RAC Foundation

A Fairer Way of Paying to Drive: Making fuel duty more intelligent

Phil Carey November 2011

The Royal Automobile Club Foundation for Motoring Ltd is a charity which explores the economic, mobility, safety and environmental issues relating to roads and responsible road users. Independent and authoritative research, carried out for the public benefit, is central to the Foundation's activities.

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Although not commissioned by the RAC Foundation, this report has been published to inform wider debate about the issue. The report content reflects the views of the author.

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Making fuel duty more intelligent

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About the author

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Abstract

This discussion paper outlines one possible component of reform of motoring taxation which would increase fairness whilst at the same time helping to achieve the government's objectives for transport.

There is an attractive opportunity to make more intelligent use of the well-established fuel duty mechanism, focusing the cost burden on urban driving in peak periods, where alternatives are more likely to be available, and reducing the costs of driving in quieter times and places. This entails setting fuel duty at a level that more fully reflects the costs of peak-time driving, but then offering all drivers a greater or lesser rebate off that price when paying for fuel, depending on how much of their driving since they last filled up had been in less congested conditions. Evidence of entitlement to rebate would be generated by a GPS-enabled unit carried in the car or van, should the driver wish to participate in the scheme. (The proposal is less well-suited to heavy goods vehicles, for which the government is already committed to reform the basis of charging.)

This Intelligent Fuel Duty concept requires further refinement before it could form a fully robust proposition but the concept is put forward now as part of some initiatives by the RAC Foundation to reinvigorate the debate on changing the way we pay for road use.

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Executive Summary

Taxes on motoring form a significant part of Exchequer receipts, and their main component, fuel duty, has the particular advantage of being unusually cheap to collect. Real-terms increases in the level of duty in recent years have highlighted its role as a green tax on carbon consumption, but beyond that its potential to support government policy objectives is wasted. For decades policymakers seeking to tackle the pressures on our road network have been urged to focus instead on some form of road pricing, bringing in new charges for peak-period driving, but in the UK, beyond the unique circumstances of London, this has all come to naught, mainly because of the force of public opposition.

This resistance is in fact rational: most driving is already paying more than all the costs it imposes on society. Progress on road pricing has hit the buffers because the government has failed to come up with a deal for the motorist that takes account of this. Road users – that is all of us – have suffered from policy paralysis as we have been unable to manage the network effectively and find a way of funding the sustained investment needed in better roads, with all the economic and social benefits that would bring.

The UK is not the most fertile ground for solutions which have worked elsewhere – for example, tolling wholly new roads – as we currently judge these to be politically unacceptable; or permit-type vignette schemes, as we do not have enough transit traffic to carry the bulk of the cost burden. A vignette scheme for heavy goods vehicles (HGVs) is now being taken forward but, to address the challenges for cars and vans, attention should turn back to fuel duty, seeking to make the most of the highly efficient collection mechanism through fuel retailers.

Also, rather than trying to levy an extra charge on reluctant drivers, the flexibility of fuel duty means the government could instead go down the easier route of offering a rebate: less fuel duty to pay if the vehicle has been driven on less congested roads. This aligns well with the current focus on behavioural economics, i.e. rewarding people for desired behaviours. If the numbers are to stack up for the Treasury, fuel duty would clearly have to rise to better reflect the costs of driving in congested conditions. However, almost all drivers would then get some rebate – modest in cities, potentially substantial in rural areas. The net effect is a more finely-tuned 'intelligent fuel duty' (IFD), collecting a fairer charge based on how motorists actually drive, and acting in a much more economically efficient way.

Full details of how this IFD scheme would work remain to be filled in, but the technical challenges are not great. Established thinking on widespread road pricing schemes has centred on the mandatory fitting in cars of GPS tracking units to calculate the extra road charge to be levied. In contrast, this approach

would leave it to the motorist to carry a GPS unit in the car if he wants to claim the rebate. The scheme would enable commercial providers of equipment and services to develop more attractive refinements. It would, however, be essential for the government to close off the main risk of fraud – carrying multiple rebate-earning units in one car – by facilitating a simple form of authentication of the rebate entitlement on each purchase of fuel. If the mechanism for this were tied to vehicle registration, the scheme could bring the additional benefits of denying the rebate to drivers of unregistered or uninsured vehicles.

One other significant challenge would be in devising a tariff of rebates which distinguishes sufficiently between different types of driving, whilst taking account of the widely varying fuel efficiency of the car and van fleet. However, an easily understandable example tariff can be drawn up. It would send a sufficient signal to motorists about the real costs of different types of driving and so should influence behaviour enough to reduce peak-period congestion, with all the economic benefits that could bring.

In addition, there would be further benefits from:

- no need for elaborate compliance and enforcement mechanisms, in contrast with the proposals for road pricing;
- no intrusion into drivers' privacy: they would only need to produce evidence from the GPS unit of the accrued rebate amount earned, not set out where and when they had been driving; and
- a strong further incentive to switch away from gas guzzlers: since the scheme works best and most simply with a fixed set of cash rebates whatever the vehicle type, drivers of more fuel-efficient vehicles would get proportionately a much bigger rebate off their fuel bill.

The core concept is being put forward now to inject fresh life into the debate on fairer and more effective ways of paying for road use. Much work would still need to be done in working up an implementable proposition, and the government would need to make a key judgment on what the new undiscounted level of fuel duty would have to be, in the light of wider budgetary and political considerations at the time. However, there may well be the appetite to clear that hurdle, from policymakers and public alike, given the potential benefits: this proposal intensifies the power of a direct tax on carbon, but also finally provides an effective tool to tackle congestion. The concept of Intelligent Fuel Duty works with the grain of what incentivises us all as car users – and so merits serious consideration.

1. Introduction

We haven't yet got motoring taxation right. It brings in some £35 billion a year, some 7% of total Exchequer revenues, but it hits car-dependent lower-income groups particularly hard and is economically inefficient. There has been no shortage of proposals for reform, but none has found sufficient favour with the government to justify departing from the current system which is easy to understand and cheap to run – notwithstanding the perceived injustices and missed opportunities.

