Chapter 15

Urban Road User Charging and Workplace Parking Levies

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Introduction

In this chapter we will briefly describe the provision made for the introduction of road user charging and workplace parking levies in the Transport Act 2000 and equivalent legislation for London and Scotland. After reviewing the background to these provisions, we will discuss the practical issues and policy questions which arise for any local authority wishing to take advantage of their new powers. Our discussion will draw attention to developments that have occurred since the passing of the Act and conclude on the prospects for charging schemes in the UK.

The UK Situation

Background to Charging for Road Use in the UK

Although the UK had a network of toll roads in the eighteenth century, the current interest in road charging is generally dated to publication of the Smeed Report (HMSO, 1964) in the 1960s. One legacy of the Smeed Report is a comprehensive set of criteria for the design and evaluation of charging schemes which, with minor amendment, are still relevant today (Milne et al., 2000). The other legacy from the Smeed Report has been a periodic recurrence of interest in the potential role of road charges in the solution of congestion problems in cities such as London. Road user charging has been considered for London several times since the 1960s but on each occasion, the idea was abandoned in the light of perceived practical and political problems. The

London congestion charging research programme (MVA, 1995), concluded that, although charging the capital's road users was a good idea in principle, it would be wise to begin with trials in smaller urban areas. The report took a cautious view of available technology, suggesting that full implementation of sophisticated electronic charges at the scale that would be necessary in a major UK city was still some way off. Meanwhile, studies in Cambridge (Blythe and Hills, 1994), Leeds (Ghali et al., 2000), Edinburgh and Leicester (Ingrey and Fouracre, 1999) sought to explore driver responses to a variety of charging schemes and to quantify the potential benefits. Results from these studies contributed to a lively debate on the role of congestion charging as a component of transport policy. The government promoted this debate as part of a wider consultation process which led, in 1998, to the White Paper (*A New Deal for Transport* (DETR, 1998a)).

The White Paper saw charging as part of a radical but balanced approach which, through consensus, cooperation and integration, could induce a mode shift and help solve some of the ingrained problems of transport in the UK (see Bonsall, 2000). A detailed consultation paper (*Breaking the Logjam* (DETR, 1998ab)), specifically devoted to charging issues, proposed primary legislation to give local traffic authorities new powers to charge for road use in two ways:

1. Road User Charging, allowing authorities to impose direct charges on drivers using roads within their area; and
2. Workplace Parking Levies, allowing authorities to levy charges on employers in their area according to the number of parking spaces they provide for their employees.

The inclusion of parking space charges was designed to accommodate those local authorities who wished to control demand for road travel to city centres but who had indicated, during the consultation processes, that they did not consider road user charging to be an appropriate solution for their locality. It had long been thought that demand for road travel could be influenced via the price of parking but, although local authorities could influence the price of on-street parking and public off-street parking, they had no control over the price of private non-residential parking (which often comprises up to 50% of total parking capacity in UK city centres). The power to influence the price of employee parking was therefore seen by some as closing a loophole. The

possibility of levies being extended later to cover other categories of parking was also discussed.

The Legislation

Provisions for both charging approaches were included in the 2000 Transport Act (for England and Wales). Specific legislation was also passed for London, in the 1999 Greater London Authority Act, and Scotland, in the 2001 Transport (Scotland) Act.

In addition to giving local authorities the power to introduce road user charging and workplace parking levies, the 2000 Transport Act stipulates that schemes starting within 10 years of the commencement of the powers will have 100 per cent hypothecation of revenue to local transport improvements, including public transport, for at least 10 years. All proposals for charging and expenditure need specific approval by the Secretary of State. The Secretary of State has the power to introduce road user charges on trunk roads, bridges and tunnels that are considered complementary to a local authority scheme.

The 1999 Greater London Authority Act provides similar powers to the mayor (and, potentially, to individual London boroughs), throughout the Greater London area. It stipulates that net revenues proceeds can only be spent on measures which, directly or indirectly, facilitate some part of the mayor's transport strategy. Any proposals need the specific approval of the Secretary of State.

The 2001 Transport (Scotland) Act gives local authorities the power to introduce road user charging, but makes no mention of workplace parking levies. Revenues are fully hypothecated for 'directly or indirectly facilitating the achievement of policies in the authority's local transport strategy'. Power to approve individual proposals falls to the Scottish ministers.

In all cases, the Secretary of State (or the Scottish ministers) can make regulations requiring exemptions or reduced rates of charge for particular groups. It is implied that appropriate authorities may put forward proposals for charging schemes at any time, but that consistency with ongoing formal local (and national) transport policy processes and goals must be demonstrated.

Although not covered directly by legislation, assurances were given that

revenues from charging would be additional to, rather than a replacement for, existing funding for transport from central government (the so called 'additionality principle'). Government also committed itself to providing funds for research, technology trials and, potentially, direct assistance towards the establishment of charging schemes.

A key feature of all the legislation is the focus on local government organisations as the main actors responsible for proposing and implementing charging schemes. Central government involvement has been constrained (formally) to approving local proposals and (informally) to supporting them through pump-priming activities and advice from appointed experts. This allowed central government to avoid direct responsibility for the introduction of schemes and, by offering local authorities the prospect of access to an additional and much needed source of revenue, provided clear incentives for cities to come forward with charging proposals.

Subsequent Developments

Initially, it was expected that several cities would take advantage of the legislation relatively quickly. Edinburgh, Bristol, Leicester and Cambridge had been developing road user charging proposals for a number of years, and were actively involved in related research studies. London, Leeds and a number of other cities had commissioned research into road charging and had produced outline proposals for charging schemes. Against this background, one of the assumptions underlying the traffic forecasts associated with the Government's Ten Year Plan for Transport (DETR, 2000) was that 21 charging schemes (9 road charging schemes and 12 workplace parking levy schemes) would have been introduced by 2010.

The key motivation for cities to press ahead with charging was that it seemed to offer the only means by which to raise the funds they required to implement their desired capital schemes (the Leeds Supertram being the classic example). However, when it became clear that much of the funding required for these capital schemes was likely to be provided by central government under the provisions of the Ten Year Plan, many of the front runners appeared to lose interest.

