



In the fast lane

**Fair and effective road user
charging in Britain**

Tony Grayling, Nathan Sansom and Julie Foley



Institute for Public Policy Research
30-32 Southampton Street
London WC2E 7RA
Tel: 020 7470 6100
Fax: 020 7470 6111
www.ippr.org
Registered Charity No. 800065

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About the authors

Tony Grayling is an associate director and head of the sustainability team at the Institute for Public Policy Research, which covers a wide range of work on progressive environmental policy, in particular on transport, energy and climate change. Tony was a special adviser to the UK Minister for Transport, Rt. Hon. Dr. Gavin Strang MP, 1997-98 during the development of the transport White Paper *A new deal for transport*.

Nathan Sansom joined ippr's sustainability team in December 2003 after graduating with a first class degree in Modern History from Wadham College, Oxford. He has co-authored a report on motorway tolling with Tony Grayling and is the research administrator for the Commission for Sustainable Development in the South East.

Julie Foley is a senior research fellow in the sustainability team at the Institute for Public Policy Research. Her previous publications include *H2: Driving the Future* and *Plane Trading: Policies for Reducing the Climate Change Effects of International Aviation* (2000) with Chris Hewett. Julie is on the Executive Board of the Socialist Environmental Resources Association (SERA), the Labour Environment Campaign. She recently edited the *Sustainability and Social Justice* report and is currently the Secretary of ippr's Commission on Sustainable Development in the South East.

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Summary

The successes of the central London congestion charging scheme and the M6 toll road have changed the terms of the debate on road user charging in Britain. Edinburgh is planning a referendum on the introduction of a congestion charging scheme and other cities are contemplating their own. The government plans to introduce a distance charging scheme for Heavy Goods Vehicles (HGVs) and has commissioned a feasibility study on a national road user charging scheme for cars and vans that is due to report this summer.

We commissioned computer modelling of the likely effects of congestion charging if it were introduced on all roads in England in 2010. Two scenarios were tested: a revenue neutral scheme in which there are offsetting cuts in fuel duty so that no extra revenue is raised overall; and revenue raising congestion charges levied in addition to fuel duty.

The results suggest that a revenue neutral scheme, while cutting traffic on the most congested roads would result in an overall increase in traffic by about seven per cent and in carbon dioxide emissions by about five per cent, nearly two million more tonnes of carbon per year contributing to global warming and climate change. Already, the government is falling short of its target to cut UK carbon dioxide emissions by 20 per cent from the 1990 level by 2010 towards a 60 per cent reduction by 2050. Road transport is one of the problem areas and this would make matters worse.

In the revenue neutral scenario, only London would see an overall decrease in road traffic, all the other English regions would see overall increases. The reductions in traffic in London and some other metropolitan areas would be outweighed by the growth in traffic elsewhere where driving would be less expensive overall because of the cut in fuel duty. In rural areas, traffic is forecast to grow by amounts ranging between about nine per cent in the rural South East to about 17 per cent in the rural North East.

By contrast the computer model forecasts that congestion charges levied in addition to fuel duty would cut traffic overall by about seven per cent, carbon dioxide emissions by about eight per cent, or nearly three million tonnes of carbon equivalent per year, and raise gross revenue of over £16 billion (at 2010 value). All regions and all areas, including rural areas, would see an overall reduction in traffic. The model also forecasts increases in bus use, particularly in London (+17%) and the metropolitan area of the North East (+28%). The change in bus use would be relatively small in rural areas, no more than two per cent.

Summary

We argue that revenue raising congestion charges would be fair in the sense of making motorists pay for the costs they impose on society, including congestion, crashes, pollution, noise and road wear. According to the best estimates, the marginal social costs of motoring far outweigh the marginal tax revenues, suggesting that increasing marginal tax rates would increase overall economic welfare. Our recommendation is that congestion charges should be introduced in addition to fuel duty and not as a substitute but that other measures should be taken to ensure fairness and political feasibility.

While most low-income households do not own cars, a very high proportion of expenditure by those that do goes on motoring. We recognise that low-income motorists could be adversely affected by the introduction of congestion charges but rather than reduce fuel duty, we recommend that part of the revenue from national congestion charging should be used to scrap vehicle excise duty, which is a flat rate unrelated to vehicle use. This would particularly help low income motorists without causing any significant overall increase in traffic and pollution. Fairness can be further reinforced by spending revenue from congestion charging on alternatives to car use, including walking, cycling and bus services as well as roads and railways.

We also recommend that the proposed national charging scheme for HGVs is introduced on a revenue raising basis. On current plans, the government stands to lose from the HGV scheme because the estimated revenue from HGVs registered overseas, about £140 million per year, is far outweighed by the scheme's operating costs, perhaps £700 million per year. A duty rebate is planned for fuel purchased for HGVs in the UK so that no additional revenue is raised overall from the UK haulage industry.

With the implementation of the HGV scheme now delayed until 2008 in light of the German experience, and the huge logistical and political challenges on introducing a Global Positioning Satellite (GPS) based national charging scheme for more than 25 million cars, our assessment is that this will not happen for at least a decade even if there is a consistent political will. This should not be used as an excuse for inaction. The government should make the case and continue the development work on a national congestion charging scheme for cars and take interim steps towards it.

These steps should include providing technical and financial support to cities planning to introduce congestion charging schemes similar to London. It should also include motorway tolling. We believe this could be done on the existing motorway network using automatic number plate reading cameras as in the central London congestion charge. The government should introduce legislation to enable motorway tolling and introduce tolling in the first instance

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on widened sections of motorway. £6 billion worth of motorway widening is already planned, 560 km including sections of the M1, M6 and M25. The introduction of tolls could fund motorway widening and release funding for other transport improvements.

Section 1: Introduction

Road user charging in Britain has been a long time coming. The first official report exploring the possibilities, the report of a panel set up by the Ministry of Transport chaired by R. J. Smeed, was published four decades ago (Ministry of Transport 1964). It observed that the structure of motoring taxation had effectively been established by Lloyd George's 1909 Budget, including a fixed element unrelated to road use, which is vehicle excise duty (VED) commonly known as road tax, and a variable element related to use, which is fuel duty. While there have been many variations on this theme, the basic structure remains in place today. The Smeed report noted the inability of these methods of taxation to restrain people from making journeys that impose high costs on other people. While finding merit in parking taxes and area licences, the report concluded that direct charging for road use would be preferable and could yield substantial benefits on congested roads. Following the Smeed report, Barbara Castle's 1966 transport White Paper stated that "Road pricing – a metering system to charge directly for the use of congested roads – is from the economic point of view, the most obvious solution to this problem" (Ministry of Transport 1966). While research and the academic debate continued, politics moved on and road pricing had fallen off the national political agenda by the 1970s. There was no mention of it in the 1977 transport White Paper (Department of Transport, Scottish Development Department & Welsh Office 1977).

Road building became the fashion for accommodating growth in traffic, reaching its zenith in the late 1980s with the Conservative government's White Paper 'Roads for Prosperity' (Department of Transport 1989). Transport minister Paul Channon boasted of the biggest road building programme since the Romans. But middle England rebelled against the damage to the countryside, ably assisted by environmental protestors. The Conservative government was forced to retreat under the guise of the 'great transport debate', which culminated in the publication of a Green Paper in 1996 'Transport the way forward' (Department of Transport 1996). Road charging was back on the agenda. 'Transport the way forward' envisaged the introduction of motorway tolling: "The government will shortly be starting trials of new technology for motorway tolling: if the trials are successful motorway tolling could add a new dimension to funding, as well as a new means of managing demand". It contemplated the introduction of distance-based charging for lorries: "One specific suggestion that has been made in the debate...is that the taxation of lorries should be reformed to introduce a new element – namely a distance-related tax linked to the size and axle configuration of the vehicle. In principle, the tax could also be varied according

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to the type of road...The government will continue to keep the case for such a proposal under review". It suggested new powers for local authorities: "These might include powers to restrain traffic by local licensing measures or electronic charging systems, or powers aimed at reducing the provision of off-street non-residential parking" and envisaged "introducing appropriate enabling legislation in due course". Thus the Conservatives' Green Paper presaged the transport White Paper subsequently published by the Labour government in 1998, which proposed powers for local authorities to introduce congestion and workplace parking charges, using the extra revenue to pay for transport improvements (DETR 1998). These powers were put in place by the Greater London Authority Act 1999, which established the Mayor and London Assembly, and the Transport Act 2000. Out of office, the Conservatives relapsed into opposition to road user charging.

