Fuel for Thought

The what, why and how of motoring taxation

Paul Johnson,
Andrew Leicester
and George Stoye

Institute for Fiscal Studies

May 2012

RAC Foundation

The Royal Automobile Club Foundation for Motoring is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users. The Foundation publishes independent and authoritative research with which it promotes informed debate and advocates policy in the interest of the responsible motorist.

RAC Foundation
89–91 Pall Mall
London
SW1Y 5HS

Tel no: 020 7747 3445
www.racfoundation.org

Registered Charity No. 1002705

This report has been prepared for the RAC Foundation by the Institute for Fiscal Studies. The report content is the view of the authors and does not necessarily represent the views of the RAC Foundation.

Fuel for Thought

The what, why and how of motoring taxation

Paul Johnson,
Andrew Leicester
and George Stoye

Institute for Fiscal Studies

May 2012

Institute for
Fiscal Studies

Acknowledgements

The authors are grateful to the RAC Foundation for funding this work, and for co-funding from the ESRC Centre for the Microeconomic Analysis of Public Policy (RES-544-28-5001). They would like to thank David Bayliss, Stephen Glaister, Peter Levell, Peter Mackie and Tom Worsley for useful comments on early drafts, and Ben Kennington for meticulous copy-editing. Data from the UK Living Costs and Food Survey are collected by the Office for National Statistics and distributed by the Economic and Social Data Service. Data from the National Travel Survey are collected by the National Centre for Social Research and distributed by the Economic and Social Data Services. Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

Contact details

paul_j@ifs.org.uk; andrew_l@ifs.org.uk *(corresponding author);*
george_s@ifs.org.uk

Disclaimer

The contents of this report represent the views of the authors alone, and not those of the Institute for Fiscal Studies or the RAC Foundation. Any errors are the sole responsibility of the authors.

Contents

RAC Foundation Viewpoint iv

Executive Summary ix

1 Introduction 1

2 Economic Principles of Motoring Taxation 5

2.1 Revenue raising 6

2.2 Distributional effects 7

2.3 External costs of road use 8

2.4 The role of non-tax instruments 13

2.5 Other relevant issues 14

3 The Structure of UK Motoring Taxation 17

3.1 Fuel duties 18

3.1.1 Current rates of duty 18

3.1.2 Historical duty rates 19

3.1.3 Duty differentiation 22

3.1.4 International comparisons 26

3.2 Vehicle Excise Duty 29

3.2.1 Current and historic rates 29

3.2.2 The effect of VED on emissions 31

3.2.3 International comparisons 33

3.3 Company car and fuel taxation 33

3.3.1 Company car taxation 34

3.3.2 The taxation of employer-provided fuel 37

3.4 London Congestion Charge 38

3.5 Distributional aspects of motoring taxes 39

4 Motoring Tax Revenues 45

4.1 Current and historical revenues 46

4.2 Revenues in the futhure 49

4.2.1 Short-term revenue projections 49

4.2.2 Raising the share of green taxes in total receipts 50

4.2.3 Long-term projections 53

5 Do UK Motoring Taxes Accord with the Economic Principles? 59

5.1 Taxes and the external costs of motoring 60

5.1.1 Fuel taxes and marginal externalities 60

5.1.2 Duty differentiation between petrol and diesel 62

5.1.3 The role of Vehicle Excise Duty 63

5.2 Other economic principles 66

5.2.1 Simplicity 66

5.2.2 Consistency 66

6 Policy Options for the Future 69

6.1 Reforming the current set of motoring taxes 70

6.1.1 Are fuel taxes 'too high'? 70

6.1.2 A 'fair fuel stabiliser' 73

6.1.3 Reforms to other existing motoring taxes 78

6.1.4 Multi-part instruments 78

6.1.5 Building congestion-related payments into existing instruments 79

6.2 Introducing new instruments 81

7 Conclusions 87

8 References 91

Appendix 95

RAC Foundation Viewpoint

At each Budget, motoring taxation catches the headlines. With good reason: the average household spends just over £50 a week on motoring. Receipts from fuel duty and Vehicle Excise Duty (VED) are one of the biggest sources of funds for the Treasury, contributing about £38 billion a year, some 7% of all the Exchequer's income. The government uses more than one way of classifying taxes, but motoring taxes account for 85% of all those classified as 'green taxes'. Less than one third of this money is spent on national and local roads.

Nobody likes paying taxes. Yet, like death, they are a fact of life. The best one can hope for is that they are at least equitable, understandable and justifiable. We asked the experts at the respected and independent Institute for Fiscal Studies to investigate how motoring taxes are being determined, and whether they meet these three criteria.