The challenges we face in making motoring taxation more effective are immense. Even in a more normal budgetary climate, the Exchequer cannot afford to see any cut in the receipts it currently enjoys from fuel duty and vehicle excise duty. Indeed, the Treasury's priority right now must be to address the accelerating erosion of the tax take resulting from the shift – strongly encouraged by the government – to more fuel-efficient and particularly electric vehicles.

There is a history of high taxation on driving in the UK, which can be easily maintained because of the extent of car dependence in much of the country. Alternatives to car travel are frequently highly subsidised, but the car is now firmly the main form of personal travel for lower-income groups as well as the better-off: even for the lowest-income quintile, over 70% of the annual distance travelled is by car.[1] Also, operationally, fuel duty is almost the perfect tax from the narrow standpoint of the Treasury itself. It is exceptionally cheap to collect, almost impossible to evade or avoid, and has sufficient flexibility to act as a balancing item if needed in fixing the budget.

Fuel duty is also highly effective in delivering the key policy objective of carbon reduction, being connected so directly to consumption of carbon. As such, there has been a credible rationale for the increases in fuel duty in recent years as an important component of green policies. For all these reasons, it would be counterproductive to get rid of fuel duty, or to let it wither away.

1 National Travel Survey (2008), quoted in Bayliss, D. (2009). *Low Income Motoring in Britain*. London: RAC Foundation.

A good attempt can be made to justify overall motoring taxation as the counter to the total costs imposed by driving, if we include in it the total costs of congestion as well as the costs of providing the road network and the adverse environmental and safety impacts. The congestion element is exceptionally difficult to calculate convincingly, and it can be argued in any case that it falls only on other motorists. However, even if tax on driving does equal the internal and external costs of motoring *in aggregate*, the current form of that tax masks considerable injustice – mainly because of the crude nature of fuel duty.

2. The challenge

The problem is that fuel duty cannot distinguish between different types of driving which impose vastly differing costs on society. It does, of course, tax driving in direct proportion to fuel consumption, so not only do 'gas-guzzlers' pay more, but a stop-start journey in congested conditions in any car will cost a little more per km than the same stretch when traffic is flowing freely. But this is the extent of fuel duty's sophistication.

At a typical average fuel duty plus VAT cost of 5 p/km,[2] rural driving on quiet roads ends up paying far more than all the costs it conceivably imposes. In fact analysis shows that at least 70% of all driving brings in more revenue in fuel duty than all the identifiable costs it imposes in congestion, pollution (including carbon) and accidents.[3] When coupled with the fact that most people living away from the major towns and cities have little alternative but to travel sometimes quite long distances by car for work and for basic services, it is not surprising that there is such strong resentment about the unfair burden of fuel

2 This assumes a typical 40 mpg consumption (= 7 litres per 100 km) at 69.5p (fuel duty + VAT on fuel duty) per litre.
3 Calculated using National Transport Model 2007 data, modelled for 2015, based on (fuel duty + VAT on fuel duty).

duty on rural areas – where, because of the smaller market, the fuel companies' need to maintain profitability often results in higher pump prices anyway.

Politicians cannot sustainably address this problem through a blanket reduction in fuel duty; quite apart from the impact on revenues, that would send the wrong signal about driving in congested conditions by charging significantly less there than the external costs incurred. But nor is it obviously practicable to levy a lower rate of fuel duty only in rural areas, beyond perhaps easily specified remote islands – given the challenges of definition and the risk that many urban drivers will shift their fuel purchase to those cheaper locations.

In addition to the unfairness inherent in the current tax structure, there is also inefficiency in its wider impacts. If driving in congested conditions is *relatively* cheap, then this underpricing may be the cause of congestion as much as the constraints of the network. Road congestion constitutes a drag on the efficiency of the British economy and is a blight for travellers and neighbourhoods. A system of road pricing – some form of variable element in the cost of using the roads – has long been promoted as the obvious solution, by economists and until very recently by the government itself. Walker's paper for the RAC Foundation[4] is an excellent explanation of the proposition and of the prospects for implementation in the UK following the abandonment of the National Debate that had been launched by Alistair Darling as Transport Secretary in 2005.

4 Walker, J. (2011). *The Acceptability of Road Pricing*. London: RAC Foundation.

3. Road pricing is not the easy answer

However, before we call for the reopening of that debate and seek to resume progress towards some form of widespread road pricing, we must remember why no leading politicians feel able to argue for it now, and why the concept became toxic for both Labour and the Conservatives in the 2010 election. At the heart of the problem is the politics of extracting additional charges from drivers for doing what they already think they are paying more than enough for.

It might be more palatable if new charges were to form just part of a restructuring of motoring taxes, keeping the total burden steady. The Coalition government puts even greater emphasis than its predecessor on devolution of decision-making away from the centre – but as there is no practicable scope to tune motoring taxes at the local level, the hope that road pricing could build up from a base of schemes introduced in individual cities is likely to be frustrated. The decisive referendum votes against road pricing in both Edinburgh and Manchester are more representative of valid majority feeling on the issue of city congestion charging than London's success in introducing it. London alone in the UK displayed all three factors which are necessary preconditions for a city charging scheme to get off the ground: widespread recognition of the especially sensitive nature of the central streets; strong political leadership; and appreciation of the generally high quality of the public transport alternatives.

Proposals for local road pricing schemes elsewhere also fell foul of very high set-up costs and worryingly high ongoing running costs, made worse the more the scheme operators had to concede complex concessions to different types of users. There also remained widespread anxiety about the possible intrusion into drivers' privacy, even if – at further additional cost to the scheme – this could be addressed. Privacy was the immediate spur to the pivotal 2007 petition on the No. 10 website which led to Ministers dropping their advocacy for any form of national road pricing.

