising a practical method of collection of charges
    whose level must change as congestion varies.

2. Road pricing and any other system of user charges would be strictly
    optimal only if all other goods in the economy are also priced at the
    marginal cost to society.

3. Border and infrastructure problems: there may be increased congestion

---

*1   Button, K. Transport Economics

*2   Sherman, R. 'Subsidies to Relieve Urban Traffic Congestion'. Journal
     of Transport Economics and Policy, 1972.

*3   Barrett, S. and Walsh, B. The User Pays Principle.

*4   Zettel, R. M. and Carll, R. R. 'The Basic Theory of Efficiency of
     Tolls'. Highway Research Record 19.

in areas bordering the restricted area. The ring road for through traffic must be adequate otherwise road pricing will not work as people will continue to use the congested roads.(*4)

4. There is the possibility of undesirable distribution repercussions, with road pricing the use of the roads depends upon the capability of the potential users to pay the charges.(*1).

5. There is controversy over the disposing of the revenues raised.

6. There are doubts about the response of road users to varying prices for road use.

Conclusion

In Ireland vehicle investment is falling and the percentage of G.N.P. spent on roads is rising steadily.(*2) Increasing investment in roads causes higher levels of noise, atmospheric pollution, vibrations, visual intrusion, planning blight and community severance. Indeed, the proposed road scheme leading to the Christ Church area requires the compulsory acquisition of thirteen licensed premises in the path of the development.

Road pricing is one example of economic science furnishing a powerful guide to practice. If one looks at the results obtained in a limtied schmee of this type(*3) the advantages become obvious. In the Singapore area licence scheme the volume of traffic entering the restricted zone fell by 44%, there was a 22% improvement in speeds within the zone, the bus share rose from 33% to 46% and car pool shares increased from 14% to 41% of all car trips. The carbon monoxide level during the restricted hours (which had formerly been at a peak) was reduced below that in the middle of the day.

Irish authorities are actively pursuing a policy of investment in expansion of roads rather than proper management of the existing capacity. It must be recognised by these bodies that urban road problems require more management and less engineering investment, and more recognition of the beneficial role of 'efficient' public transport.

In conclusion, despite the theory of second best, few would quarrel with the argument that the introduction of direct road pricing would improve the efficiency of resource allocation. Therefore I believe road pricing is a first best solution in a second best world.

- o -

*1 Richardson, H. W. 'A note on the distributional effects of road pricing'. Journal of Transport Ec. and Policy, 1974.

*2 Building on Reality Report.

*3 O.E.C.D. Conference 'Better towns with less traffic', 1979.