London soon emerged as the only major city likely to introduce road charging in the foreseeable future. The London scheme (GLA, 2001) will require drivers to pay £5 per day to enter an 8km^2 zone in central London. The London scheme is closely associated with the ambitions of the mayor, Ken Livingstone, not only for radical solutions to transport problems in the capital, but also for an independent revenue stream. At the time of writing, the scheme is due to come into force in February 2003. Bristol and Edinburgh are the only other major UK cities thought to be anywhere near bringing forward a firm plan for road user charging (a modest scheme has been introduced in Durham, but it amounts to little more than an access charge to an extended car park within the historic city core).

Only one city, Nottingham, is pressing ahead with proposals to introduce a workplace parking levy but the proposed scheme is meeting significant opposition from local employers and some pundits are now suggesting that it may never actually come into effect. It seems that almost all the other proposals for charging schemes or parking levies have been abandoned or indefinitely delayed. Concerns about acceptability appear to be the main stumbling block. Several major cities in England were once thought to be close to announcing plans for road charging or workplace parking levies, but, with the exceptions noted above, few will now admit to the existence of any such plans.

At the time of the White Paper, discussions were based on the assumption that the most appropriate technology for road user charging would be to equip vehicles with smartcard payment systems communicating with roadside or overhead detector/actuator units and relying on CCTV or video-based enforcement. Trials of this technology were proposed in Edinburgh and Leeds, but were subsequently delayed. The Edinburgh trial has been abandoned and the Leeds trial is not now expected to report before the end of 2003. Meanwhile, it has become clear that the authorities in London wish to begin their scheme before the results of these trials are analysed. Initially at least, there seems to be a widespread preference for less advanced technology. London has chosen a proven, relatively low-technology, system which uses CCTV cameras and Automatic Number Plate Recognition to match vehicles against a database of paid-up users.

In some contrast to this, the Commission for Integrated Transport has proposed a satellite-based system (CfIT, 2002). Their view is that the best long-term solution for managing road travel demand and encouraging more efficient travel decisions would be a nationwide system of road user charges based on travel distance, whereby cars could be charged an amount appropriate to their usage of different categories of road at different times of day. This would require all vehicles to be equipped with on-board units using satellites to determine their current location and, thus, the distance travelled in a particular charge zone. The technology would be similar to that needed for a new distance-based tax to replace Vehicle Excise Duty for heavy goods vehicles which was proposed by the Chancellor of the Exchequer in his April 2002 budget and which is expected to be implemented by 2006.

From Theory to Practice

The Theory

The idea that direct charges should be levied for road use originates from developments in welfare economics during the first half of the twentieth century (Pigou, 1920) and has been covered extensively in both the academic and policy-making literature (Maddison et al., 1996; COEC, 1995). The theoretical argument is that overall efficiency can only be achieved in a market if all participants are charged the full costs, including any externalities, of their activities ('externalities' being those impacts on other people, or society, which are not normally perceived or paid for – typical examples being the marginal contributions to congestion and environmental emissions made by each car in a stream of traffic). If individuals are charged for these externalities they can take them into account when choosing whether to use the roads – and each individual will use the roads only if the benefit they receive from so doing exceeds the full cost that such usage would impose on society.

Externalities are particularly evident in congested traffic; each additional vehicle worsens the congestion and imposes more delay on the other vehicles in the network. Crucially, this delay is over and above that which they themselves suffer and hence, in the absence of a means of charging for this

additional delay, the number of vehicles on congested roads will exceed the economically efficient optimum. The resulting traffic conditions are the cause of significant reductions in social welfare.

Economic theory proposes that this should be resolved by imposing a corrective tax on each driver, equal to the difference between the perceived cost and the full cost. Delay is particularly prominent in congested conditions but other externalities, such as noise, local or global emissions and aesthetic intrusion, occur even when the road network is relatively uncongested. Thus it can be argued that drivers should pay corrective taxes for all road trips at all times.

Finally, in order to provide an indication of the scale of the costs being considered, it is worth noting that the European Commission has estimated that, taken together, the cost of congestion and local environmental externalities is equivalent to 4.1 per cent of annual gross domestic product, as an average across all member states (COEC, 1995). The cost of global environmental externalities is uncertain and controversial but could significantly increase this figure. The definition of externalities may be obscure to most people, but the issue is not unimportant!

Practice

A considerable gap exists between the theory summarised above, normally referred to by economists as the “first-best benchmark”, and the approaches, normally referred to as “second-best solutions”, which can be considered in practice. There are three main reasons for this gap:

- current technologies are unable to provide reliable estimates for the levels of externality generated;
- drivers are unable to respond to price signals as the theory requires them to do – indeed some of their responses would introduce further costs and inefficiencies; and
- Institutional constraints make it impossible to achieve economic efficiency.

We will deal with each of these in turn.

In the simplest systems the technology can support the imposition of charges on vehicles passing particular points in the network during a specified period of time, for example crossing a cordon around the city centre during peak hours. By increasing the number of charge points it is possible to approach a situation where drivers are charged for using those stretches of road which are usually congested or where additional traffic is particularly unwelcome (eg at bottlenecks). However, drivers' use of these points in the network is a poor proxy for the generation of externalities at any given moment in time. Using more sophisticated technologies, which can record the distance travelled or the time spent within the charge area, it becomes possible to vary the charge so as to approximate the amount of use being made of the network but, again, this is not a very good proxy for the generation of externalities.

Even if we had the technology with which to charge according to the value of externalities, this does not mean that the drivers could, or would, respond so as to maximise economic efficiency. In order to respond effectively, the drivers would need to know what the charges were *before* they committed themselves to a given pattern of behaviour. Since the generation of externalities varies from minute to minute and from place to place according to the prevailing traffic and weather conditions, the theoretically-ideal externality-charge is bound to change rapidly and it would be impossible for any driver to predict what the charges would be at any point in the network at any given point in time.

It has been argued that, if non-trivial charges were to be imposed for use of congested links, drivers would have an incentive to become well-informed on the likely incidence of congestion before setting out on any journey, to keep themselves informed of conditions ahead, and to adjust their behaviour accordingly. Although a perfect match between charges and behaviour could never be achieved on any given day, the medium-term match might be quite adequate.

The imposition of charges can, of course, have unintended effects on behaviour. This can obviously occur in an under-specified or incomplete system. For example, the imposition of a charge at a point A inside the charge area might cause problems if traffic is thereby diverted to an equally sensitive

point, B, which happens to be just outside the charge area. More fundamentally it can occur if the driver responds to a charge which is proportional to distance by diverting to a shorter but more congested route, or if the driver responds to a charge which is proportional to travel time by driving more recklessly - an effect which was confirmed during research in the Leeds driving simulator (Bonsall and Palmer, 1997).