Labour also got cold feet. Its candidate for Mayor of London, Frank Dobson MP, promised that if elected he would not introduce congestion charging in his first term. The Conservative's candidate for Mayor, Steve Norris, decided to oppose it altogether, though he had previously supported congestion charging and had chaired a study that suggested the introduction of a central London scheme with striking similarity to the one that would subsequently be introduced, based on a £5 a day charge for cars (Halcrow Fox 1999). At national level, the transport debate turned as a result of fuel tax protests in early autumn 2000 precipitated by the rise in world oil prices. The government had already abandoned the 'fuel duty escalator' whereby there had been annual real increases in fuel duty. It now cut duty on diesel and petrol and restructured lorry vehicle excise with the effect of halving the revenue raised. Another outcome was that the government promised to introduce a distance-based charge for heavy goods vehicles using roads in the UK, as presaged in the Conservatives' Green Paper, which would also be charged on vehicles registered overseas. The Labour government promised offsetting cuts in other taxes so that there would be no net increase in revenue from the UK haulage industry.

Where Labour and Conservative candidates feared to tread, the former Labour MP Ken Livingstone standing as an independent was elected as Mayor of London in 2000 with a manifesto commitment to introduce congestion charging in central London in his first term. The ROCOL study commissioned by the Government Office for London had shown that this would be technically feasible, but would require strong political leadership and tight project management (The ROCOL Group 1999). Livingstone pressed ahead and, defying widespread predictions of calamity, the central London congestion charging scheme was introduced successfully in February 2003. It has resulted in sustained reductions in traffic, congestion and pollution in the charging zone

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during the hours of operation (Transport for London 2003 and 2004). The main elements of the scheme and its impacts are set out in the box below. Ken Livingstone was re-elected in June 2004 for a second term, this time as the Labour candidate, with a commitment to consult on proposals to extend the charging zone to include more areas of Kensington, Westminster and Chelsea. Even before the London scheme, Durham also successfully introduced a smaller congestion charging scheme to cut traffic in its historic centre.

Another precedent was set late in 2003 with the opening of Britain's first tolled motorway, the M6 toll road north of Birmingham, a project inherited from John Major's Conservative government. The examples set by the M6 toll road and central London congestion charging have changed the terms of the debate. Edinburgh is now planning a referendum on the introduction of a congestion charging scheme. The transport secretary Alistair Darling has commissioned a study on the feasibility of a national congestion charging scheme for cars, which is due to report in the summer. The debate is moving forward. ippr has a history of work on road user charging: its very first report by Patricia Hewitt in 1989 called for the introduction of congestion charging in London (Hewitt 1989). In the present report we discuss the design of a fair and effective national congestion charging scheme and the intermediate steps that might be taken towards it.

Central London congestion charging

The central London congestion charging scheme started operation on 17 February 2003. The charging zone covers 22 square km in the heart of London bounded by the inner ring road, including centres of government, law, business, finance and entertainment. Improvements were made in advance of the scheme to bus services to and from the zone and to traffic management around the zone to accommodate the anticipated increase in passengers and changing patterns of traffic.

A £5 daily charge is levied for driving or parking a vehicle on public roads within the zone between 7am and 6.30pm Monday to Friday, excluding weekends and public holidays. The charge can be paid by telephone, text message, internet, post or designated retail outlets. Certain vehicles such as buses, taxis, motorcycles and emergency vehicles are exempt from the charge. Residents of the zone can register for a 90 per cent discount, while disabled Blue Badge holders and certain alternative fuel vehicles are eligible for a 100 per cent discount.

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There are no toll booths or barriers: cameras capture images of vehicles entering, driving within or leaving the zone and number plates are checked against a register of charge payers using an automated computer system. Penalty charge notices are issued to the owners of the vehicles that fail to pay.

As a result of the scheme, there has been a sustained reduction in traffic, congestion and pollution during the hours of operation:

- Congestion cut by 30 per cent in the charging zone
- Traffic cut by 15 per cent in the charging zone
- Emissions of nitrogen oxides from road traffic cut by 12 per cent
- Emissions of carbon dioxide from road traffic cut by 19 per cent

Of the 65,000 to 70,000 fewer car trips made to the zone, survey evidence suggests that between 50 and 60 per cent have transferred to public transport, 20 to 30 per cent now divert around the zone (having origins and destinations outside) and 15 to 25 per cent have made other adaptations such as changing the time of trips.

Comparing autumn 2003 with a year earlier, there were 71,000 extra bus passengers entering the charging zone during the hours of operation each day, an increase of 37 per cent, including 29,000 extra during the morning peak hour, 38 per cent up. In the same period, there has been a reduction in the number of people arriving in central London by tube, which is unlikely to be connected to congestion charging. There has been no significant change in national rail passengers entering central London.

The numbers of taxis, bicycles and motorcycles entering the zone – all exempt from the charge – have increased significantly, while there is no evidence of an increase in road casualties.

On the inner ring road that bounds the zone, there has been a small decrease in congestion in spite of a small increase in traffic. There is no evidence of systematic changes in traffic on roads outside the zone either during or outside charging hours.

There has been controversy over whether the congestion charge has reduced retail sales in central London, with John Lewis in Oxford Street fingering the congestion charge for a reduction in sales coincident with

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the introduction of the scheme. Transport for London have estimated that only 4,000 fewer trips are made to central London each week day as a result of the congestion charge, dwarfed by a total reduction of 70,000 in the number of people travelling to central London in the first half of 2003 compared with the equivalent period of 2002. Likely causes include a slowdown in the economy, the temporary closure of the Central Line and a reduction in tourism due to the threat of terrorism.

Preliminary analysis by Transport for London suggests that the scheme is generating net economic benefits of around £50 million per year – see table below. This excludes net revenue from the scheme of £80 to 100 million per year, which is earmarked for transport improvements (in the first year the net revenue was just short of £80 million).

Preliminary estimates of costs and benefits of central London congestion charging

	£m per year
Annual costs	
Transport for London administrative and other costs	5
Scheme operation	90
Additional bus costs	20
Charge payer compliance costs	15
Cost to car occupants transferring to public transport, etc.	20
Total	150
Annual benefits	
Time savings to car and taxi occupants, business use	75
Time savings to car and taxi occupants, private use	40
Time savings to commercial vehicle occupants	20
Time savings to bus passengers	20
Reliability benefits to car, taxi and commercial vehicle occupants	10
Reliability benefits to bus passengers	10
Vehicle and fuel operating savings	10
Accident savings	15
Total	200

Box sources: Transport for London 2003 and 2004

Section 2: The effects of national congestion charging

ippr commissioned Stephen Glaister and Dan Graham of Imperial College London to forecast the effects of a national congestion charging scheme if it were introduced on all roads throughout England in 2010. The forecasts were made using a computer model of England's transport system, developed for the Independent Transport Commission and described in a previous publication (Glaister and Graham 2003). The model differentiates between the nine English government office regions, different area types from metropolitan to rural, different road types from motorway to unclassified and different times of the day and week. It distinguishes five different types of road vehicle: cars, light goods vehicles, rigid heavy goods vehicles, articulated heavy goods vehicles and buses. The model is based on year 2000 traffic data supplied by the Department for Transport projected to 2010 consistent with the government's forecast for overall traffic growth of 20 to 25 per cent (Department for Transport 2002). It uses the same assumptions as the Department for Transport in its own national transport model that by 2010 real fuel prices will have fallen by 12 per cent and fuel efficiency will have improved such that average fuel costs per km will have fallen by 30 per cent.

