ASPECTS OF ROAD PRICING IN BRISTOL, UK

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1. INTRODUCTION

The city of Bristol is the regional capital of the South West of England located at the head of the Severn Estuary. It is the major centre of employment for the region with many motorists commuting daily from local towns and also the city of Bath which is around 17 km distant. Bristol, in common with most UK cities, currently relies heavily on the private car to meet its transport needs, and indeed car ownership is higher in Bristol than in any city of comparable size. Increased car ownership and the increasingly dispersed residential areas of its workers have resulted in steadily worsening traffic congestion. Market research carried out in 1997 found that most Bristol motorists recognise that the build up of traffic in Bristol over recent years is a major problem. Air quality is often raised as a particular concern, and there appears to be a general willingness to pay for air quality improvements. Inadequacy of public transport was felt to be a serious problem by almost a fifth of the respondents.

The authority responsible for transport policy in Bristol is Bristol City Council. In response to concerns such as those outlined above, the council has adopted policies which aim to break the pattern of continued car use and the decline of alternative modes, particularly public transport, while maintaining economic competitiveness. Priorities include ensuring good access to facilities, enabling economic development, providing safety and security, and improving the environment. The neighbouring local authorities have adopted similar policies under the umbrella of the Transport Plan for the former Avon area.

Transport and Travel Research is currently working with Bristol City Council to investigate a range of transport strategies each of which has the aim of achieving lower levels of environmental pollution through encouraging motorists to switch to using public transport. The demonstration study of the effectiveness of these measures (both individually and in combination) forms part of the European funded CONCERT project. This project comprises a consortium of eight European cities: Barcelona, Bologna, Bristol, Dublin, Hannover, Marseilles, Thessaloniki and Trondheim, each of which is investigating the effectiveness of various transport management systems.

The Bristol study is known by the acronym ELGAR (Environment Led Guidance and Restraint). The measures investigated were introduced in two phases between Summer 1997 and Spring 1998, and the evaluation concentrates on the effectiveness of the measures as a package rather than each in isolation. The study concentrates on the A4 Bath Road corridor which is a major radial road. This route suffers from traffic congestion but has a successful bus park & ride scheme with 1300 car spaces on the edge of the city, linked to the centre by a fast and frequent bus service using high quality buses.

The measures investigated are:

Phase 1:
The installation of five variable message signs (VMS) informing drivers of times when pollution levels in Bristol city centre are high. Strategically placed signs encourage drivers to use Park & Ride as an alternative to driving into the centre.

Phase 2:
Improved bus priority measures.
Real time bus information provided at a the main city centre park and ride bus stop
An environmental road pricing trial, in which a selection of volunteers were rewarded for switching to modes other than private car for their journeys into the city. The rewards were increased when high pollution levels were advertised. This trial aimed to simulate the volunteers' likely reactions to being charged tolls for driving to the city centre.

In this paper I concentrate on the issues surrounding the introduction of road pricing both in Bristol and more widely in the UK. At the time of writing (June 1998) validated results quantifying the effects of road pricing trial are not available - these will be presented at the European Transport Conference and an updated paper will be provided by the author.

2. THE ROAD PRICING TRIAL DESIGN

2.1 Geographical Considerations

Major employment centres in the area are located in Bristol City centre itself and in South Gloucestershire just to the north of the city. The centre of Bristol forms the focus of a highly radial road network with limited opportunities for travel between the radials. A consequence of this is that many commuters need to travel to or through the city centre to reach their employment. Two major inter-regional motorways, the M4 and the M5 pass to the north and west of the city, and, because the opportunity for driving around Bristol is limited, these are heavily used by local traffic despite the considerable extra travel distances which are often involved. Inappropriately high levels of road pricing in the city centre or a poorly designed cordon structure could produce the undesirable effects of increasing traffic on the periphery of the city or encouraging business to relocate away from the city centre. Although this latter problem could be alleviated to some degree by including the urban parts of South Gloucestershire within a road pricing system, the M4 and M5 which pass through this area are important national routes which could only be included as part of a national motorway tolling policy.

The previous transport authority, Avon County Council, commissioned Ove Arup & Partners to assess the feasibility of a road pricing scheme. This study was completed in September 1997. They investigated a number of cordon charging structures including a series of three concentric cordons based around the city centre and a cellular zonal system. The latter system would in practice have the advantage of providing a more equitable balance of costs between businesses in the city centre and those in South Gloucestershire to the north, hence minimising the number of businesses relocating from the city centre. The concentric cordons are, however, more readily understood by motorists and we were able to take advantage of the radial road structure in Bristol

to simulate such a scheme while installing tolling equipment on just one route into Bristol.