Ultimately, the public have not been convinced that paying extra to drive when and where there is currently congestion would bring them in return a benefit

of smoother journeys in future. London's experience on this has hardly been clear-cut. Much of this is down to lack of trust in the authorities promoting the scheme; if drivers are paying, they want to see something far more tangible and certain in return. That's why the only form of road use charges for motorists currently in the government's policy toolbox is tolls for new roads, following the model of the M6 Toll. But there is no commitment to applying this to extra capacity on existing routes, as opposed to wholly new roads. There is little prospect for the foreseeable future of any wholly new roads in England even getting on to the drawing board, so we are unlikely to see any action on this policy in this Parliament.

The Road Ahead Group has already tabled an attractive proposition, published in association with the RAC Foundation, which could quickly alleviate congestion on our key motorways using rebates off vehicle excise duty (VED) for drivers who do not use specified motorways at peak periods.[5] As well as applying a simple form of peak pricing to road use for the first time, it would also start to provide the basis for a more enduring response to the problem of congestion. There is the potential for substantial revenues from those who do pay the full amount of VED, providing a ring-fenced 'Network Capacity Fund' for roads investment. Identifying a revenue stream is a precondition for tapping into the substantial appetite of international infrastructure investors to bring in private capital to make our road network fit for purpose.

It is clear that investment in roads, improving existing ones even more so than building new ones, brings some of the highest economic returns of any form of public investment. There would clearly be much attraction in re-establishing some link between motoring taxes and roads spending (as Wadsworth argues[6]). But there is no inevitable connection between what is raised in taxation from a particular sector of the economy and the level of public spending on that sector; and the case for highly beneficial reform of motoring taxation does not depend upon hypothecation. It will however entail addressing the role of fuel duty, which still provides the lion's share of revenue from motoring. At present we are caught by the Treasury's understandable desire to protect the current attractions of fuel duty and to target carbon reduction, and the political wish to avoid anything that smacks of extra charges for using roads. The result is paralysis in the face of the congestion challenge.

5 Wadsworth, B. (2011). *Fairer Motoring Taxes: Investment for Growth and Jobs*. London: RAC Foundation.
6 Ibid.

4. Approaches which work elsewhere

The policy cupboard is not quite so bare in other countries – but it's far from clear that the solutions being pursued in our European neighbours or in North America are going to help much in the particular circumstances of the UK.

- **Motorway tolls** are long-established in much of the rest of the world, and familiar to UK motorists visiting France, Italy and the USA – but these had always been introduced at the point the road was first opened. There are no obvious precedents for levying a per-mile charge for a road that had previously been free to users. The state of the public debate on the costs of motoring here means the UK is hardly likely to be able to be the pioneer in making that switch. Nor, as noted earlier, are we likely to have the opportunity to launch a new toll road here for many years.

- Over the past decade several European countries have introduced a **vignette scheme** for cars as well as heavy goods vehicles (HGVs) – a permit entitling the vehicle to use specified roads for a set period of time. To meet the requirements of European law, these have to apply to domestic as well as foreign vehicles, but in all cases the primary reason for the schemes' introduction has been public resentment at the extent to which foreign drivers have been using the road network without contributing to its costs in the way that locals do through their taxes. Also, to smooth the path for their introduction, there has usually been a compensating reduction in motoring taxes for domestic drivers. Such car vignette schemes are now operating in Switzerland, Austria, Slovenia and the Czech Republic, all smaller countries facing a disproportionate burden from foreign traffic, particularly those purely in transit. The UK does not have this problem – or opportunity.

- These car vignette schemes have all been introduced on the back of the successful introduction of **lorry-only charging**. HGV schemes have

gathered momentum across much of the EU, with Germany's being the largest and most sophisticated example. The UK is now preparing proposals for simpler time-based HGV charging, following up a Coalition Agreement commitment, but we have a much smaller proportion of foreign to domestic traffic than Germany. And even Germany is finding it immensely difficult, politically as well as practically, to make any transition from HGV charging to charging all vehicles.

- The Netherlands remains the only country to have made serious progress towards a **network-wide road pricing** scheme for all vehicles on its roads. Preparations were well under way for a costly but potentially very effective 'kilometre charge' alternative to existing motoring taxes, which would levy a fixed charge per kilometre for using any Dutch road, topped up by a surcharge for certain stretches of road at peak periods. The ambitious plans were, however, stopped in 2010, although not yet abandoned altogether, following changes in the composition of the government. The key lesson for the UK in the Dutch experience so far is that they had only been able to make as much progress as they had because of the clear commitment to restructure and reduce their hefty fixed taxes on motoring and leave the bulk of drivers no worse off. Dutch fixed taxes on car purchase and ownership play a much more important role in the tax mix than do the UK equivalents. To make similar progress here we would undoubtedly also have to start fiddling with fuel duty.

So the UK has distinct features that mean other countries' approaches to charging for road use could not easily be adopted here: we have a very heavily trafficked road network in much of the country, but a strong resistance to its expansion, even if we could afford it; we also have some very sparsely populated areas, where the feeling of being overtaxed for driving is at its strongest; and we have very little transit traffic, or even foreign visiting traffic, by continental standards. Arguably important also is a sense, built up by some sections of the media, that the British have a particularly strong attachment to personal privacy and a suspicion of big government solutions, which all increases the difficulty of more strategic policymaking by the government.

Finally, we are also (Northern Ireland's land border aside) an island nation – but this could be turned into an advantage in working up some more creative ideas for reform.

5. Thinking afresh: Intelligent Fuel Duty

Car and van drivers are convinced that they are taxed too highly as it is. We have the opportunity in the UK to run with that perception and reward drivers for doing the right thing, rather than charge them even more for doing the wrong thing. We should also make the most of the existing well-established fuel duty mechanism, adapting it to ensure that each time drivers fill up, they are paying the appropriate level of tax for the type of driving completed.

The simplest way to do this would be to retain fuel duty, and to ratchet it up in real terms until the tax per mile reaches the level agreed to be appropriate for driving in peak period on congested roads. Drivers would then be entitled to a rebate when paying for fuel depending on how far they could demonstrate that they had in fact been driving in less congested conditions.