Two different scenarios for congestion charging in 2010 were tested: revenue raising, in which congestion charges are added to existing motoring costs; and revenue neutral, whereby congestion charging is offset by cuts in fuel tax so that no net extra revenue is raised overall. Congestion charges in the model are set according to estimates of the time costs of congestion with an additional amount for the environmental costs of carbon dioxide emissions, which vary by area, road type and time period. The forecasts should be taken as illustrative of the likely direction and magnitude of changes rather than as precise measurements. Some of the key results are set out in table 1.

What the results show is that revenue neutral congestion charging could result in an overall increase in road traffic, although congestion would be cut and average traffic speeds would increase by about 5 km per hour. A more detailed breakdown of the results is shown in table 2. Only the London region would see an overall reduction in traffic, all other regions would see an overall increase. Reductions in road traffic on the most congested roads would be outweighed by the growth in traffic on other roads, particularly in rural areas. This is because the cut in fuel duty would make driving cheaper on less congested roads, by about 2 to 3 pence per km on average in rural areas (see table 3).

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Table 1: Forecast effects of introducing congestion charging across England in 2010

Type of charging scheme	None	Revenue neutral	Revenue raising
Road traffic			
Vehicle km per year (billions)	542	578	505
Change	-	+6.7%	-6.8%
Emissions of CO2			
Millions of tonnes of carbon per year	34.1	35.8	31.3
Change	-	+5.0%	-8.2%
Bus use			
Passenger km per year (billions)	18.5	20.1	20.6
Change	-	+8.7%	+11.4%
Fuel tax and charge revenue			
£bn (2010 prices)	29.0	29.0	45.6
Change	-	-	+57%

The growth in road traffic would be problematic in itself, reducing tranquillity and the quality of life particularly in rural areas. However, it is especially problematic because of the resulting increase in fuel consumption and carbon dioxide emissions, contributing to global warming and climate change. In addition to its Kyoto commitments, the government has set a target to cut domestic UK carbon dioxide emissions by 20 per cent from the 1990 level by 2010 and made a commitment to put the economy on a path to a 60 per cent cut by 2050 (DTI 2003). This is the magnitude of reduction recommended by the Royal Commission on Environmental Pollution for the UK to play its part in preventing dangerous global climate change. In the first year report on the energy White Paper, the government forecasts a 14 per cent cut in carbon dioxide emissions by 2010 without further action, far short of its target (DTI 2004). Road transport is one of the problems. Emissions from road traffic are already likely to increase because improvements in fuel efficiency are outweighed by the growth in traffic (Foley and Fergusson 2003). It would not make sense to make matters worse. The model forecasts that revenue neutral congestion charging could increase carbon emissions from road traffic in England by nearly two million tonnes.

By contrast, the model forecasts that revenue raising congestion charging would reduce both the overall amount of traffic and cut carbon emissions by nearly three million tonnes (table 1). Since road transport accounts for about a quarter of UK carbon dioxide emissions, this would be a significant contribution to cutting overall UK emissions. The modelling results suggest two other potential benefits: a greater increase in bus use and extra revenue amounting

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Table 2: Forecast changes in road traffic (bn vehicle km per year) resulting from congestion charging introduced across England in 2010

	Whole region		Metropolitan areas		Urban areas		Rural areas	
	Revenue neutral	Revenue raising	Revenue neutral	Revenue raising	Revenue neutral	Revenue raising	Revenue neutral	Revenue raising
North East	+1.08 (+4.7%)	-2.10 (-9.2%)	-0.36 (-4.4%)	-1.08 (-13.5%)	+0.18 (+2.5%)	-0.74 (-10.0%)	+1.26 (+16.8%)	-0.28 (-3.7%)
Yorkshire & Humberside	+4.60 (+8.7%)	-3.31 (-6.3%)	+2.07 (+6.4%)	-2.25 (-7.0%)	+0.34 (+5.9%)	-0.44 (-7.7%)	+2.19 (+14.8%)	-0.62 (-4.2%)
East Midlands	+3.72 (+6.9%)	-4.03 (-7.5%)	n/a	n/a	+0.24 (+1.3%)	-1.84 (-9.8%)	+3.48 (+9.9%)	-2.20 (-6.3%)
Eastern	+6.96 (+9.6%)	-4.44 (-6.1%)	n/a	n/a	+0.85 (+3.5%)	-2.15 (-8.9%)	+6.11 (+12.7%)	-2.29 (-4.7%)
South East	+8.01 (+7.4%)	-7.30 (-6.7%)	n/a	n/a	+1.61 (+4.6%)	-2.19 (-8.3%)	+6.40 (+8.7%)	-4.39 (-6.0%)
London	-3.70 (-10.7%)	-5.93 (-17.1%)	-3.70 (-10.7%)	-5.93 (-17.1%)	n/a	n/a	n/a	n/a
South West	+7.06 (+10.9%)	-3.72 (-5.7%)	n/a	n/a	+0.35 (+1.8%)	-1.92 (-9.7%)	+6.71 (+14.9%)	-1.80 (-4.0%)
West Midlands	+3.40 (+5.3%)	-5.02 (-7.8%)	-0.49 (-2.3%)	-2.44 (-11.6%)	+0.35 (+3.1%)	-0.99 (-9.0%)	+3.54 (+11.1%)	-1.59 (-5.0%)
North West	+6.16 (+8.6%)	-4.50 (-6.3%)	+1.39 (+4.4%)	-2.61 (-8.2%)	+0.91 (+7.4%)	-0.84 (-6.8%)	+3.87 (+14.0%)	-1.05 (-3.8%)

to more than £16 billion per year (at 2010 prices). This figure should be treated with caution as it does not take account of the costs of operating a national congestion charging scheme but for comparison total public spending on transport in the UK in 2002/3 was about £13 billion (HMT 2003). Given that extra public spending on other priorities like health and education inevitably mean spending restraint in other areas, national congestion charging could potentially generate a significant amount of extra funding for transport improvements.

Table 4 sets out the forecast changes in bus use in more detail. It shows quite varied results between regions, with relatively larger increases in bus use in London and the North East than in other regions. Bus use is forecast to increase under either revenue neutral or raising scenarios in nearly all metropolitan and urban regions, though the forecast changes are relatively small in the metropolitan areas of Yorkshire. Under the revenue neutral scenario, bus use is forecast to fall slightly in rural areas by up to four per cent. It is forecast to increase a little in rural areas under the revenue raising scenario, though the increases are not as much as two per cent.

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Table 3: Forecast average car running costs (pence per km) with or without the introduction of congestion charging across England in 2010

	Metropolitan areas			Urban areas			Rural areas			Trunk roads		
	No charge	Revenue neutral	Revenue raising	No charge	Revenue neutral	Revenue raising	No charge	Revenue neutral	Revenue raising	No charge	Revenue neutral	Revenue raising
North East	11.6	17.0	19.7	10.8	10.7	13.8	9.5	6.5	10.1	10.3	7.1	10.7
Yorkshire & Humberside	11.0	11.7	14.9	10.9	10.4	13.7	9.5	6.6	10.2	10.2	7.2	10.8
East Midlands	n/a	n/a	n/a	11.0	12.1	15.1	9.4	7.1	10.5	9.9	10.2	12.9
Eastern	n/a	n/a	n/a	10.9	11.5	14.6	9.5	7.1	10.5	10.5	8.9	11.7
South East	n/a	n/a	n/a	11.1	13.6	16.4	9.4	7.5	10.8	10.2	9.7	12.3
London	13.0	26.3	28.4	n/a	n/a	n/a	n/a	n/a	n/a	9.6	8.6	11.7
South West	n/a	n/a	n/a	10.8	10.4	13.5	9.5	6.7	10.3	11.0	7.7	11.4
West Midlands	11.0	13.7	16.4	10.9	11.1	14.2	9.4	6.8	10.3	9.8	9.7	12.4
North West	11.4	14.7	17.6	10.8	9.9	13.2	9.5	6.6	10.2	10.2	7.3	10.8

Combing fairness and effectiveness

There is a perception that motorists already pay a high rate of tax in the UK, in the case of fuel tax much higher than in other European countries. In fact these perceptions do not take account of other taxes such as road tolls and vehicle purchase taxes. When these are taken into account, UK drivers are not the most heavily taxed in Europe – that accolade belongs to motorists in the Netherlands – and they pay similar levels of tax overall to drivers in France, Italy, Ireland, Finland and Denmark (CfIT 2001).