Their answer is worrying, but probably of little surprise to even casual observers. Whilst there are at least two quite different fundamental principles by which these important taxes might be set – to both of which government appeals from time to time – what happens in practice bears little relation to either of them.

This report relates a comprehensive history of policy announcements on motoring taxation. The clear inference is that there has been no coherent, long-term policy.

Rates of fuel duty and VED are changed frequently – and, it seems, proposals are revised even more so. The approaches taken by successive governments have often smacked of policy made on the hoof, with short-term political expediency dominating any willingness to establish a fair system which is transparent and appropriate, to the needs of both the individual and the state.

Against this backdrop, a new difficulty has arisen for government. Despite a projected growth in traffic – the Department for Transport's January 2012 estimate[1] is for 44% more traffic by 2035 – the IFS, using the government's own figures, notes that revenue from motoring taxation is set to drop by £13 billion a year by 2029 (to £25 billion, from £38 billion in 2010). This is simply due to the improvement in the fuel efficiency of vehicles, as existing technologies are refined and new ones are adopted in response to the government's climate change targets for greenhouse gas reduction.

Will the government stand by while motoring tax revenues decline? The IFS report estimates that to preserve the current level of fuel duty revenue, the rate

[1] Department for Transport (2012). *Road Transport Forecasts 2011*. Retrieved 13 April 2012 from http://assets.dft.gov.uk/publications/road-transport-forecasts-2011/road-transport-forecasts-2011-results.pdf.

per litre would have to be increased by over 50% above the present 57.95p/litre (plus VAT, as at March 2012). Would that be politically acceptable? Or even justifiable? The RAC Foundation argues that in the longer term, government must redesign the system of motoring taxation to be fairer and more transparent across the spectrum of users of different technologies, and to raise a total revenue that is politically acceptable given other sources of revenue to the Exchequer.

The IFS report shows that motoring taxation is, on average, mildly progressive. For the 10% of households with the lowest incomes, fuel duty and VED account for 3.6% of total expenditure, whereas they account for at least 5.9% in the case of higher-income households. But there is no such thing as an 'average' household; either a household runs at least one car or it runs none. In the lowest income band, about half of all households do run at least one car. Amongst households that incur the considerable cost of having a car, current motoring taxation is regressive. The cost of fuel and VED represents 8.1% of the budget of the poorest 10% of car owners, but only 5.8% of the 10% with the highest incomes.

Some will insist that motorists are taxed heavily simply because they can be, and the government needs the money. Many people find that use of the car is unavoidable, and the movement of goods an essential activity. In practice there is little alternative to paying up. If a government insists that a particular sum must be raised by indirect taxation, one principle is that a 'good' structure is one which taxes the less responsive sectors relatively highly and the more responsive sectors lowly. This yields the required total revenue whilst causing the least distortion to the quantities people buy; and that does the least damage to the economy and total personal welfare. As the IFS notes, despite occasional pronouncements to the effect that the government 'needs the money' or cannot afford a motoring tax reduction, government does not really attempt to sustain this line of argument.

The report discusses in detail the second line of argument as to how motoring taxes might be structured: rather than simply raising revenue, taxes should reflect the various economic and social impacts that the use of vehicles has on other road users and the community at large. These impacts include traffic congestion, accidents, visual intrusion, noise and air pollution, and greenhouse gas emissions.[2]

'Revenue raising' and 'paying the external costs' are quite distinct principles. The amount of tax gathered under a revenue-raising regime might bear no particular relation to the yield that reflects external economic, environmental and social impacts.

[2] This is similar to the 'polluter pays' principle that guides charges and taxation in other sectors, including environment and waste.

So what of the 'external costs' justification? By this formula is tax too high or too low? The IFS notes that it is sensible to include within conventional fuel duty a charge that reflects the carbon price of burning a litre of fuel: if carbon is the problem then tax (price) it directly. This suggests a contribution to the duty rate of around 14p/litre at current official carbon prices.

The RAC Foundation agrees with this approach to carbon taxation. But we note that other sectors burning hydrocarbons and producing carbon dioxide pay lower rates of duty than road users: agriculture, railways and bus companies. Most notably, private householders pay no duty on domestic fuels, and a reduced rate of VAT. 25% of all greenhouse gas emissions come from burning these fuels, as against 19% from roads.[3]

The advent of the pure electric car charged up from the domestic electricity supply creates a further problem. Drivers will pay the carbon charge implicit in electricity due to the generating companies having to pay for carbon credits. But the price of credits is currently much lower than that used by the UK government to make policy decisions. From the perspective of the purchaser, at current showroom prices after government grants, electric vehicles can only compete with conventional vehicles because they are excused duty on their fuel equivalent to that imposed on petrol and diesel. It is uncertain how long government will be willing to preserve this inconsistency.