Drivers could use a simple mechanism to provide the necessary evidence: they could keep in the car a GPS-enabled device which could calculate, using a well-publicised tariff, the rebate entitlement from the extent to which their car had been driven between refuellings on quieter roads or at quieter times. Drivers would claim the rebate when next filling up.

Turning fuel duty into 'Intelligent Fuel Duty' in this way would build on the very clear strengths of the established collection mechanism, but would provide a much more tailored tool to set a fairer price for driving. In sending a stronger and more relevant price signal to drivers, it will encourage them to switch to quieter times when the net fuel cost would be lower, thus easing congestion and so contributing to economic growth. Furthermore, because drivers of the most fuel-efficient cars would benefit disproportionately from a flat-rate rebate off their already modest fuel bill, it would intensify current incentives towards more fuel-efficient driving. Total fuel duty receipts would be maintained as long as the tariff makes the average mix of driving in both congested and uncongested conditions no more or less expensive than at present.[7]

7 A plausible proposition, with a net neutral effect on both the Exchequer and the average driver, might

The idea of an in-car GPS tracking unit has been a centrepiece of most proposals for ambitious road pricing proposals on the scale which could, in theory at least, bring substantial economic benefits. Intelligent Fuel Duty is a very different proposition, not least in how it would be perceived by the motorist. Instead of needing to extract payment in accordance with where and when the motorist has been found to be driving, Intelligent Fuel Duty is more like a reward for that driving which is deemed to cause less adverse impact on other road users and on the environment; the concept is therefore in tune with the current 'nudge' focus of behavioural economics, with the reward mechanism more likely to be effective than the penalty of extra charges.

The proposition can achieve all the goals that have been claimed for widespread road pricing, such as more efficient use of the road network as a whole through clear price signals, without the massive costs of enforcement and the fear of invasion of privacy. All it needs is an acceptance that the onus can fairly be placed on motorists to demonstrate that their driving has been in quieter times and places; motorists would have a pretty strong incentive to go along with this.

***Treatment of HGVs**: freight traffic (other than light vans) is not considered within the scope of this proposal. The concept of IFD is less well-suited to HGVs because of the prevalence of refuelling at operators' own yard facilities, and the greater ease of filling up abroad, thus bypassing the scheme. Furthermore, the scheme's strength in protecting privacy is of no obvious advantage to commercial freight operators. The government is in any case already planning to reform taxation of HGVs through the permit scheme, a Coalition Agreement commitment.*

HOW IT COULD WORK: A POSSIBLE SCHEME DESIGN

- The concept centres on determining a new standard level of fuel duty – almost certainly higher than at present – which is then offset by an entitlement for rebate for driving in less congested conditions according to a tariff set by the government. A simple, well-publicised banded structure assigns different levels of rebate per km driven on different types of road at different times; there is no discount for driving on urban roads at peak periods.

- The discount is redeemable at the filling station through the driver presenting evidence, accrued from a simple GPS-enabled device in the vehicle, as to the extent to which he has driven on quieter roads or at quieter times.

entail 30 p extra on fuel duty per litre, offset by a rebate of typically 2.5 p for each km of off-peak driving; this is set out in the Annexes.

- All vehicles on the Driver and Vehicle Licensing Agency (DVLA) register are entitled to be equipped with a 'time–distance–place' On-Board Unit (OBU) loaded with a database of the road network. It identifies on what type of road the vehicle has been driven and when, and calculates from that the cumulative rebate to which the driver is entitled. The OBU records the accumulated entitlement, which can be transmitted in a secure way to the petrol station cashier or at-pump payment machine.

An easily adopted and trusted transmission mechanism could be based on a secure 'smart' card, issued by the DVLA for each registered vehicle, which can be inserted into the OBU to read off the accrued discount and then be presented to the cashier to obtain the discount off the pump price. The card reading could be processed by the retailer in a similar way to established commercial discount or loyalty schemes. Alternatively, more sophisticated Near-Field Communication, Bluetooth or Wi-Fi technologies might be incorporated, perhaps based on the smartphones already in widespread circulation.

From the driver's perspective:

- There need be no obligation to install an OBU, but little reason not to. The government will have approved a basic OBU specification, and may decide to subsidise in some way the cost of models that conform – although it is, of course, in almost all drivers' interests to invest in one. The OBU needs to be easily accessible in the vehicle, with a clearly visible display showing the rising discount to which the driver is entitled (rebate ceasing to build up when the vehicle is stationary). There is no need for it to be hardwired into the vehicle, as all it needs to do is pick up the GPS signal.

If using a secure card as the transmission method, the stored value in the OBU can be transferred to the secure card and taken off it when presented against fuel payment. On next insertion in the OBU, the accrued discount is reset to zero or any residual value still on the card (if it was not possible to apply all the value against payment). The design of the OBU/card interface needs to ensure that the value is either on the OBU or on the card, never both. It would help scheme users to protect against loss or theft of the discount they have earned on the card if it is PIN-protected.

- Commercial suppliers are encouraged to develop and market more sophisticated OBUs with added functionality – for example, displaying not just the total cash discount but information on how the discount is accruing according to where and when the car is being driven. An OBU could perhaps also offer the net fuel price per litre payable for a full tank at the next refuelling, or a download facility transferring data to a home computer to study driving pattern and costs. Insurance companies might be interested in offering more targeted insurance products drawing on this data.

- The only data that is transmitted out of the OBU will be the cash figure of rebate which can be claimed. There is no need for any of the underlying information on driving location and timings to be shared with any other party, except where the user chooses to submit an appeal if he believes the OBU is not calculating the entitlement correctly.

- **Under a revenue-neutral scheme, many motorists will pay the same or less than usual, particularly if in rural areas. A minority of drivers, those predominantly in cities, will pay substantially more – unless they are able to adjust their journeys**. On the suggested tariff, there would be no extra burden for night-time journeys, for example by shift workers – for whom even in urban areas alternatives are less likely to be available.