A salient question is whether the marginal rate of tax on motoring, the amount raised from each additional kilometre driven, covers the marginal social costs, the extra costs imposed on society by each additional kilometre driven. Economic theory suggests that social welfare is optimised when marginal costs and revenues equate, and that welfare is reduced if marginal costs are more than marginal revenues. An authoritative study commissioned by the government suggested that for road vehicles in Britain the marginal costs –

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Table 4: Forecast changes in bus use (bn passenger km per year) resulting from congestion charging introduced across England in 2010

	Whole region		Metropolitan areas		Urban areas		Rural areas	
	Revenue neutral	Revenue raising	Revenue neutral	Revenue raising	Revenue neutral	Revenue raising	Revenue neutral	Revenue raising
North East	+0.45 (+12.5%)	+0.53 (+14.8%)	+0.33 (+25.4%)	+0.36 (+27.6%)	+0.14 (+11.7%)	+0.17 (+14.0%)	-0.02 (-2.0%)	+0.01 (+0.3%)
Yorkshire & Humberside	-0.02 (-0.5%)	+0.10 (+2.3%)	-0.01 (-0.4%)	+0.06 (+2.2%)	+0.02 (+3.2%)	+0.03 (+5.8%)	-0.03 (-2.4%)	+0.01 (+0.6%)
East Midlands	+0.12 (+3.8%)	+0.22 (+7.2%)	n/a	n/a	+0.16 (+12.9%)	+0.19 (+15.9%)	-0.04 (-2.0%)	+0.03 (+1.7%)
Eastern	-0.02 (-0.8%)	+0.10 (+4.4%)	n/a	n/a	+0.04 (+5.2%)	+0.08 (+9.5%)	-0.06 (-4.1%)	+0.02 (+1.4%)
South East	-0.02 (-0.7%)	+0.10 (+3.5%)	n/a	n/a	+0.03 (+3.1%)	+0.07 (+6.8%)	-0.05 (-2.7%)	+0.03 (+1.7%)
London	+1.28 (+15.6%)	+1.36 (+16.5%)	+1.28 (+15.6%)	+1.36 (+16.5%)	n/a	n/a	n/a	n/a
South West	-0.02 (-0.7%)	+0.09 (+3.8%)	n/a	n/a	+0.05 (+5.8%)	+0.08 (+9.5%)	-0.06 (-3.8%)	+0.02 (+1.0%)
West Midlands	+0.06 (+1.3%)	+0.17 (+3.9%)	+0.05 (+3.3%)	+0.09 (+5.8%)	+0.04 (+5.2%)	+0.06 (+7.6%)	-0.04 (-1.9%)	+0.02 (+0.9%)
North West	+0.03 (+0.5%)	+0.18 (+3.2%)	+0.07 (+2.6%)	+0.14 (+5.4%)	+0.01 (+0.6%)	+0.03 (+3.1%)	-0.05 (-2.3%)	+0.01 (+0.6%)

including congestion, crashes, road wear, pollution and noise – significantly exceeded marginal revenues, often by a factor of two to one or more even on low cost estimates (Sansom et al. 2001). In the case of cars, on low cost estimates, the average difference was estimated at between at least four pence per km off-peak and ten pence per km in peak hours. For heavy goods vehicles, again on low cost estimates, the average difference was estimated at between at least two pence per km for rigid lorries off-peak and at least 25 pence per km for articulated lorries in peak hours. Congestion is the dominant cost, estimated to account for between 60 and 90 per cent of the total depending on vehicle and road conditions. This suggests that marginal tax rates should be increased to increase social welfare, consistent with the introduction of congestion charges on top of fuel duty.

On the 'polluter pays' principle, charging for road use to ensure that people and organisations pay for the costs that their driving imposes on others is fair. However, there are other dimensions of fairness, for example the relative impacts on different groups in society, particularly those on low incomes or



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people with impaired mobility. A straightforward way to ensure that people with disabilities are not disadvantaged is to provide an exemption or discount, such as the 100 per cent discount for blue badge holders from the central London congestion charge. The situation is more complex for people on low incomes. Overall, taxes on motoring and fuel duty in particular are not as regressive as sometimes suggested. The higher the household income, the more likely the household is to have one or more cars and the more miles it is likely to drive. Most low income households do not own cars.

Figure 1 shows average expenditure on motoring by household income in 2002/3. The data are taken from the Office of National Statistics annual Expenditure and Food Survey (ONS 2004). It illustrates the point that richer households on average spend more on motoring. Figure 2 shows expenditure on motoring as a proportion of total household expenditure. It shows that on average a similar proportion of household expenditure is on motoring across the income distribution and a similar proportion of spending is on road fuel, about three per cent. The picture is different, however, when non-car owning

Figure 1: Household expenditure on motoring by income decile

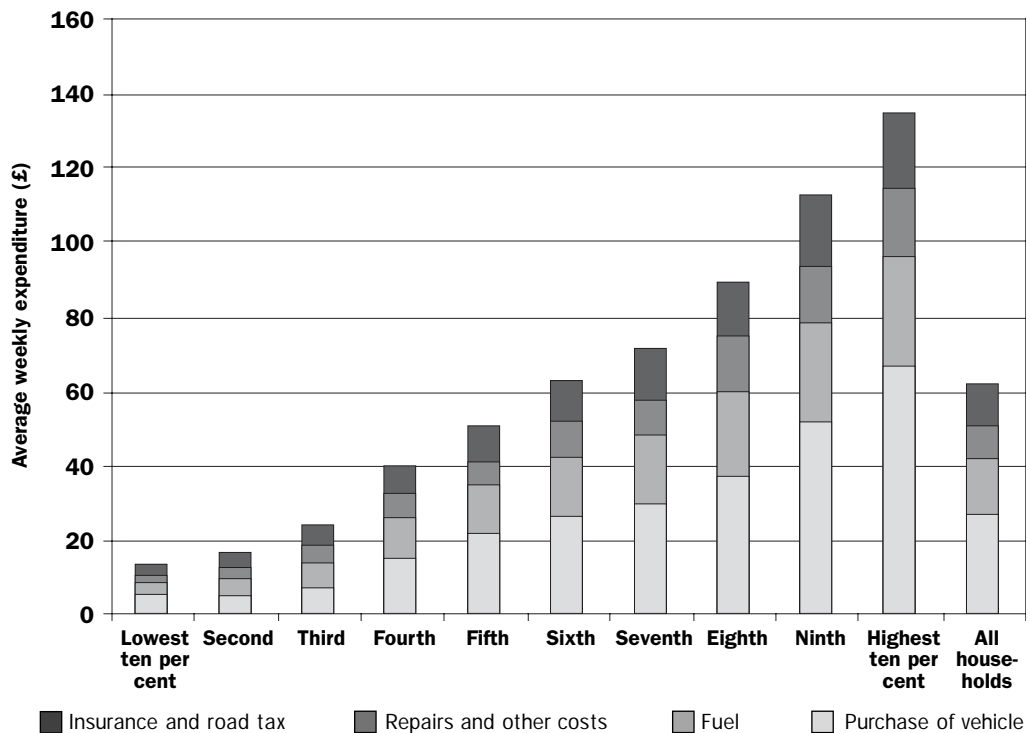
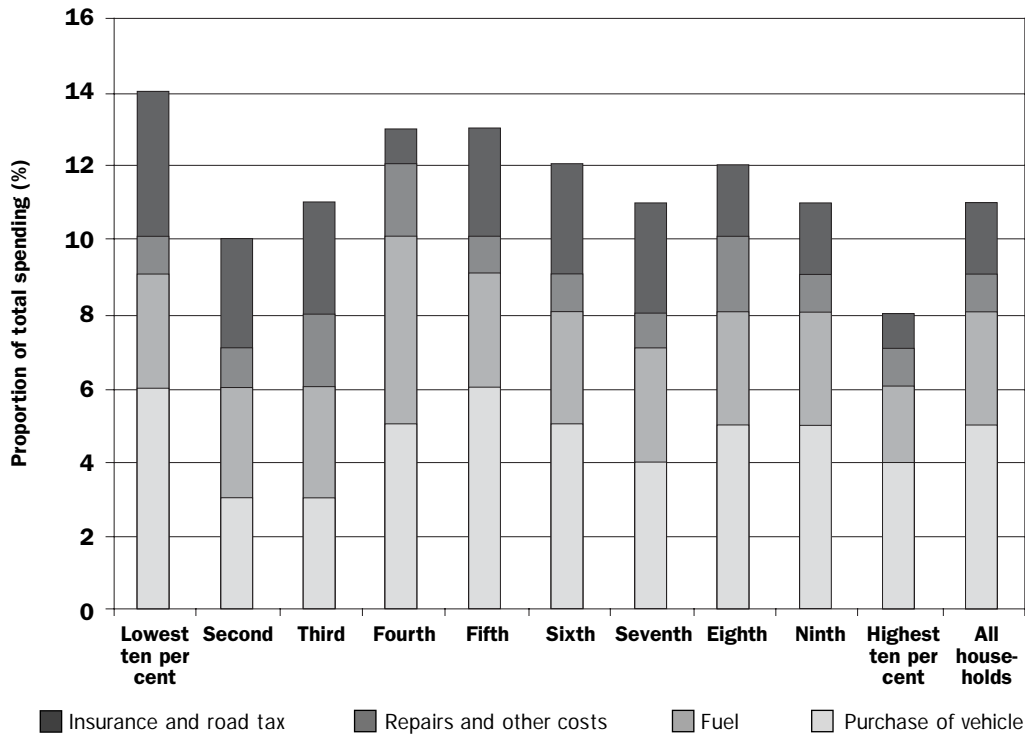