Institutional constraints can make it difficult or impossible to approach the first-best position. There are three particular issues here. Firstly, the spatial extent of a scheme is in practice likely to be limited to the territorial jurisdiction of individual government authorities, whereas economic theory implies that charges should be levied universally. Secondly, the objectives of authorities seeking to implement charging schemes invariably embrace pragmatic goals such as reducing traffic levels in sensitive locations, inducing modal shift to public transport and raising revenues to fund desired capital investments. These goals have conflicting requirements and it is clear that a concern to maximise theoretical economic efficiency of the system will fall some way down the lists of priorities. Thirdly, policy-makers have a preference for simple charging regimes, such as fixed charges to cross a cordon round the city centre, which can be implemented with relatively simple technology. Among the attractions of simple systems are that they are based on well-tried technology, that they can be introduced quickly with minimal legal and institutional complication and that they may be easier for everyone involved to understand and accept.

The ability of simple road charging systems and of workplace parking levies to support charges which reflect economic externalities is obviously limited, but they may be quite well suited to meeting the broader objectives described above.

The inclusion of revenue-raising as an explicit objective of road user charging introduces a particular conflict between economic theory and the perceptions of road users and policy-makers. In the first-best case, it is assumed that the utility contained in the corrective taxes is returned to the population in ways which ensure that everyone shares the benefits without producing economic distortions in the transport sector. The nearest second-best approximation to this is normally taken to be using the revenues to reduce

general labour taxes. In practice, however, any suggestion that charges levied locally should be recycled nationally would face major opposition from the local communities involved. Indeed, the typical local perception is that charging would be quite unacceptable unless the revenues were hypothecated for improvements to the transport system in the local area.

In the longer term, the widespread use of satellites to support in-vehicle systems may make this the obvious choice of technology for road user charging because it would obviate the requirement for roadside infrastructure and because quite sophisticated charging regimes may become possible using equipment that may be fitted as standard to the majority of new vehicles. The probable wider uptake of smartcard technology for electronic payment may also tend to increase the acceptability of more complex charging approaches. How far these innovations might be used to develop practical proposals for charging based on better estimates of externalities is an open question. On the one hand, promoting economically efficient charges is currently a significant element of transport policy in the European Community. On the other hand it seems (Train et al, 1989) that users prefer simple charging structures and, so long as the control and operation of road transport is in public hands, it is perhaps unlikely that policy-makers will go against this preference.

Experience Elsewhere

Outside the UK, it is relatively common for drivers to pay direct charges for using major inter-urban motorways. However, these charges are generally associated with the operation and maintenance of the road and are not designed to cover externalities or affect travel behaviour.

In the US, Canada and Australia, payments have been introduced on a small number of urban motorways and the idea of using charges to control peak demand has been investigated. The American ‘value pricing’ trials (FHA, 2000) are particularly interesting because they allow for the fact that although some users (those with high values of time) will be prepared to pay to avoid congestion, others will not. The concept involves the designation of one or two lanes of the highway as a ‘value lane’ while the other lane(s) remain untolled. The toll is set at a level which is just sufficient to depress demand enough to

leave a time advantage for those using the value lane. Drivers have the option of paying for improved travel conditions on particular stretches of road, but are also still able to access their destinations for free if they are prepared to use the slower lanes. This approach provides interesting empirical evidence about the willingness to pay to avoid congestion and may go some way towards mitigating the impacts of externalities on users with high values of time while providing some protection to low income users whose values of time would not justify their payment of a toll. However, it departs from the pure economic efficiency rationale for congestion charging, which implies that all drivers should be affected equally.

The best examples of direct charges for use of urban roads come from Singapore and the Norwegian cities of Oslo, Bergen and Trondheim. Singapore has, for demand management purposes, operated a charged cordon for entry to the central business district since 1975. Initially, this was a manually operated system involving the purchase of paper permits but it has subsequently been converted to a sophisticated electronic payment system and is now being expanded ultimately to cover all major routes on the island. It provides an excellent case study of road user charging but the unique geographical and political setting may reduce its usefulness as a role-model for the average UK city. In Norway, charge-cordons have been in place in three cities since 1986, using a combination of manual and electronic tag-based payment. The explicit aim has been to raise revenues to fund a series of major transport projects and, to this end, charges were designed to spread the financial burden as thinly as possible across the largest number of drivers rather than to affect travel demand. The policy-makers initially stated that the charges would be removed as soon as the investment costs had been recovered. However, subsequent growth of traffic, especially in Oslo, has led to this commitment being reviewed. The Norwegian experience provides valuable information about the practicalities of introducing direct charges for urban road use in a European setting. In particular, it demonstrates the political possibility of successfully implementing a charging policy despite very low levels of initial acceptability. A key factor seems to have been that revenues were explicitly hypothecated for popular capital investment projects and that central government provided a proportion of the funds up-front to enable some

of the results of the investment to become apparent immediately before charges were introduced.

The Netherlands has actively considered introducing road user charges (see www.roadpricing.nl). An initial proposal (Rekeningrijden), focused on the four major cities of Amsterdam, Rotterdam, The Hague and Utrecht, aimed to charge all drivers a fixed fee during the morning peak for entering a cordoned area around each city. The Rekeningrijden proposal met very effective opposition and was superseded by a new proposal (MobiMiles), involving a distance-based charge for all roads in the Netherlands with charge levels varying by vehicle type, location and time of day. Although this is, potentially, a more draconian approach, it initially met with less opposition.

Implementation Issues

Local authorities contemplating the implementation of road user charging and/or workplace parking levies will wish to consider a number of issues: the effect on traffic levels, the net revenue, the impact on economic activity, equity, practical issues and, last but by no means least, acceptability. We now discuss each of these issues, highlighting the extent to which the impacts are dependent on factors within the control of the implementing authority.