From the government's perspective:

- Increased fuel duty is collected from oil companies using the current mechanism, based on deliveries out of refineries.[8] However, the payment due from the oil companies will be after deducting the discount they have paid out at the point of sale. Transitional arrangements would be needed to estimate the first net payment due in the scheme ahead of actual discounts being granted, and special provision would need to be made for independent fuel retailers.
- The discount tariff needs to be set to maximise impact on congestion reduction, based on the assumed average fuel efficiency of the vehicle fleet. It will therefore have to be reviewed periodically as overall fleet performance improves.
- The government supports roll-out of OBUs through commercial suppliers for up to 31 million cars and vans. The government might go as far as paying for a basic unit (no specialist installation should be needed), or making a voucher contribution to those motorists who opt to buy their own more sophisticated offering from commercial service providers. Consideration should also be given to the benefits of using GPS-enabled smartphones for the initial roll-out.
- No OBUs are issued to foreign-registered cars and vans, subject to advice on consistency with EU law, but the government would probably need to put in place alternative arrangements for *bona fide* visiting motorists to obtain equivalent rebates off the fuel price. Foreign-registered vehicles used illegally in the UK for longer periods have to pay the full cost of fuel. This is just one way in which the scheme can strengthen incentives for compliance with motoring law.

8 The government might decide for reasons of fiscal policy to keep fuel duty as at present and levy alongside it a separately identified Congestion Supplement against which the rebate is set, but both could be collected through oil companies as at present.

To support the basic data transmission mechanism suggested, a rebate card incorporating a chip is issued by the DVLA, unique to each vehicle registered on payment of the appropriate VED and evidence of valid insurance. Only one card can run up a discount in any OBU at any one time, and only one card can be presented with payment at any one time. An equivalent unique identifier mechanism would be needed if other transmission methods are being used.

- An appeals mechanism is in place to handle claims about defective OBUs, working with the garage service industry. An additional refund mechanism is available in the unlikely event of localised or wider failure in the GPS signal.

- The scheme can easily provide the flexibility that government needs to adjust the tariff, and to allow for changes in the road network. The OBU actually calculates the rebate in units rather than an explicit currency amount, with units being converted to currency according to the published tariff in force at the time. But to allow for possible change in the *relative* value of different types of driving, and for possible new roads or reclassification for tariff purposes of existing roads, drivers are obliged to renew the software in their OBU from time to time. This could be done by time-limiting the validity of the rebate points it generates: the government could announce the expiry of currently generated points in, say, 12 months' time, allowing sufficient time for all motorists to obtain a software upgrade through existing car service networks. This clearly cannot allow for frequent fine-tuning of the scheme rules, so it will be important for government to design as effective as possible a tariff from the outset.

- **A key, essentially political, decision for the government would be about the combined impact on the motorist of the new fuel duty level in conjunction with the average rebate set to be earned. As a starting point, the transition to the scheme could be presumed to be revenue-neutral for the government (as in the exemplifications in the Annexes), but the actual approach to be taken will depend on overall revenue-raising imperatives at the time.**

- **These very simple exemplifications do not take account of scheme costs. Whilst ongoing operating costs for the scheme should be modest – essentially managing occasional software updates for the OBUs and the petrol station terminals – there would still be substantial set-up costs which would either have to be borne directly by the government or factored into the deal around future motoring taxation that is put to the motorist.**

- This paper focuses only on the concept rather than the detailed operation and allocation of responsibilities for Intelligent Fuel Duty, and so there is no attempt here to cost the proposal, but with 31 million vehicles potentially included within the scheme, a £100 subsidy for the basic OBU could cost the government in excess of £3 billion. Investment in adapting systems at

the DVLA and the Vehicle and Operator Services Agency would be modest in comparison; the bulk of the costs of upgrading the terminals at the ca. 9,000 petrol stations in the UK could reasonably fall to the fuel retailers themselves who would join the scheme to retain market share.

- The costs to the government and industry would, however, be dwarfed by the substantial economic return that the scheme should bring. Eddington had argued that the benefits of a national road pricing scheme would be of the order of £28 billion p.a. (although the benefits, after set-up costs, of the sophisticated scheme he had in mind could be significantly lower).[9] Intelligent Fuel Duty would be functionally equivalent to such a national road pricing scheme, also setting a more accurate price for each journey, anywhere in the country.

From the fuel retailer's perspective:

- The scheme builds on fuel retailers' existing role of unpaid tax collector, and should entail no more than running a discount card or equivalent through their till in the same way as some existing discount schemes. There has to be some adjustment to their central accounting, given the need to offset total discounts granted from their fuel duty bill.

- **Crucially, the oil company is under no obligation to check the validity of rebates paid out against one authorised DVLA-issued card per transaction. The retailer need not concern himself with the identity of the driver or his vehicle.**

9 Department for Transport (2006). *The Eddington Transport Study.* London: Department for Transport.

6. Potential benefits

Intelligent Fuel Duty should bring all the benefits of an ambitious road pricing scheme with very little pain, and at vastly lower cost.

1. It makes motoring taxation much fairer: the cost of driving will be much closer to its real impact for each journey. On the plausible tariff set out in the annexes, rural driving on quiet roads would be charged 64% less than peak-time city driving.

2. This then means that the driver can make better-informed decisions about when to drive, or whether to switch to another mode of transport. As with road pricing schemes, congestion in peak periods – wherever it happens on the road network – can be expected to fall as enough drivers respond to the price signal.

3. Whatever the tariff structure chosen, the scheme will intensify the existing incentive that fuel duty provides for switching to a more fuel-efficient vehicle. This is because the rebate can only sensibly be expressed as an absolute cash amount rather than a percentage: a fixed reduction may not have much impact on the costs of refilling a 'gas guzzler', but would be worth much more when taken off an already small bill for a fuel-efficient car. In contrast, introducing system-wide road pricing in a revenue-neutral way would undermine current incentives to fuel efficiency, as it could only be done by part-replacing fuel duty.