Figure 2: Average Proportion of Household Expenditure on Motoring by Car Owning Households by Income Decile

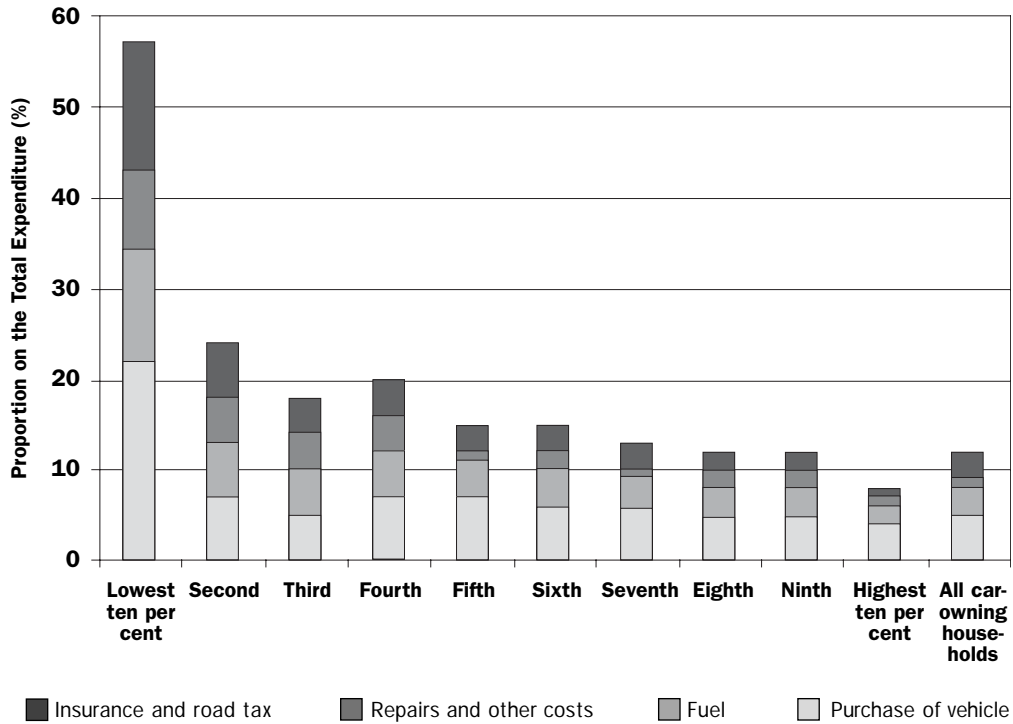


households are excluded. Three quarters of households surveyed in the lowest ten per cent income group did not own cars but figure 3 shows that for the quarter that did own them on average more than half their expenditure was on motoring. About 12 per cent of expenditure by these households was on fuel, a significant proportion.

There is a valid argument on equity grounds that changes to the taxation of motoring should not result in an even higher proportion of expenditure on motoring by low income motorists who need their cars, such as low income motorists in rural areas where the alternatives to driving are limited. One way to address this problem would be to combine the introduction of congestion charging with cutting vehicle excise duty (VED), a fixed cost unrelated to the use of the car. Analysis for ippr showed that if VED for cars was reduced and the revenue was raised from fuel duty instead, then low income motorists in general and low income rural motorists in particular would be better off (Skinner and Fergusson 1998). The same would apply if the money was instead raised from congestion charging, perhaps more so because congestion charges would

The effects of national congestion charging

Figure 3: Average proportion of household expenditure on motoring by car owning households by income decile



be relatively lower in rural areas. As shown in our forecasts for congestion charging in 2010 driving costs would on average be only about one penny per km more expensive in rural areas as a result of the introduction of congestion charging in 2010 on top of other taxes on motoring (see table 3). A low-income rural motorist driving 8,000 km (5,000 miles) per year for essential journeys would pay about £80 extra, which could be more than compensated for by abolishing VED. ippr has previously recommended abolishing VED for cars, which raised about £4.5 billion in 2002/3, at the same time as introducing a national congestion charging scheme, to make it fairer and more politically acceptable (Foley and Fergusson 2003). This has also been suggested by the Commission for Integrated Transport (2002). Although VED is now graduated for new cars according to carbon dioxide emissions, with a lower charge for vehicles that emit less per km, the differentials between the four bands are too small to have a significant influence on car purchasing. A revenue raising congestion charge, by reducing traffic, would do more to cut carbon dioxide emissions than VED.



The effects of national congestion charging

There are other aspects to the fairness argument. If congestion charging cuts traffic and pollution, as it has in central London, then it improves the environment for walking and cycling, the most environmentally benign and egalitarian forms of transport. People on low incomes make a high proportion of journeys on foot, more than people on high incomes. If charging also leads to improvements in public transport, particularly bus services as again has been the result of the central London scheme, then that also helps people on low incomes who make more journeys by bus. It matters how the money raised from congestion charging is spent. If it is spent on things that are particularly beneficial to households on low incomes, then the fairness of the scheme is strengthened. Ken Livingstone has used the money from central London congestion to improve bus services and road safety to the benefit of everyone but especially people on low incomes.

Section 3: How national congestion charging could work

The Department for Transport's feasibility study, due to report in summer 2004, is considering options for a variety of national road user charging schemes for cars. Clearly outlined in the terms of reference is the need for options to be "fair" and to "deliver a more efficient approach to transport pricing" (DfT 2003). Similar aims were identified for the national heavy goods vehicle (HGV) charging scheme announced in the November 2002 budget. The Government's environment and transport policy objectives were to ensure that "lorry operators contribute fairly and efficiently towards the costs they impose in the UK" (HMT 2002).

The congestion and other costs that vehicles impose vary according to the traffic conditions, which depend on the type of road, time of day and location. Raising charges in proportion to external costs therefore requires collecting detailed information about vehicles' movements. This range of information could be obtained most effectively using Global Positioning Satellite technology (GPS). Indeed, HM Treasury's second progress report on the HGV scheme recognised that "satellite-based systems probably offer the best way forward, since they have the most flexibility for charging all roads" (HMT 2003). GPS technology is best placed to deliver the Government's transport and environment objectives by providing the necessary information.