Effect on Traffic Levels

The impact of a road user charging scheme on road traffic will obviously depend primarily on the level of charge applied, the extent of the charge area and the number of drivers affected. This relationship will not be so clear in the case of a workplace parking levy for several reasons. Firstly, because employers may choose to absorb the levy rather than pass it on to their employees – in which case there would be little incentive for commuters to modify their travel behaviour – although some effect might be achieved if employers, seeking to reduce their exposure to the levy, were to reduce the number of parking spaces available. Secondly, even if road-space is freed up because the increased cost of parking persuades some commuters not to drive,

the space might be filled by travellers unaffected by the levy. These might be commuters whose employers are not subject to the charge, commuters whose employers decide to absorb the charge or people making other types of trip. Thirdly, although, as intimated above, there might be some shift of trips from other periods in towards the peak, this might in turn be offset by increased off-peak travel associated with trips using car parking spaces no longer required by commuters.

In the case of road charging the overall impact of a scheme may be crucially dependent on the precise location of the charge area boundary. From a city-wide perspective, a looked-for reduction in congestion within the charge area could be outweighed by an increase in congestion on those roads just outside the boundary which provide alternative routes for drivers wishing to avoid the charge. A major issue in the design of road user charging schemes will be to locate the boundary of the charge area such that there is adequate capacity for this traffic. The precise boundary of a workplace parking levy scheme would have relatively little impact on traffic patterns but could have a significant effect on local parking demand.

The traffic impact of a road charging scheme can be tailored to the temporal pattern of congestion by careful definition of the time periods during which charges are to apply. In the case of workplace parking levies, however, even allowing for the possibility of journey retiming, any traffic reductions are likely to be largely restricted to the commuting periods. This may be fine if congestion is concentrated in those periods but not if congestion also occurs at other times of day.

The impact of road user charging schemes on traffic conditions will depend critically on the charging regime adopted. Modelling work has provided some useful insights here. Work by May and Milne (2000) has suggested that charges based on time spent travelling are most effective in reducing delays, but that this may be at the expense of increases in distances travelled and that this effect may outweigh any reductions in traffic levels due to reduced trip-making. Charges based on distance travelled have been found to be most effective in reducing vehicle miles (see for example Hyman and Mayhew, 2002). They may provide some relief at congestion hot-spots due to reduced trip-making, but this effect may be small and congestion may actually

increase on the shorter routes. The effect of charges to cross cordons or screenlines are critically dependent on the size of the charge area, the levels of charge applied and the precise locations of charging points (Shepherd et al, 2001). Work by Fridstrom et al (2000) suggests that cordon-based road charging schemes of the kind usually proposed by policy-makers are unlikely to achieve much more than around 40% of the benefits predicted under economically optimal pricing.

If charges are varied by time of day and are concentrated on key links in the network, it may be possible to focus impacts on those times and places where congestion is common and to avoid major effects on other travellers. There is clearly a theoretical argument for varying the charges from day to day and hour to hour depending on current levels of congestion (Oldridge, 1990). However, if the charging regime becomes complicated or unpredictable, drivers will be unable to modify their travel behaviour in the light of the charges and much of the theoretical benefit will be lost. There is clearly a trade-off between sophisticated regimes which attempt to focus charges on the times and places where congestion is most serious and simpler approaches which, although not so finely tuned to the problem, do allow drivers to predict the charges and respond accordingly.

The impact of a given charge on driver behaviour is likely to depend not only on its level and predictability but also on the extent to which it is perceived as being associated with individual journeys. A charge levied per journey and evident at the point of use is likely to have more effect than one which can be paid in advance or which can buy access for an extended period of time. Although the initial outlay for a period-ticket will be greater, once it has been purchased there is every incentive for the driver to make maximum use of it. It has been suggested that the effect of a given charge would be maximised by emphasising its relationship to road use, for example by displaying the charge at the roadside or on an in-vehicle meter.

Revenues

The net revenue achievable from road user charging will be a function of the charge level, the costs of system installation and operation, the number of

drivers affected and the nature of their response. All except the last of these are, to a greater or lesser extent, within the control of the system designers. For example, the number of drivers affected will be determined by the spatial extent of the charge area, the hours of operation and the list of exempted vehicles while the costs of installation and operation will be a function of the technology employed. Initial estimates of the amount of revenue 'lost' as a result of drivers modifying their behaviour in order to reduce their exposure to road charges have been based on conventional price elasticities derived in other contexts and from responses to road charging observed in other countries. However, evidence from field trials and experiments and from stated preference questionnaires (see for example, Bonsall et al., 1998) suggests that drivers will be less likely to change their behaviour in response to road charges than would be predicted from conventional elasticities and that the elasticities will vary depending on the scheme design.

The net revenue from a workplace parking scheme will depend on the charge, the costs of implementation and operation, the number of eligible spaces and the response of employers. Although initial estimates of the costs of implementation and operation suggested that they might be quite modest, more recent studies have suggested that the costs involved in the establishment and maintenance of a database of commuter parking places, the collection of charges, the monitoring of space usage and the enforcement of restrictions, could be quite considerable. Prediction of employer response, or more specifically, of the number of commuter parking spaces which employers might decommission or re-designate for other purposes, is difficult because of the lack of precedents. Some firms will, of course, seek to reduce or avoid their liability to the levy by under-reporting their parking stock or, if exemptions are offered for firms which are below a given size or who adopt an approved green travel plan, by seeking to qualify for such exemptions, legitimately or otherwise. Such possibilities will need to be taken into account when forecasting revenues. The response of individual employees will only affect the revenue from workplace parking levies if it leads employers to reduce their stock of spaces.

Economic Impacts

Road user charging can be expected to produce economic benefits through reduced congestion, but may also do so through appropriate use of the revenues. The hypothecation clauses in the Transport Acts rule out the use of revenues to reduce local property taxes/business rates but would permit use of revenues to improve environmental conditions or the provision of transport – either of which would be likely to make an area more attractive to investors. However, the distribution of benefits is likely to be very uneven; some locations, and some firms, will lose out relative to others.

The mechanisms are fairly clear. Reductions in economic activity are likely to occur just inside the charging area – particularly if the charge is simply based on crossing the cordon – because the exposure to charges may not be offset by substantial reductions in congestion. Reductions in economic activity may also occur just outside the charging area if the volume of traffic seeking to avoid the charge results in increased local congestion and environmental deterioration. The net effects are difficult to predict but it seems reasonable to suppose that the pattern of land use will change over time and that high value activities for whom the charges represent a small fraction of their turnover, will tend to congregate within the charge area – where they can benefit from the reduced congestion, while low value activities will be displaced or relocate outside the charge area. The area just outside the charge zone is likely to attract car parks and housing for those wanting to be within walking distance of the centre. If there is a charge at a cordon, bulk retailing will tend to locate on whichever side of the cordon its main customer base is to be found.