4. The scheme is simple to understand and straightforward to run. Unlike congestion charging schemes, there is no need to set up a large new agency and bureaucracy to bill drivers and chase non-payment. It uses the established revenue collection mechanism of the fuel station network,

so additional costs are negligible and the risk of evasion is minimised.

5. Indeed, by putting the onus on the motorist to claim the discount the scheme does away with the core challenge of road pricing acceptability: how to ensure compliance. That further reduces the overheads of running the scheme. There is, however, a significant challenge, discussed below, which has to be addressed: the opposite risk of fraud through motorists trying to run multiple OBUs to duplicate their entitlement.

6. The transfer of responsibility to the driver means that set-up costs would be much lower than for the road pricing schemes considered so far by the government. No specialist installation would be required for the OBUs, and no hardwiring, as there is no need to protect the OBU from being disabled. Beyond the core functionality, which would probably need to be funded in some way by government, it will be in the driver's interest to invest in better performance or more sophisticated information displays.

7. There is no intrusion into the driver's privacy. No agency needs to keep track of an individual's driving pattern in order to calculate a bill and enforce the debt. The OBU simply produces the necessary evidence that a rebate has been earned, based on that driving pattern but carrying out the calculation solely within the unit.

8. Only registered vehicles that have paid VED will be issued with the card or other secure device that will prove entitlement to the rebate, so the scheme will help combat VED evasion by making illegal driving significantly more expensive. There is also the potential to additionally tie issue of the card to proof of valid insurance, to penalise uninsured driving.

9. With the intensification of the incentive within fuel duty to run more fuel-efficient vehicles, there is now scope to simplify VED rates by dispensing with the CO_2 banding.

10. Finally, a range of potential benefits could accrue to users, road managers and third parties from most vehicles being voluntarily equipped with a GPS-enabled unit. One attractive opportunity would be to facilitate the development of more targeted insurance products, given that the insurer would have much easier access to verifiable data on driving patterns, should the customer wish to provide it. This could help reduce the burden of premiums for predominantly rural drivers.

7. Hurdles

There are two potentially crucial obstacles, and one further challenge, which need to be overcome for this concept to become a practicable option for the government to pursue.

(1) **The challenge of devising a tariff** *(and new standard rate of fuel duty) that would be politically acceptable in its impact on pump prices, provide sufficient incentive to impact on driving behaviour, and still accommodate the widely varying fuel efficiency of the car fleet.*

The first element has to be a matter for the Chancellor, as part of the difficult budget decisions that have to be made each year. Clearly it would not be possible to give worthwhile discounts for more 'desirable' driving whilst protecting total revenues without a hike in the rate of fuel duty itself. Higher fuel duty, if only for some driving, would of course be controversial and government would need to explore a range of options for phasing the new system in over time, or perhaps by different classes of vehicle.

However, there is a structural challenge in this concept as well: the incentive value of whatever rebate is offered will vary greatly because drivers pay vastly different amounts to fill up their cars depending on what car they have chosen. Simplicity and logic dictate that the rebate is built up at a flat rate per km for each category of road, avoiding the need to identify the vehicle type at the filling station and apply different levels of rebate. This means that the entitlement will lead to a far greater percentage reduction in the cost of driving for the driver of the most fuel-efficient cars than for a car using perhaps up to four times as much fuel.

The wide range in fuel efficiency in the car fleet constrains the spread of discount levels that can be offered. The government and fuel retailers would,

of course, want to prevent the rebate entitlement exceeding the total fuel duty element of the cost of refilling, and indeed the Treasury may want to determine a minimum amount of fuel duty per litre that would still be payable on each refilling. But it would also be counter-intuitive to offer a *higher* level of discount to the less fuel-efficient cars, the only variation which could neutralise the effect of a flat-rate discount off varying fuel bills.

It is, however, possible to identify a tariff structure which still provides sufficient incentives to change driving behaviour in all cars without requiring a prohibitively large hike in the price of fuel at the pump. Annex A proposes a plausible structure of modest rebates per km, ranging up to 5p per km for the least congested driving, and Annex B shows how this would work alongside a fuel price increased by up to 36p per litre. This would entail the pump price rising by 28% to £1.66 per litre, yet the net change in the duty/VAT paid per km for an average car achieving 40 mpg would fall by 47% for the least congested driving, but climb by 47% for the most congested driving. There is no change in what the motorist in the average car pays if all his driving is in medium congestion conditions, and so at this level the scheme would be revenue-neutral (before costs).

The 47% cost increase also applies to the most and least fuel-efficient cars, as no discount is payable for that congested driving, but an 80 mpg car (a level which could soon be reached) would have all the duty/charge rebated for wholly uncongested driving, whereas the least efficient 20 mpg car would gain no benefit from wholly uncongested driving.

(2) **The risk of fraud** *through cars carrying more than one OBU, and thus duplicating the entitlement to which the driver is entitled.*

A key advantage of the discount-based approach over past thinking on how GPS-based road pricing would work is that users will actively want to obtain units and ensure they are operating effectively. This, however, exposes a wholly new risk of fraud: that users will install multiple units and run up duplicate discounts to which they are not entitled.

The necessary security mechanisms will require detailed study, but as outlined above, a simple approach would be control by the DVLA of the issue of secure cards or other mechanism (one per vehicle and one per transaction) needed to prove entitlement to rebate. Consideration would also need to be given to making the carriage of multiple OBUs a criminal offence, taking account of the challenges of effective enforcement.

(3) Interaction with the Irish land border.

This proposition is better suited to Britain than to other countries as our island status means the risk of motorists simply driving to a neighbouring country to fill up is minimised. However, a decision will need to be taken on how Northern

Ireland fits into the scheme, given the attractions of what might then be significantly cheaper fuel over the land border in Ireland. It might be simplest to restrict the scheme to Great Britain only (i.e. excluding vehicles registered with the Driver and Vehicle Agency in Northern Ireland), if the present lower level of fuel duty can continue to be levied within Northern Ireland.

8. Approaches to implementation

Whilst the concept of Intelligent Fuel Duty is simple, its widespread implementation would constitute a major change with a large number of risks that would need to be managed.