The main route between Bristol and Bath (the A4) is particularly congested at peak times. Furthermore, the existence of a parallel railway route and the park and ride bus service means that most road commuters have a good public transport alternative to paying the road toll - as would be desirable on all routes if road pricing were introduced. This corridor was hence chosen as a suitable location for the road pricing trail. The trial was designed so that choices to be made by the trial participants were as close as possible to those which they would face under a full cordon implementation with real road pricing. In order to achieve this we needed to minimise any gain drivers would have had by avoiding the tolling point - and so the exact tolling locations and charges were not those which might be most appropriate under a full cordon scheme. The participants were not explicitly told that the tolling locations were restricted to the Bath road (though many were probably aware of this through local media interest) in order to discourage the participants from considering taking long detours to avoid the toll.

2.2 Recruitment of Trial Participants

The impact of the overall ELGAR measures on road users and their effectiveness in changing behaviour and attitudes is being monitored using a panel of 528 car drivers. This panel was recruited by distributing self-completion questionnaires to drivers travelling into Bristol city centre on weekday mornings in November 1996.

This initial questionnaire aimed to ascertain drivers' views regarding traffic problems in Bristol, and about the perceived effectiveness of different measures in alleviating these problems. The respondents were also questioned about their personal characteristics and travel habits for different journey purposes. An analysis of the sample profile suggested that the panel is broadly representative of drivers using this route on weekday mornings. The panel exhibit a wide range of opinions regarding the effectiveness and acceptability of a number of potential measures, including road pricing.

The 116 road pricing trial volunteers were largely recruited from this panel. This group comprises people who make very regular (often daily) trips past Brislington Park and Ride and into or through the central area. Choosing regular travellers means we have people who are more likely to already have personal knowledge of mode and route choices, and we can observe each passenger making these choices on a large number of occasions during the trial. Furthermore, we required that they normally passed the Brislington Park and Ride site, which can generally only be avoided with a lengthy and time consuming diversion. Although the rewards of taking part in the trial were potentially considerable, this was not made explicit during the recruitment exercise - otherwise we would have risked biasing the sample to include too high a proportion of price sensitive travellers. An analysis of the group selected shows them to have a similar profile to the panel as a whole - and probably representative of drivers on this route into Bristol.

2.3 System Technology

Roadside equipment, comprising microwave detectors mounted on poles projecting over the road, together with a computer link to a central control room, was installed at points

roughly corresponding to Ove Arup's Inner and Outer cordons on this route (Totterdown Bridge and outside the park and ride site). These recorded the trial volunteers passing on the A4 going towards Bristol centre. The road pricing trial involved equipping the participants' cars with an electronic tag (transponder) which was detected each time the vehicle passed the roadside tolling equipment.

In order to simulate a toll being levied when each vehicle passed the Park and Ride and when the vehicle passed Totterdown Bridge on days when the VMS signs advertised that air pollution is high, a reward was paid each time volunteers demonstrated that they had modified their behaviour to avoid driving past the toll device. A machine was installed at the park and ride site for trial members to obtain free Park and Ride tickets using a smart card.

2.4 Trial Objectives

The trial objective is to determine changes in passenger behaviour in response to the toll. In particular to quantify:

- The level of diversion to Park and Ride
- The level of diversion to other modes (rail, bus, cycle, walk)
- The extent to which passengers are prepared to change route or change mode in response to tolls which are implemented on days with poor air quality
- The proportion who would make a trip to an alternative out of town facility in order to avoid paying a toll
- The proportion of trips which would not be made at all if road pricing were introduced.

A further objective is to determine whether the environmental road pricing trial has influenced individuals' perceptions of:

- the willingness of car drivers to accept road pricing
- the likely effectiveness of road pricing in encouraging passengers to change mode or use park and ride buses, with or without an air pollution episode

We believe that the availability of a range of public transport options will be a major factor in a successful implementation of road pricing. So public transport is promoted to some degree in the trial (through refund of tickets) in much the same way as it could be at the start of a true implementation. We imagine this will have a positive effect on the participants views of the acceptability of road pricing.