The outcome in any given city will reflect the spatial relationship between charges, businesses and residential areas and will be mitigated by development control policies. Evidence from the Norwegian cities, where charges have been imposed towards the perimeter of the main urban area, is that property prices have increased more rapidly inside than outside the cordon. This probably reflects the fact that the area within the cordon is of sufficient size for people to reside, work and travel to all the main urban activities without making a payment. Businesses and housing outside the cordon are cut off from their natural market and therefore are relatively disadvantaged. By contrast, many of the road user charging proposals for UK cities involve a fairly tight cordon

around the central business district (CBD) with relatively little residential property inside the cordon. It may be that, unless prevented by strict development control, this will lead to a migration of activities with large customer bases to areas outside the charge area and an increasing dominance of business-to-business commercial activities within the CBD.

The attractiveness of the charge area as a location in which to live may depend on whether outbound trips are charged in the morning and inbound trips are charged in the evening – if they are then city-centre living may become less attractive. It is by no means clear that the long term effects on land use patterns would be beneficial – the migration of mass activities from the city core could further exacerbate environmental problems and make it more difficult to service transport demands via public transport.

It is difficult to be optimistic about the impacts of a workplace parking levy on the urban economy. Since it is unlikely that such a scheme would result in a significant reduction in congestion, the main economic effect will be the additional costs imposed on business (or their employees) offset by any beneficial consequences from use of the revenues. Consultation exercises in Nottingham and other cities which have considered introducing a workplace parking levy suggest that business leaders are profoundly pessimistic about the likely impact on their activities. A major concern for policy-makers must be that organisations may decide to relocate outside the charged area or, more seriously for the local economy, to other cities and regions.

The legislation envisages that parking levies will not be imposed on firms below a certain size (it being recognised that the effort required to administer a system which includes the smallest firms would not be justified by the revenue to be derived from these smallest firms). This could distort the local economy. Small firms in the charge area will have a commercial advantage over their larger rivals in the short-term, but the natural tendency of successful firms to grow may be constrained by the prospect of becoming liable to the levy and so small firms within the charge area may be disadvantaged relative to their competitors outside the area.

Equity

Any system of road charging will produce winners and losers. Generally, drivers with high values of time (for example, the rich and those involved in business activities) may be expected to benefit from travel time savings which, to them, are worth more than the fee paid, while drivers with lower values of time may be expected to lose out – particularly if they have no option but to continue using the charged roadspace. In addition, where charges are spatially concentrated there may be major differences in the impact on organisations or individuals located inside and outside the charge area – particularly if, as noted earlier, they are located close to the boundary.

The equity implications of variations in charge by time of day will depend on the nature of the activities involved. For example, high charges in the peak would adversely affect low income people whose work requires them to travel by car but does not allow any flexibility in work hours. Conversely imposition of charges during evenings and at weekends would adversely affect low income shift-workers whose work hours make use of public transport unrealistic.

Provision of exemptions will have an important role to play in mitigating equity problems with road charging or workplace parking levies but cannot solve all the potential problems. We are not aware of any proposals which do not grant exemptions to individuals who are seriously mobility impaired but we are well aware that granting exemptions to those with more minor handicaps would raise difficult issues of comparability and, potentially, invite abuse. A concern for the particular problems of low/medium income workers led to the suggestion that 'key workers' should be exempt from charges in the London scheme but the idea was dropped when it was recognised that any definition of key workers could be seen as discriminatory with respect to individuals and the organisations employing them.

The proposed exemption of small firms from workplace parking levies could be regarded as discriminatory – and might lead to legal challenge – because it would confer a commercial disadvantage on larger firms and a penalty on their employees. Furthermore, since public sector organisations are likely to have less freedom to absorb the levy, they are more likely than private sector organisations to pass it on to their employees. This difference could be regarded as working to the disadvantage of public sector employees

and may lead to objections from labour unions.

Decisions on location, regime, level of charging and exemptions are central to equity. The standard argument from economics is that those who are particularly negatively affected can be compensated by the revenues obtained from those who benefit. This is rather easier to conceive in theory than implement in practice, as it would be impossible to identify the full range of circumstances that cause each individual to be a winner or a loser, but it helps point to the fact that use of revenue is the main tool available for resolving those equity concerns which cannot be tackled via provision of exemptions.

Recognition of the particular problems for night-shift workers led the organisers of the London congestion charging scheme to propose improved late-night bus services but concerns for their personal security have led some of the workers involved to dismiss this as a wholly inadequate response to what they see as unfair treatment.

Practicality

The main issues to be considered under this heading relate to the technology and procedures used for charging, billing and enforcement.

The relative merits of a number of approaches, including paper permits, were assessed by consultants working for the Government Office for London on behalf of the then-yet-to-be-elected Mayor of London (GLA, 2000) and for Leeds (MVA et al., 1999). It was concluded that the best approach for a relatively small scheme would, in the early years, be to use cameras and image recognition technology to read the registration plates of vehicles within the charge area and to check each registration plate thus identified against a database of vehicles for which a charge had been paid for the day in question. Enforcement action could then be taken in respect of any vehicle for which a charge had not been paid. Drivers would be able to pay the charge on a daily basis, or for an extended period, by a variety of methods including credit card transactions by phone.

A number of concerns remain over this system particularly in respect of errors in the image recognition technology (perhaps around 10 per cent in typical traffic conditions), the need for evidence of non-compliance that would

stand up in court, and inaccuracies in the Driver and Vehicle Licensing Authority (DVLA) database which would be used to identify the registered keepers or owners of non-compliant vehicles (some estimates suggest that up to 20 per cent of DVLA records have errors and the figure is likely to be even higher for that subset of vehicles for which enforcement action is necessary). There is also a concern that, although the proposed London scheme covers a relatively small area, the sheer volume of data involved in registering payments, checking registrations against the database and monitoring the payment of fines, might outstrip the capacity of the computers. Finally, some database experts have suggested that computer hackers might find a way of bringing the system to a standstill or corrupting its content.