The key challenges are:

- the design and roll-out of user-friendly OBUs which drivers trust;
- the ability to devise a sustainable tariff which also has the desired impacts on traffic;
- combating the potential for fraud through multiple OBUs; and
- succeeding in communicating the need for a higher cost of driving in congested conditions.

Full use should be made of the essentially voluntary nature of the proposition to build up participation gradually. An obvious starting point would be to test feasibility with initially small groups of drivers in a rural area. The Devolved Administrations might, for example, be interested in leading such a study in an island or a larger area such as the Highlands, piloting the technology and payments systems on a small scale. Early adopters would obviously cost the government money, but a programme could be devised to protect

overall revenue by ratcheting up fuel duty as the number of users builds up, and as more petrol stations equip themselves with the necessary terminal enhancements in order to retain business.

This phase would be essential in testing approaches to the key delivery challenges of ensuring sufficient commercial provision of OBUs, with some form of government support for acquiring the basic model, and of adapting DVLA systems to manage the issue of the VED-linked authorisation.

The scope of the scheme could be firmly limited in a first phase by **fuel type**. A diesel-only scheme would keep the impacts to only 13% or so of the total fleet; it would provide an incentive for the environmentally beneficial shift of diesel cars over time to rural areas from urban areas, where their use would become progressively more expensive. (Special account would need to be taken of the impact on taxi fleets.)

Government might separately consider applying the core concept to the very different circumstances of **electric vehicles**. As the number on the roads increases, these will need to start making some contribution to motoring taxation, if the burden is not to become still heavier on the declining conventional-powered fleet. Once sufficient momentum has been established, government could start to recover some of the subsidies it provides to the take-up of electric cars through lease repayments or other means, with the sum collected being adjusted by the same rebate that would offset Intelligent Fuel Duty. This could be fertile ground for testing the systems and its impacts, albeit on a small scale, as electric car owners can be expected to be readier to embrace new technologies.

With appropriate phasing in place, the political challenges of shifting to Intelligent Fuel Duty should be manageable. There would be little need for new primary legislation, if Finance Bill provisions can authorise any structural adjustments needed to fuel duty. There would probably also need to be a legal bar on carrying more than one OBU in a vehicle at any one time.

9. Conclusion

It is clear that the route through the major challenges in this scheme remains to be worked up in detail, but the basic concept is clearly attractive: it offers a way to finally realise the benefits that ought to come from road pricing, without the major drawbacks that have made that proposition operationally and politically a non-starter. It intensifies the power of fuel duty as a direct tax on carbon, but also makes it an effective tool to tackle congestion.

The national debate on road pricing that got under way in the last decade has come to nothing. This idea is tabled now to inject fresh life into that discussion, not within the dead end of charging motorists more, but in the far more productive territory of finding a fairer way of paying for road use.

Annex A

Example tariff structure

It is worth giving initial consideration to what type of tariff structure – the set of discount rates for different types of driving – might be practicable. A balance needs to be struck between ease of understanding and its ability to have some impact on driving behaviour. A matrix of three time bands (peak, medium and low) and three types of road could in the first instance be populated with just three possible rebate levels per km. It would make a lot of sense to define the road type by the speed limit in force on that stretch: this would avoid the need for any extra signing, and would increase drivers' awareness of the speed limit they need to comply with.

Rebate per km standard across GB	**Motorways** (and other dual carriageways with a 70 mph limit)	**Urban roads** (speed limit 30 mph or less)	**Rural roads** (speed limit 40/50/60 mph)
Peak M–F 0700–1000 ; 1600–1900	Nil	Nil	2.5p
Mid M–F 1000–1600 ; Sat, Sun 1100–1900	2.5p	2.5p	5p
Low M–F 1900–0700 Sat, Sun 1900–1100	5p	2.5p	5p

Annex B proceeds to apply this tariff to three car types of contrasting fuel efficiency, to determine the actual impact on representative driving costs.

The tariff could be refined by adding more rebate levels to more accurately reflect the impacts of the different types of driving. It could pick up specific policy steers that the government might want to give, as here for example in making motorways cheaper than less suitable urban roads for driving in the peak as well as off-peak:

Rebate per km standard across GB	**Motorways** (and other dual carriageways with a 70 mph limit)	**Urban roads** (speed limit 30 mph or less)	**Rural roads** (speed limit 40/50/60 mph)
Peak M–F 0700–1000; 1600–1900	1p	Nil	2p
Mid M–F 1000–1600; Sat, Sun 1100–1900	1.5p	2p	2.5p
Low M–F 1900–0700 Sat, Sun 1900–1100	5p	2.5p	4p

Annex B

Impact of rebate on different vehicles

A tariff structure designed to make no difference to the tax levied on driving in average conditions (the categories earning 2.5p per km rebate in the first table of Annex A) would have very different impacts on more and less fuel-efficient vehicles. The range of fuel efficiency can be crudely represented by the following three cars:

- the '80 mpg future hybrid', roughly equating to 3.5 litres per 100 km
- the '40 mpg typical car', roughly equating to 7.0 litres per 100 km
- the '20 mpg sports car', roughly equating to 14.0 litres per 100 km

If, for the sake of this demonstration, tax on fuel (fuel duty plus VAT – inc. VAT on fuel duty) is assumed to be 75p per litre, giving a pump price of £1.30 per litre, then the total tax cost for driving 100 km for the three vehicles is approximately £2.65/£5.30/£10.60.

If fuel duty plus VAT were to **increase by 33% to £1.00 per litre**, these costs would increase to £3.53/£7.06/£14.13. But we now have scope for a rebate regime; anything above 3.5p per km would wipe out all the fuel duty payable by the hybrid car in uncongested conditions, but it helps to go higher to send clearer signals about 'good' and 'bad' driving. Using the simpler Nil/2.5p/5.0p tariff from Annex A, average driving in the average vehicle ends up 14% cheaper.