2.5 Charging Regime

The trial took place on the A4 Bath road over a 12 week period between February and May 1998. The charging regime was in operation on Monday to Friday 06:30 to 18:30. As the main aim of the Bristol trial is to assess the potential for reducing pollution, there is less benefit in 'spreading the peak' or promoting route diversion. This criterion distinguishes the Bristol trial from the objectives of other road pricing trials currently being carried out elsewhere (e.g. Trondheim, Norway and Leicester, UK).

Public transport was free to the trial participants (up to a maximum of £4.00 per commuting day). This enabled us to make public transport no more expensive than changing route to avoid the tolling points (hence minimising the potential for bias through only installing tolling equipment on a single route).

During the first 6 weeks, different tolling schemes were applied to assess the trial members' sensitivity to different scales of charging. Different levels were applied for 2 periods each of 3 weeks. During the remainder of the trial we assessed the participants normal travel behaviour and whether the promotion of public transport had any persistent effects.

The charging regime for the first 3 weeks is shown below. Instructions to the volunteers stressed the importance of the volunteers being aware of the potential rewards and treating these as they would their own money.

Charge	
Toll levied at Park and Ride	£2.50
Toll levied at Totterdown Bridge (only on high air pollution days)	£2.50
Charge for Park and Ride tickets	None
Maximum Refund for Public Transport	£4.00

In advance of the second charging period (weeks 4 to 6), the volunteers were informed by letter of the second period charges and of the possible rewards accrued by them at that time. For this period, a randomly chosen half of the volunteers had their rewards increased as shown below, while the remainder were retained at the previous level as a control group.

Charge	
Toll levied at Park and Ride	£4.50
Toll levied at Totterdown Bridge (only on high air pollution days)	£2.50
Charge for Park and Ride tickets	None
Maximum Refund for Public Transport	£4.00

As an aim of this study was to assess behavioural change on days when poor air quality is advertised and tolls are increased, we needed to ensure this happens on an appropriate number of occasions during the trial and during different charging periods. As genuine pollution episodes cannot be relied upon to occur in this way, the 'high air pollution days' were decided on in advance - an average of 1 per week and with 3 in each charging period. Air quality was advertised on the VMS as being poor for the whole day.

2.6 Attitudes to Road Pricing

A further aim of this study was to look at the perception of the likely effectiveness of environmental road pricing amongst drivers to Bristol. This has been assessed using panel questionnaires with additional questions being asked of the trial participants to see whether their attitudes have been changed by taking part in the trial.

We have collected and structured the participants' opinions on issues such as:

- The ease and reliability of the equipment supplied (the smart card and transponder), and whether the participant would have preferred road pricing in some other way. (E.g. toll booths, local tax).
- Ways in which road pricing might improve the participant's lifestyle, or have benefits for Bristol in general.
- Ways in which road pricing might make the participant's lifestyle worse or have negative impacts on Bristol.
- If the participant used public transport for some journeys during the trial, what they thought of it and whether they are encouraged to use it again.
- How the participant would like to see the road pricing revenue spent and whether the participant would be happier to see road pricing introduced if the money were spent in a way they believe is worthwhile.
- The level of road price the participant would see as reasonable, and whether the participant believes any groups should be exempt.
- For the trial, charging beacons were located at the Park and Ride site and Totterdown bridge. We asked whether the participant felt that that two 'rings' of charging sites around Bristol at these approximate distances from the centre would be appropriate for a toll system.
- Whether the link to air quality information was an important consideration in the participant's choice of transport.

We also asked if road pricing were introduced at a sufficiently high level for the participant to change behaviour, what would that change probably be. Alternatives suggested include:

- Using public transport instead
- Car sharing
- Walking or cycling
- Seeking to change job to avoid making trips to Bristol City Centre
- Avoiding making many of the trips the participant now makes to Bristol City Centre
- Moving house to avoid or reduce the level of road charge

3. CONCLUSION

Preliminary findings confirm that a substantial switch from private cars to other modes can be achieved through financial inducements, and we would expect that changes of a similar order may be effected through introduction of real road tolls. Furthermore, an additional modal shift was observed for those recruits whose rewards were increased.

Although results at this aggregated level are of value in predicting traffic flow changes, it is important to investigate variations in behaviour amongst individuals; a few of the participants switched nearly all their trips from private car and these account for most of the traffic reduction. The majority, however, continued to use their cars as before and it is important that we identify circumstances in which they would be able and willing to switch to public transport. Key factors in determining switch include the

cost of travel, public transport opportunities at home and work locations, whether public transport timetables are appropriate to the hours of work and whether a car is needed in the course of work. Further work is in progress to understand how these factors influence the choice of mode.