Despite the efforts currently being expended in London to overcome or minimise these problems, there are those who doubt that the current schedule (with charging due to start in February 2003) allows enough time for them to be fully overcome. There is clearly a serious concern that the credibility of the London scheme could be jeopardised if the problems outlined above were to result in high-profile erroneous prosecutions or if the public were to come to believe that the risk of being prosecuted for non-payment was very small – either as a result of the system's failure to identify non-compliant vehicles, or as a result of a low level of successful enforcement. If the system is not able to provide clear and incontrovertible evidence the authorities will be faced with a dilemma in respect of their policy on enforcement: too aggressive and they risk bad publicity from unsustainable prosecutions, too weak and they risk promoting the perception that non-compliance is unlikely to be pursued.

As a general rule, the more complicated the charging regime, the greater the scope for practical problems in the installation, maintenance and operation of the scheme. Thus a scheme with different charges for vehicles of different types or using the network in different ways (for example, travelling different distances, taking different routes or spending different lengths of time on the road) may encounter more practical problems than one based on a simple cordon such as that proposed for London. As was noted in a previous section, theoretically ideal charging systems require charging regimes which discriminate between vehicles according to the amount and timing of their use of the network. This discrimination is only achievable if the vehicles'

whereabouts can be carefully, and almost continually, monitored. The privacy and practicality issues raised by any kind of external monitoring at this level of detail lead to the conclusion that vehicles would have to be equipped with in-vehicle units (IVUs) which can 'know' where the vehicle is and how far and fast it is travelling.

Any proposal to require IVUs immediately raises three very practical issues; Firstly, what to do about non-equipped vehicles? Experience with the introduction of smartcard-based tolling systems, notably in North America and France, suggests that it is not necessary to have all vehicles equipped provided that there is some way of charging non-equipped vehicles. The possibility of a later migration to a smartcard or IVU system was certainly taken into consideration before London chose to adopt its camera-and-database system. Secondly, how to meet the cost? Theoretically, of course, because it can support charges which are more closely adjusted to the value of the journey being made, an IVU system should be able to capture more revenue and would therefore justify some central contribution to the cost of the IVUs. However, there is evidence, again from the side-by-side operation of smartcard systems and manual systems, to suggest that an appropriate system of discounts could persuade drivers to contribute towards the costs of their own IVUs. Thirdly, can we be sure that IVUs would not be tampered with in order to avoid payments? Although some advocates of IVU-based systems express confidence that a tamper-proof system could be produced, others privately admit that it is impossible to be sure that some technical 'geek' would not succeed in the challenge of overcoming almost any security measures.

The practical problems outlined above have all related in some way to the technical specification of road charging schemes. One of the reasons for the initially high level of interest from local authorities in workplace parking levies was that they did not depend on unproven technologies. This is true but closer examination revealed that the practical problems involved in the establishment and maintenance of an inventory database of workplace parking spaces will be far from trivial. Given the prevalence of unmarked spaces, labyrinthine site layouts and creative parking behaviour, establishing the number of spaces is something of a challenge but the real problem is how to determine whether a given space is an employee's space or whether it is for

customers or operations. Particular complications may arise where employees use vehicles for a mixture of commuting and business purposes. The resources required to complete the task will depend on cooperation from the organisations affected but, as Nottingham is discovering, this cooperation may not be forthcoming. The likelihood that firms will be actively considering how best to minimise their exposure to charges – by obfuscating their parking capacity, redefining their employees or seeking to be reclassified as a group of small firms below the threshold size, may make the preparation of the database particularly challenging. Even after the database is completed considerable effort is likely to be required to keep it up to date and to monitor the usage actually being made of spaces within the charge area. The overall impact of the scheme on road traffic will depend on the effectiveness of associated control of off-site parking. This may require expenditure of considerable effort on enforcement.

Another group of problems, which may affect road charging schemes as well as workplace parking levies, arise when there is a conflict of interests between the authority wishing to implement the scheme and another authority with a legitimate interest. This may make it difficult or impossible to define an effective scheme. For example, if the optimum location for the boundary of the charge area were to cause diverting traffic to use roads administered by an adjacent authority, that authority might be able to convince the Secretary of State that the scheme should not proceed. Even if the Secretary of State decided not to intervene the authority might decide to pursue its objection through the courts. It is of course open to any aggrieved party, individual, company or local authority to question the legality of a proposed scheme. Given the strength of passions likely to be aroused it is almost inconceivable that such challenges will not be made. Such action could delay the implementation of a scheme or force a change in its design which would seriously compromise its effectiveness.

In the London case, the fact that the Mayor has the power to introduce a road charging scheme under the provisions of the Greater London Authority Act (1999) does not prevent any aggrieved party from raising a legal objection to the way that the scheme is being introduced. Any authority intending to implement a charging scheme will need to take particular care not to expose

themselves to charges of discrimination, invasion of privacy, failure to comply with data protection legislation, failure of fiduciary duty, or failure to consult fully. The current London administration, led by Ken Livingstone who was at the wrong end of a legal judgement on public transport fares subsidy in the 1970s, was well aware of these issues and took great care to avoid being exposed in this way. Three London Boroughs (Kensington and Chelsea, Wandsworth and Westminster) mounted a legal challenge on the grounds that the Mayor had not consulted fully but their claim was rejected. Nevertheless, although the judge concluded that the scheme did not amount to contravention of human rights, the possibility of a further action on these grounds is threatened before February 2003.

Acceptability

It is important to draw a distinction between *acceptance* – the willingness of individuals to comply with a measure – and *acceptability* – whether or not they support it. Road charging is certainly controversial in the UK and dire predictions have been made that its implementation will conjure mass protests of the kind which effectively killed off Mrs Thatcher's Community Charge. Reference to road charging as a 'poll tax on wheels' will undoubtedly cause some politicians to hesitate and were not lost on Ken Livingstone who will have recalled the public support for the 'Can't Pay, Won't Pay' campaign following fares increases in London in the 1980s. Some commentators have suggested that the decision to exempt taxis from the proposed London charge is not unconnected with their noted willingness to mount effective protests if their interests are ever threatened. Despite these worries it must be noted that there is no evidence from experience in either Singapore or Norway that failure to comply is a major problem.