How GPS works

The first part of a GPS system is the installation of an On Board Unit (OBU) in the vehicle. The unit takes positional coordinates from several satellites to establish the exact location of the vehicle. The accuracy of this measurement is dependent on a number of variables, including the number of satellites used to establish position, whether the reading is taken in a valley or on a hill, interference from local electrical signals, atmospheric conditions and how long the measurement is taken for. Current levels of accuracy for stationary measurements are in the order of 10 metres with 95 per cent confidence and are projected to improve over the likely timescale for the implementation of GPS based road user charging. It should be noted that contrary to popular misconception satellites do not capture any information, but only enable the OBU to establish the vehicles' position and movements.

Once the movements have been recorded, either a charge could be calculated by the OBU itself or the information transmitted to a central office where the

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charge is calculated. The charge could be varied according to the distance travelled, type of road driven on and time of day. If the charge were calculated by the OBU, it could be charged to a smartcard or if the charge were calculated centrally, the vehicle owner could be sent a bill. To prevent evasion, there could be a system of enforcement using cameras and automatic number plate recognition and mobile patrols, similar to the central London congestion charging scheme (described in section 1). A combination of these methods is likely to be used for the HGV scheme and it seems probable that a similar method would be appropriate for a national car system. In addition periodic checks could be carried out on the OBU, possibly during MOTs, to ensure it has not been tampered with.

There are, however, a number of considerations that must be taken into account before a nationwide GPS road user charge can be introduced. Challenges of a technical, legislative, and not least political character must be met.

The UK HGV scheme

The government's HGV scheme was envisaged to ensure that all lorry operators contribute to the congestion, pollution, road wear and other social costs that they impose in the UK, regardless of where the vehicles are registered. It will enable the government to charge foreign operators for the use of UK roads for the first time. The government contends that UK operators already pay enough, so there will a rebate on diesel duty for all HGVs buying fuel in the UK to make the charge revenue neutral for the UK haulage industry.

After consultation with the haulage industry the government has decided to introduce a distance-based, rather than a time-based charge as the former is more reflective of the negative costs imposed by road use. The charge is likely to allow for different charging bands accounting for various factors that contribute towards external costs imposed. These include the type of vehicle, road and time of day: the number of axles and the emission category of the vehicle, motorway or non-motorway, peak or off-peak (HMT 2004). It was decided that GPS satellite was the most effective technology for collecting the necessary data needed to administer the charge.

In order for a GPS system to operate lorries participating in the scheme will need to be fitted with an OBU to measure the lorry's coordinates and send these to a central office for processing. However, it was deemed inappropriate for occasional users to have to install OBUs so an occasional user scheme will be set up in parallel. Vehicles driving below a certain distance threshold could be fitted instead with a "Low-use On-Board Unit". A Low-use OBU would be



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self-contained and not require any interface with the lorry's power or other systems. Driver intervention would be required to input the vehicle's tachograph readings from time to time, with input from roadside infrastructure to enable the Low-use OBU to distinguish between motorway and non-motorway roads. The procurement prospectus was published by HM customs and excise in May 2004 and the exact nature of the charging scheme will be known when the tender is awarded in late 2005.

Criticism has been levelled at the UK HGV scheme by Professor Alan McKinnon on the basis that the scheme will cost more to operate than the net revenue it raises. His conclusions are based on the premise, as set out in the second progress report, that the charge will be revenue neutral for UK hauliers (HMT 2003). McKinnon has estimated that revenue raised from foreign hauliers, who make up 4 per cent of freight travel in the UK, would amount to £139m annually (McKinnon 2004). The costs of running the system, including a mechanism for a fuel tax rebate, are estimated at £700m annually. In order for the HGV scheme to pay for itself it would be necessary for the charge to raise additional revenue from UK operators.

There is a strong case to be made for a revenue-raising scheme if UK hauliers do not already pay for the external costs they impose. Research commissioned by the government estimated that HGVs impose up to 30 pence per kilometre more in marginal social costs than they pay in tax (Sansom et al. 2001). Under the logic of the HGV scheme, and in the interest of equity, it would certainly be appropriate to introduce a revenue-raising scheme to ensure HGVs cover more of their external costs.

In addition Professor McKinnon questions the need for a GPS scheme to operate a distance-based charge, arguing that fuel duty is an adequate proxy for distance driven. However, a GPS system offers the opportunity to vary prices in a more subtle manner than fuel duty. Once the charge is established greater variability in pricing should be introduced to have a greater influence of travel patterns and thereby reduce congestion and improve efficiency.

Requirements for GPS implementation

The basic prerequisite for any charging method is technical feasibility. Much adverse publicity regarding the technical effectiveness of GPS has been generated as a result of the difficulties encountered by the German HGV scheme. However, many of the problems appear to have been related not to the technology per se but to inadequate planning. Important features were left out of the software, such as the ability to operate with the payment cards and accounting systems used by most German HGV firms (The Economist 2004).

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Moreover, the problems encountered in Germany regarding the effectiveness of the OBUs have been largely resolved. Toll Collect, the company awarded the contract, have recently completed a comprehensive test of 1,270 OBUs which showed that the units are operating at 97 per cent accuracy.¹ They hope that accuracy will be improved further by the time the system collection is due to start in January 2005. In light of the delays encountered in Germany, the time scale for implementing the UK HGV charge has rightly been extended to allow for a "comprehensive testing phase" (HMT 2004). This should reduce the risks of similar delays in the operation of a UK system.

Once operational accuracy has been established legislation will be needed if a GPS system is to become mandatory. A means of avoiding the legislation would be to pursue a meter-based approach. Instead of legislative compulsion there would be strong financial incentives for drivers to install an OBU and pay for road use as they drive rather than pay a large flat-rate fee. However, such a system would discriminate unfairly against drivers from Europe. The UK lorry scheme did not pursue the possibility of a meter-scheme for this reason.

Finally, and probably most importantly, is the political opposition that a nationwide GPS system might encounter. Any new form of taxation and data collection, even if accompanied by considerable individual and social benefits, is likely to be viewed sceptically to begin with. In particular, public concern might be raised about the civil liberty implications of a GPS charging scheme. The public will need reassurance that GPS systems are compliant with existing legislation and do not constitute an excessive intrusion of privacy.

Information collected as part of a GPS scheme would be covered by Schedule 2 of the 1998 Data Protection Act. Clause 5c permits the collection of non-sensitive personal data "for the exercise of any functions of the Crown, a Minister of the Crown or a government department" (TSO 1998). Guidelines set out in the Act would need to be observed; namely that fair processing is observed, that individuals are informed of the purposes of data collection, and informed of any third parties who will have access to the information, for example agencies responsible for recovering unpaid charges, the police and the vehicle owner. Provided a GPS scheme complied with these provisions there would not be any need for new data protection legislation.

An option for data processing

Any system relying on GPS technology will result in an increase in data collection. However, a system could be designed to minimise the amount of information collected and held by the central authority, and thereby allay public concern about civil liberties.

How national congestion charging could work

The least intrusive method of processing charges would be for the OBU to perform some of the basic calculations and send the calculated charge itself to the charging agency. The OBU would take readings from satellites to obtain positional coordinates and the time of day. The unit would also be programmed with information about different prices charged for different roads at different times of day. Taking this information together the unit would calculate the appropriate charge and send this to the back office. This way the only information seen at any point by the charge-collecting agency would be a charge that appeared in the form of a particular price for driving a specified distance on a given type of road. No information would be transmitted to the central data collection office concerning which particular road had been driven on. The bill would then be presented monthly to the driver broken down by road type, time-price band and the distance travelled. If the charge were disputed an independent reviewing body would recover the raw data from the OBU, which specifies the exact road, distance, and time and use this to establish the correct charge. A time limit, possibly 6 months, could be set during which time contested charges had to be raised. After this time the data collected by the central charge-collecting agency, and the information held on the OBU would be deleted. Limiting the amount of data viewed by the central agency in this way would help to assuage public fears of abuse of civil liberties, and enable the arguments in favour of GPS to be made.