33% increase to £1.00 fuel duty	Current cost/ 100 km	Cost all high congestion (rebate: nil)	% increase	Net cost all mid congestion (rebate: 2.5 p/km)	% change	Net cost all uncongested (rebate: 5 p/km)	% change
80 mpg	£2.65	£3.53	33	£1.03	–61	Nil*	–100
40 mpg	£5.30	£7.06	33	£4.56	–14	£2.06	–61
20 mpg	£10.60	£14.13	33	£11.63	10	£9.13	–14

* The £5.00 of discount earned from 100 km of least congested driving now exceeds the cost of £3.53 incurred by the most fuel-efficient vehicle. The system does not allow discount greater than the tax actually paid, so the fuel-efficient vehicle's driver finds that the balance of £1.47 of his accrued discount is simply cancelled when paying for the fuel.

In the expectation that a 14% fall in total revenue (even before scheme costs) would not be acceptable to the Exchequer, the simple tariff needs a rather higher tax of £1.11 per litre to break even, producing a new pre-discount pump price of £1.66 litre:

47% increase to £1.11 fuel duty	Current cost/ 100 km	Cost all high congestion (rebate: nil)	% increase	Net cost all mid congestion (rebate: 2.5 p/km)	% change	Net cost all uncongested (rebate: 5 p/km)	% change
80 mpg	£2.65	£3.90	47	£1.40	–47	Nil	–100
40 mpg	£5.30	£7.81	47	£5.30	-	£2.81	–47
20 mpg	£10.60	£15.61	47	£13.11	24	£10.61	0

Average driving in the averagely fuel-efficient car costs the same as now, so the scheme ought to be revenue-neutral for the Exchequer. Driving in peak conditions only, whatever the car, will mean a 47% rise in the tax payable, but if by contrast all driving is in uncongested conditions, the tax bill either remains as now (for the gas guzzler), falls 47% (for the average car) or disappears entirely (for the most fuel-efficient vehicles).

RAC Foundation

The Royal Automobile Club Foundation for Motoring Limited is a charity which explores the economic, mobility, safety and environmental issues relating to roads and responsible road users. Independent and authoritative research, carried out for the public benefit, is central to the Foundation's activities.

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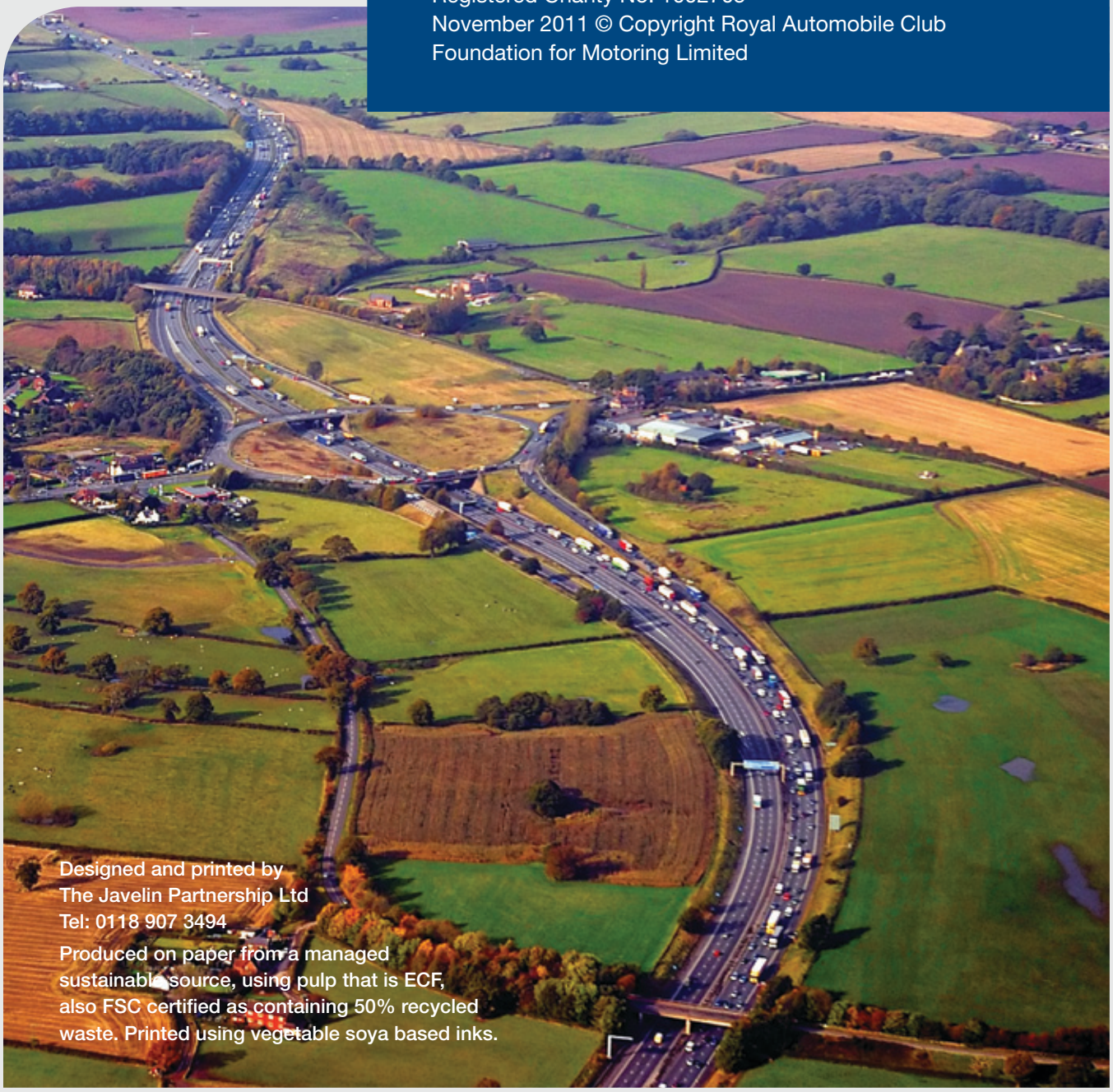

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