But even if there are no mass protests, the scheme is unlikely to be popular with motorists – particularly in the short term. Public support for Oslo's charges has been rising continuously over the decade during which the scheme has been in operation but still is only just approaching half of the urban population. Support for any given road charging scheme will depend on its design and will reflect its perceived effectiveness, equity, practicality and

economic impacts. Other things being equal, there is likely to be particular exception to schemes which seem unnecessarily complicated or which do not produce any obvious benefits. A major problem for those seeking to implement a scheme is that those who stand to gain are likely to be much less voluble than those who stand to lose. The trick may be to ensure that the gainers are more numerous than the losers – which takes us back to the issue of equity and the judicious use of exemptions and revenues to turn potential losers into actual gainers.

In their detailed consideration of acceptability issues in transport pricing, Schade et al. (2000) identify three separate interest groups: the public; the business community; and political decision-makers.

Individuals are likely to oppose proposals which seem to impact on them more than on other groups, payment structures or mechanisms which appear unnecessarily complex, and technologies which appear intrusive. A major concern, often articulated in public discussions is the fundamental unfairness of having to pay for road space which has traditionally been free at the point of use and which 'we pay for through our taxes and petrol'. There is little that a local authority can do to defuse this argument – though Leeds have considered offering reduced parking charges within the charge area and, at a national level, it has been suggested that any revenue from national road charges should be offset by reductions in Vehicle Excise Duty and fuel tax.

The granting of exemptions may seem an obvious means of defusing complaints about unfair treatment, and we note that the London scheme will offer significant discounts to people resident within the charge area, but ill-judged exemptions may simply enrage those who do not qualify. A scheme which fails to deliver the expected reductions in congestion is likely to be intensely unpopular even if it involves only modest charges. Hence the importance of ensuring that the charge is high enough to create some traffic reductions and that there is sufficient capacity outside the charge area boundary to carry the diverted traffic without causing yet more congestion. It is said that Ken Livingstone decided on a £5 daily charge for the London scheme on the grounds that ‘£3 would have been too small to have any effect and £10 would have led to riots’.

The acceptance of value charging by US motorists demonstrates the

importance of good marketing (to label the concept ‘value pricing’ was a stroke of genius) and of providing choice. Norway’s decision to offer drivers a choice between manual and electronic payment reflected the perceived need to avoid *compulsory* imposition of electronic payment technology – recalling the fact that trials of electronic payment for road use in Hong Kong in the 1980s were famously abandoned due in part to concerns that the chosen technology would compromise privacy.

One impact of road charging schemes which seems not to have raised much concern among the public is the aesthetic impact of the associated street furniture – this is the sort of issue that is not perceived until it is experienced first hand and even then is likely to be a minority concern.

Public acceptance of workplace parking levies will depend crucially on whether their employers decide to pass the charge on to those of their employees who drive to work. If the charges are passed on then one can expect considerable opposition and, although part of the opprobrium may well fall on the employers rather than on the authority responsible, a major issue is likely to be the unfairness of a policy which affects some drivers to the advantage of others.

The response of the business community to a charging scheme will depend particularly on its perceived effectiveness and economic impacts. It seems that business leaders will tend to support road user charging measures if they believe they will be effective in reducing travel costs, but they understandably oppose all policies that would reduce their competitiveness in the market. The fact that the charges take effect immediately while the benefits may not be obvious until later will tend to reduce their enthusiasm for road charging but many large businesses express support for the concept as a necessary response to the problem of urban congestion – although they are mindful on the possible effect that a charge might have on their ability to recruit and retain staff. Their response to workplace parking levies is less measured – not only are they sceptical about the supposed traffic reduction benefits but they are enraged to learn that they are expected to resource the process by which the charges are passed on to the drivers at whom they are aimed. They are faced with an unwelcome dilemma – do they reduce their competitiveness by absorbing the levy or do they risk alienating their workforce by passing it on?

Business leaders are, of course, particularly concerned if they believe that they are to be more disadvantaged than their key competitors. Those who operate primarily in local markets will be most concerned about equity of treatment within the local scheme, while those operating in wider markets will make comparisons with policies being adopted in other areas. It is not clear what can be done to increase the business community's acceptance of charging schemes other than by emphasising the expected reduction in congestion and targeting the revenues in ways that are likely to benefit the local economy – although the hypothecation rules clearly rule out direct assistance to business.

Political decision-makers are likely to be concerned about all aspects of a charging scheme but most particularly by its acceptance by the voting public, its ability to generate revenue, its ability to deliver reductions in congestion and its impact on the local economy. Elected representatives will be very concerned about timing; they need to be confident that, at critical points of the political cycle, they will be able to point to benefits which outweigh any negative aspects. Given the relatively short gaps between elections in UK cities, this may encourage a focus on charging schemes that can rapidly deliver some benefits, even if there is reason to believe that other approaches might bring greater benefits in the longer term. This fact may indeed explain the greater initial interest in workplace parking levies than in road charging.

The main concern for politicians must be the extent to which the overall policy is supported by the voting public. As the introduction of charging is unlikely to be a vote-winner on its own, the use of revenues to fund measures that improve acceptability may be vital. In the Norwegian case, road user charging has never achieved support from a majority of the public but there is widespread support for the major transport projects that the charging schemes were designed to enable. The Norwegian politicians concluded that the pain was well worth the gain but it takes a brave politician to introduce a charging scheme unless they have no alternative.

Conclusion and Tangent

Although direct charges for road use are, according to economic theory, the ideal solution to transport inefficiencies, there are, as we have seen, many

reasons why they may be unable to produce the same benefits in practice. Not least of these reasons is that government is not actually seeking to maximise economic efficiency; their objectives include solving transport problems, raising revenues and promoting the local economy and they seek to achieve theses objectives in a manner which is equitable, practicable and acceptable to their electorate. The niceties of internalising the externalities and theoretical arguments about economic efficiency will have little bearing on their decisions.

The legislation provided local authorities with the powers necessary to introduce schemes that could provide transport system benefits and revenues. The associated forecasts of potential benefits, the assurances on additionality, and the offer of technical assistance where needed, led several authorities to express an interest in introducing road charging or a workplace parking levy. This initial interest in turn led the government to build into their Ten Year Plan the assumption that 21 cities would have charging schemes in place by 2010. This target now looks unachievable. At the time of writing, no city other than London and Durham has come forward with firm plans for road charging and Nottingham now seems alone its intention to implement a workplace parking levy.