Benefits of GPS Technology

In order to overcome opposition, the benefits offered by GPS will have to be made clear to the public. GPS technology can contribute significantly towards private benefits and public policy objectives in the variety of services it offers. These services include satellite navigation and Pay-As-You-Drive (PAYD) car insurance. The private benefits of satellite navigation are immediately obvious: routes can be pre-planned according to price or distance; congestion accumulating around an accident site can be avoided; and the exact location of the vehicle can be relayed to emergency services in the event of a breakdown (HMT 2002). Similar private benefits can be reaped from PAYD insurance schemes (see box below).

The prospects for GPS

In order to win over a potentially sceptical public it will be vital that the benefits associated with GPS, for example satellite navigation and PAYD insurance, are well publicised and that concerns over data collection are met. Successful implementation of the HGV charge would address precisely these issues and is therefore likely to be a vital prerequisite for winning public support.

How national congestion charging could work

Implementation of the HGV scheme has been delayed by two years from the original plan and the charge is now expected to be operational in 2008 (HMT 2004). If the charge remains on the revised schedule, it will have taken seven years from the start of consultation on the policy to its implementation. A national GPS system for cars would be considerably more ambitious, covering more than 25 million vehicles, compared with fewer than half a million HGVs. This clearly represents a considerable logistical and political challenge. Given these constraints it is reasonable to suggest that a national GPS based road user charging scheme for cars is unlikely to be in place for at least another ten years even if there is consistent political will. Meanwhile traffic and congestion continue to grow.

Pay As You Drive (PAYD) vehicle insurance

The principle of PAYD is similar to that of differential road pricing; namely that fairness is increased by replacing fixed charges with variable ones that more closely reflect costs imposed on others. At present car insurance is usually a fixed cost: once payment has been made there is coverage for unlimited mileage. With PAYD drivers are placed into risk categories, as in conventional schemes, with a driver in a low risk category paying a lower premium per mile than a high-risk driver. Instead of paying a fixed cost for a set period of time they are charged according to how many miles they drive. Empirical research confirms that there is a correlation between miles driven and the number of crashes (Litman 2004). So it is fairer to charge drivers according to miles driven than per month or year since distance is the more accurate indicator of how many crashes they will be involved in. Certain components of car insurance, such as the risk of fire, theft and vandalism are clearly not distance related and so would remain separate components in a PAYD scheme.

Linking insurance premiums to mileage enables motorists to reduce costs by driving fewer miles. This could enable lower-income motorists to maintain a car and use it for vital journeys without having to pay unaffordable up front premiums. PAYD is a more progressive insurance scheme since lower-income motorists, who drive fewer miles on average, pay less.

If PAYD enables lower-income drivers to make essential journeys it also encourages drivers, especially in higher risk categories, to drive fewer miles since they will save money by doing so. PAYD could contribute

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towards reductions in pollution and congestion, both key public policy objectives, by encouraging a 10 per cent reduction in road travel according to one estimate (Litman 2004). Furthermore, research suggests that since the incentive to drive less falls most heavily on high risk drivers with higher premiums it could reduce the number of road accidents by an even higher percentage, up to 15 per cent (ibid.).

Norwich Union is piloting a scheme of 5,000 vehicles to run from 2004 to 2005/6 to investigate the possibilities presented by PAYD insurance. The pilot will consider how time of day and types of roads used might set premium levels to achieve actuarial accuracy and deliver greater fairness to customers. In the pilot scheme volunteers' vehicles are being fitted with OBUs to obtain the necessary data for processing. The nature of the data; road type, time of day and distance travelled is the same as that which would be needed for a nationwide GPS charge and the same unit used for a charging scheme could deliver the necessary data for premium processing. Polls commissioned by Norwich Union suggest that 90 per cent of motorists would "prefer their motor insurance to reflect the usage of their car"² and would therefore welcome the opportunity to use PAYD.

1. According to information on their website <http://www.toll-collect.de/frontend/press/PressEntryVP.do;jsessionid=F05D52A7FD949C180A41894AD4548DC0?pressId=528>

2. According to research conducted for Norwich Union:
http://www.norwichunion.co.uk/pay_as_you_drive/index.htm

Section 4: Interim steps

The fact that a national GPS charging scheme for cars will not be in place for at least a decade should not push road user charging off the political agenda. Rather, interim charging options that fulfil the criteria of fairness and efficiency ought to be introduced as soon as possible to cut congestion and pollution. Among the intermediate options for road user charging are further urban congestion charges along the lines of the London and Durham schemes, and more tolled motorways in the vein of the M6 Toll road.

Following the pioneering example of Ken Livingstone in London, Edinburgh's Labour Council is promoting its own charging scheme. The proposed Edinburgh system differs from the London scheme in that it is a cordon, rather than an area-charge. Instead of being charged to drive within a designated area, motorists only pay if they cross a cordon to drive within the zone. Under the proposals there is an outer cordon following the trunk road city bypass, which would operate during the morning peak hours from 7am to 10am, and an inner cordon which would cover the centre of the city and be in force from 7am to 6:30pm. A single payment of £2 entitles drivers to an unlimited amount of travel across both cordons for one day. Both cordons would operate Monday to Friday. The system would operate using the same technology as the London scheme, automatic number plate reading (ANPR), so there would be no need for vehicles to stop as they cross the cordon.

In October 2004 three representatives of the Scottish Executive will deliver their decision on whether the proposed system meets the Executive's criteria for road user charging. The scheme must demonstrate that it can deliver reductions in noise, emissions and congestion, and that it will be fair. In addition, revenue raised will have to be additional to current local authority spending, and investment in public transport will have to be made prior to the introduction of the charge. If the charge fulfils these criteria the council propose to put the decision to a referendum in January 2005. Pending support from residents the council will present the final charging order to the Executive for ratification, with an earliest possible implementation date of 2006.

Edinburgh council have proposed to spend the revenue raised from the scheme on road maintenance and public transport improvements: a tram line in the southeast of the city, cycle lane improvements and better bus services. If the Edinburgh charge proves to be as successful as London's scheme more local authorities are likely to be emboldened to introduce urban road user charging. Indeed, the government's assumptions on revenue streams in the ten year transport plan were based on the premise that 8 large towns and cities



Interim steps

implement congestion charging schemes (DETR 2000). The UK government has every reason then to support the implementation of urban congestion charging schemes.

Another interim option is motorway tolling. There is a long history of tolls being levied to pay for specific infrastructure improvements in the UK, the most notable recent example being the Dartford crossing. With the opening of the M6 toll in December 2003 the precedent was set for tolling a wholly new motorway. The popularity of the M6 toll road, which recorded its highest daily traffic in May this year, has paved the way for further motorway tolls in the UK. On both the M6 toll road and the Dartford crossing tolls are collected either by paying cash into a collecting bucket or electronically, using a microwave tag system.

However, it is doubtful whether the technological model of microwave transponders combined with toll plazas could be used in a tolling scheme that covered a substantial section of the strategic network. If a microwave system were adopted each vehicle would need to be fitted with a transponder which would communicate with roadside beacons to calculate and deduct the charge. However, if the installation of a microwave transponder were to be made compulsory this would represent a considerable initial expense to be borne by the Treasury. Alternatively, if vehicle owners were legally required to purchase transponders occasional drivers on motorways would be unfairly discriminated against with a large fixed cost.

There would therefore need to be an alternative system for occasional users whose vehicles are not fitted with a transponder. This would necessitate plazas and tollgates such as those on the M6 toll road and at the Dartford crossing. Building plazas is relatively straightforward where there is a new infrastructure development, as in the case of Dartford and the M6. To do so where there is an existing motorway with a heavy traffic flow is considerably more problematic. Building tollgates would not only be expensive but would cause considerable disruption to existing routes, particularly on motorways such as the M25 where junctions are close together. It would also take additional land causing environmental damage.

An alternative option, which would require limited infrastructure, is automatic number plate recognition (ANPR). A charging system based on ANPR would operate in a similar fashion to the London Congestion Charge. Before making a journey, drivers could book their route and pay the corresponding charge according to certain criteria, which could include vehicle class, distance, and peak or off-peak journey time. Drivers could then pay the charge through a call centre, on the internet, by telephone, text message or designated retail outlet.