The reason for the decline in interest is not hard to find. Firstly, for local authorities in England and Wales, the generous provision of funds under the Ten Year Plan for Transport has removed what was the most immediate reason for introducing charges - namely to raise revenues. Secondly, following the emergence of a very vocal motoring lobby and the successful campaign against fuel tax, government at all levels is keen to avoid being cast as anti-car (see Parkhurst, 2002).

Although the legislation was passed by central government, it was always going to be up to local government to take the initiative and responsibility for charging schemes in their area. Given the shift in stance of central government away from charging and the departure from the transport policy arena of John Prescott (the architect of the 2000 Act), local authorities which might have had an interest in introducing charges now feel rather exposed and are by no means convinced that central government would provide political support when times get hard.

In the medium term, a delay in the implementation of road charging may not matter to the cities who were expected to be in the vanguard because they can be getting on with spending their Ten Year Plan money while waiting to see whether the London scheme succeeds. In the longer term however, the absence of the expected revenue stream from road charging and parking levies, may leave the Ten Year Plan financially unsustainable and the absence of traffic restraint may make its targets for modal split and traffic reduction unachievable.

We have indicated some scepticism about the ability of workplace parking levies to have much impact on general traffic levels – suggesting that their main role may be in raising revenue for other transport schemes. We are not alone in suggesting that they are likely to be difficult and unpopular to implement and that their impacts on land use patterns may be detrimental. Ironically perhaps, the problem seems to be that they are limited in their scope; if levies were applied to *all* parking spaces, irrespective of location or type, there would be some incentive to reduce car use and to use alternative modes. The problem with the schemes allowed for under the Transport Act is that, because they deal only with one type of parking activity and are only to be applied in a few areas, they will be relatively ineffective, difficult to administer and may distort land use patterns.

We also have concerns about the effect that local road charging schemes might have on land use patterns. The boundary effects of urban road charging are potentially very serious and, in the absence of an effective mechanism for development control, the long term effects of a localised scheme on land use patterns could be regrettable. Accelerated out-migration of mass activities from the urban core would leave a more dispersed pattern of land use and with transport demands which cannot easily be met by public transport. If charges are imposed in one area of the network but not elsewhere, the tendency will be for those uncharged areas to attract more of the traffic growth. But do we really want to see accelerated growth of traffic on suburban roads and in the countryside? Proponents of motorway tolls point to the fact that, without such tolls, the most rapid growth is likely to be on motorways and that the introduction of urban road pricing without commensurate tolls on peri-urban motorways would quickly lead to them becoming congested. Meanwhile,

some studies (for example, Mauchan and Bonsall, 1995) have suggested that the introduction of motorway tolls without any charge on local roads would encourage diversion to less suitable roads. It seems that any non-universal charging system will have undesirable effects on the uncharged network.

The Commission for Integrated Transport's backing of nationwide distance-based charges seeks to overcome this problem. Publication of the proposals resulted in a predictable, if largely misplaced, concern about personal privacy but the predicted concern about any additional tax burden on motorists was largely defused by the suggestion that the scheme would only be introduced as a replacement for other forms of motoring taxes – the net effect would be tax-neutral. This proposal raises some interesting issues.

Firstly, why, other than for presentational reasons, is it designed to be tax-neutral? Can it really be that road users already pay enough to cover the full social costs of their travel through annual vehicle licence fees, fuel tax, parking charges etc? A number of studies have attempted to quantify the full social costs generated by road users and to draw comparisons with taxes and charges paid (see for example Maddison et al., 1996). Results vary significantly from one study to another depending particularly on the value attributed to environmental externalities, but a universal finding is that urban drivers fail to cover their social costs, particularly during congested periods. Against this background we note that the traffic forecasts built into the Ten Year Plan assume that the real cost of motoring will fall by 20 per cent by 2010. This reduction in cost will inevitably lead to traffic growth and, given the objective of reducing traffic levels, it could be argued that we should be seeking ways to increase, or at least, maintain the real cost of motoring. It follows that if underlying costs are declining, taxes should be increased.

The second question is whether it is really necessary to introduce a universal system using sophisticated technology. Could not much of the benefit be gained more simply increasing the level of an existing tax whose incidence is broadly proportional to distance travelled and environmental damage caused – namely fuel tax? The usual objections to increased fuel taxes are that it would not be politically acceptable in the aftermath of the fuel tax protests of September 2000, that it would be unfair on rural motorists, and that its impact would not be sufficiently focused on congested roads.

It cannot be denied that increased fuel tax would be unpopular; but is it reasonable to assume that they would be any less popular than road charges? Increased fuel tax would undoubtedly fall most heavily on rural motorists because of the longer distances they have to travel to reach local facilities and because of the paucity of alternative means of transport. But if the revenues from increased fuel tax were used to subsidise rural facilities (post offices, schools, local hospitals, etc.) the rural communities, and the environment, might be better off.

Although fuel efficiency is below average in congested traffic, the proportionate increase in fuel consumption in congested conditions is not as great as the proportionate increase in externalities attributable to the traffic involved. It is therefore clear that fuel taxes can never correct for congestion-related externalities. However, given that in practice the correction of congestion-related externalities will be less important than selected traffic reduction and effective revenue raising, a package combining increased taxes on fuel and levies on all parking spaces would seem to offer a possible way forward. The real problem is perhaps that the Transport Act does not provide for this!

At the time of writing the prospect of widespread adoption of road charging by UK local authorities seems remote. Despite calls from the Commission for Integrated Transport for introduction of charging in congested urban areas and on motorways, the Government are sending very lukewarm messages on urban charging and are denying the existence of any plans for motorway charging. Relieved, by the funding promised under the Ten Year Plan, of the need to find an independent revenue stream, most local authorities are content to duck behind the parapet and wait the outcome of the schemes in London and Nottingham. This is an altogether rational position to take; why risk public disaffection when there is so much that can go wrong? The technology may fail, effective enforcement may prove impossible, the looked-for reduction in congestion may not materialise, the associated improvement in public transport capacity may not prove deliverable, a future government may renege on the promise of additionality – quite enough here to daunt most politicians!

The nightmare for proponents of road charging is that, perhaps because of

the ambitious schedule against which has been planned, the London scheme will not succeed and that such a high profile failure would set back the cause of road charging for decades. However, if Nottingham proves more successful than most people expect, and if London meets its targets, then other schemes are likely to follow – although there will always be those who question the transferability of experience in the capital city to smaller cities less well served by public transport and without such a uniquely competitive position.

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