Interim steps

Commuters regularly using the same route could have the option of monthly or weekly passes to make the system more convenient for the regular user. Cameras located on the periphery of the charging zone, which for motorways would be at the entry and exit lanes at junctions, would read number plates as vehicles drove on and off the motorway. Provided the correct payment has been made the number plate images would be immediately deleted. If the payment has not been made a Penalty Charge Notice (PCN) would be dispatched. As with the London scheme, there could be a reduction in the penalty charge if it is paid promptly.

ANPR has a number of advantages over a microwave-based motorway tolling system. Foremost among these would be the fact that there would not need to be a separate system for the occasional user; everyone would pay by the same method. Since there would no longer be the need for toll plazas or the fitting of microwave transponders in vehicles the infrastructure costs of ANPR would be considerably less than those associated with microwave technology.

In addition ANPR could be used for the enforcement of a GPS scheme. It is likely that some form of vehicle verification independent of an On-Board Unit (OBU) will be required to enforce a GPS system. If data concerning the vehicles' exact location was collected centrally, rather than being processed by the OBU, cameras mounted on gantries could be used to perform spot checks and verify the vehicles' positions. If this method were chosen to enforce the HGV charge, gantries could house the cameras for the purpose of car tolling too. And when a national GPS based congestion charging scheme for cars was introduced the basis of an enforcement system would already be in place.

To be set against the advantages of an ANPR scheme is the fact that the system would have a high operating cost. The London congestion charge, which operates using ANPR, estimated 6 months after implementation that about 60 per cent of the revenue collected would be spent on operating costs (TfL 2003). This figure is set to decline as people become more familiar with the system and less complacent that unpaid charges will not be collected (TfL 2004). It is reasonable to assume a similar proportion of revenue might be needed to operate an ANPR based motorway tolling scheme.

One means of introducing motorway tolls would be to charge tolls on widened sections of the network. There are several justifications for this approach. Firstly, without charging the expanded sections roads will rapidly become as congested as they formerly were, thus representing a poor return on public investment. As the study of the M25, for example, concluded: "Without some form of road user charging on inter-urban roads there will be no substantial reduction in congestion" (GOSE 2002). Secondly, it is fair that those who

Interim steps

benefit from the improvements to the road network should pay for those improvements. Thirdly, congestion contributes two-thirds or more of the external costs of motoring according to the estimates cited earlier in this paper (Sansom et al. 2001). A charging scheme which targets those contributing most to congestion would fulfil the objective of “making clear to road users the real cost of their journeys” (DfT 2003). Tolling widened sections of motorway would therefore fulfil the objectives set out in the terms of reference of the Department for Transport’s feasibility study. Indeed, the question of motorway tolling was specifically outlined as an area of enquiry in the multi-modal transport corridor studies commissioned by the DETR from 1998. The ten-year plan stated that “the future of inter-urban charging would take account of the conclusions of the multi-modal studies” (DETR 2000).

The Government’s 1998 White Paper proposed legislation to enable the development of pilot charging schemes on motorways and trunk roads to “help meet environmental and transport objectives” (DETR 1998). However, the ten-year transport plan made no provision for pilot charging schemes. Subsequently, the government has abandoned its ten-year plan target for reducing congestion in urban and inter-urban roads and it now predicts that congestion on inter-urban roads will increase by up to 15 per cent (DfT 2002). In order to prevent congestion from increasing to this level the Government ought to pass legislation enabling tolling on free-standing sections of motorway, which the Transport Act 2000 does not permit.

In addition to fulfilling environmental and transport objectives charging tolls could raise significant revenue streams. Research by ippr shows that if tolls were levied on 560 km of the motorway network when these sections are widened as the government has announced, including sections of the M25, M1 and M11, nearly £1 billion could be raised per year (Sansom and Grayling 2003). This rough estimate is based on a charge of 5 pence per km for cars and 15 pence per km for HGVs. About a half of this revenue might be needed to operate the schemes, leaving a surplus to pay for the road improvements. If the schemes were delivered under the Private Finance Initiative and paid for using the toll revenues, then this would release £6 billion in the ten-year plan for much needed public transport improvements.

Section 5: Conclusions and recommendations

We conclude that a national congestion charging scheme could have significant economic, social and environmental benefits but in order for the full benefits to be achieved, it matters how the scheme is designed. The computer modelling we commissioned on the effects of introducing congestion charging on all roads in England suggests that if there are offsetting cuts in fuel duty to make the scheme revenue neutral, then there could be a significant increase in the overall amount of road traffic and carbon dioxide emissions contributing to global warming and climate change.

In this scenario, reductions in traffic on the most congested roads, particularly in urban areas, would be outweighed by growth in traffic elsewhere, particularly rural areas where driving would be cheaper as a result of the cuts in fuel duty. We do not recommend this approach. Instead, congestion charges levied in addition to fuel duty would yield reductions in traffic and environmental benefits across the whole country. It would also significantly increase bus use and generate billions of pounds that could be used for transport improvements or other tax cuts, or a combination of the two. This logic also applies to the proposed distance-based charging scheme for heavy goods vehicles (HGVs). As it stands, the HGV scheme is in danger of losing money for the government because the operating costs will far exceed the extra revenue from HGVs registered overseas, while the scheme will be made revenue neutral for the UK haulage industry by duty rebates on fuel purchased for HGVs in the UK.

Congestion charges levied in addition to fuel duty would increase overall economic, environmental and social welfare. This is because the marginal social costs of driving cars and lorries, in terms of congestion, pollution, crashes, road wear and noise, far exceed the marginal costs of motoring. Congestion charging is fair in the sense that it makes drivers pay for the costs they impose on society by driving. However, low-income car owning households who spend a very high proportion of their income on motoring and may have no realistic alternative to car use, especially in rural areas, would be unfairly penalised if no compensating measures are taken. We therefore recommend that part of the revenue from a national congestion charging scheme should be used to scrap one of the fixed costs of motoring, vehicle excise duty or 'road tax'. This would particularly help low-income motorists who drive fewer miles than their wealthier counterparts but pay the same road tax. It would especially help low-income motorists in rural areas where congestion charging might add only one penny per km to the cost of motoring. The fairness of congestion charging is also reinforced if at least some of the revenue is

Conclusions and recommendations

allocated to improving bus services and amenities for pedestrians and cyclists, which is particularly helpful to people on low incomes that make more of their journeys by foot and bus. We recommend that some of the revenue is used for these purposes and not all the money is spent on roads and railways.

A national congestion charging scheme for cars would best be based on GPS technology, similar to the proposed HGV scheme that requires vehicles to be fitted with an On-Board Unit (OBU). There are significant logistical and political barriers to implementation. The start of the HGV scheme has been delayed until 2008, in order to avoid similar problems to the German scheme and learn from Germany's experience. There are under half a million HGVs in Britain, compared with more than 25 million cars. Implementing a national GPS based charging scheme for cars presents logistical and political challenges of a greater order of magnitude. The public will need to be convinced of the benefits of the scheme, that their civil liberties will be protected and that the scheme is workable and fair. With the best political will in the world, we do not think that a national scheme for cars can be implemented for at least a decade, beyond the time frame of the new ten-year transport plan.

This should not be used as an excuse for inaction. Continued growth in traffic congestion and emissions of carbon dioxide from road traffic are serious problems that need urgent action. The government should proceed with the HGV scheme, though not on a revenue-neutral basis, and carry out the development work on a national GPS based charging scheme for cars and vans. Following the successful precedents of the central London congestion charging scheme, the small scheme in Durham's historic centre and the M6 toll road it should take interim steps towards national charging by supporting more cities to introduce congestion charging, including financial support, just as the Scottish Executive should support the Edinburgh scheme.

The government should also introduce legislation to permit tolling on motorways and pilot schemes on widened sections of motorway, using the revenue to pay for the road improvements and any surplus for other transport improvements. We believe that tolling on existing motorways could best be done using similar technology to the central London congestion charge, automatic number plate reading that requires no barriers or toll booths. It is likely that number plate reading cameras will be used to verify HGV movements for enforcing the GPS based charging scheme. The same gantries could be used for tolling cars and vans and the cameras used for enforcing the national GPS based scheme for cars and vans when it is subsequently introduced.



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