On top of the 14p for carbon you can reasonably add to fuel duty elements corresponding to external costs such as air pollution. But then you have a problem: by far the most costly damage inflicted by road users is traffic congestion. This is not directly related to the amount of fuel used, and hence it is hard to justify factoring it into fuel duty. Traffic congestion varies enormously by time and place. Thus no single, universal rate of fuel duty can be regarded as appropriate for all. The IFS estimates that at the current rate of duty, about half of all vehicle miles are taxed too highly – many of them on uncongested rural roads; one quarter are taxed about right; and the remainder are charged too little – in some congested urban locations, far too little.

The IFS is driven to the conclusion that if the 'paying the external costs' justification is to be sustained then a significant portion of current fuel duty must be replaced by some form of 'pay-as-you-go' charge based on distance driven in congested conditions. Such a charge moderates demand, and therefore reduces congestion. There is a net overall gain, and the economic value of the road is increased. The amount of revenue is determined by the characteristics of the road and the level of demand for use of it. But this begs the question: who gets the benefit of the use of the revenue?

---

[3] Committee on Climate Change (2012). *The 2050 target – achieving an 80% reduction including emissions from international aviation and shipping*. Retrieved 13 April 2012 from http://hmccc.s3.amazonaws.com/IA&S/CCC_IAS_Tech-Rep_2050Target_April2012.pdf.

Road users cause congestion to each other, and most of the 'disbenefits' are suffered by drivers themselves, not the population at large. So it might be argued that, in fairness, the revenues should be used to compensate – at least to some degree – those paying the taxes. This could be achieved through improvement of the road (or the general transport network). If implemented, road users as a group could be made better off. But if (as is currently the case) most of the revenue is swallowed up by general government expenditure, then most motorists paying the tax will be made worse off.

A further consideration is that if congestion is severe, and hence the revenue in a particular location from a correctly set pay-as-you-go charge is high, then this is a clear signal that there is not enough road capacity. The question arises: should the revenue from the tax be used to fund an expansion of capacity? This might come about either through more active management of the existing asset or by physical enhancement. In other words, there is a case for ploughing the tax revenue back into the road system to alleviate the specific congestion generating the revenue, rather than using it for general expenditure. This is essentially what happens in our other utilities: the charges for water and power are dedicated to paying operating costs, and the costs of providing and financing sufficient infrastructure, to ensure delivery of an adequate level of service.

Overall, one cannot help but think that the current levels of motoring taxation have little to do with either sound revenue-raising principles or external cost arguments. Rather, they are an accident of history by which the government raises as much as it can get away with.

The IFS report points out the fundamental difficulties posed by the notion of a 'fair fuel price stabiliser'. It is not possible to make a credible promise to protect consumers from the consequences of variation in the global US dollar price of crude oil. As the report notes, that is essentially the conclusion which the government has itself reached. What government can and should do is to set out the principles by which it intends to set tax rates, and thereby establish a greater degree of stability.

Concluding remarks

It is easy to see why the Treasury likes motoring taxation, especially fuel duty. It is simple to collect, is almost impossible to evade, and brings in significant revenue: some 7% of all tax receipts. It is also a dependable source of cash with less short-term fluctuation in revenue than some other taxes. The demand for road fuel is relatively inelastic: most people, most of the time, have to use their cars to go about their daily business. If the cost of fuel rises at the pumps, motorists might be able to make marginal changes to their driving behaviour, but they are more likely to cut back spending elsewhere rather than risk ending up in a position where their tanks run dry or they lose mobility. To all intents and purposes, the greater part of transport spending is not discretionary.

But what is the point of fuel duty? Is it an environmental tax? Is it about changing behaviour? Is it the bill drivers must pay to account for the damage they impose on society? Or is it simply a revenue raiser?

The conclusion must be that there is no clear answer.

That is why the RAC Foundation urges the government to do the following:

1. admit that fuel duty is a frequently altered tax without adequate rationale;
2. recognise the acute impact that high fuel prices have on car-owning households, particularly those on low incomes;
3. recognise the dramatic fall in fuel duty revenue that is inevitable as the decarbonisation of road transport proceeds apace; and
4. start a dialogue on what a more transparent system of motoring taxation might look like, which should include a consideration of alternatives to fuel duty and VED.

There are 34 million drivers in the UK. Historically they are not a militant group. Yet there have been sporadic protests about the price of fuel and the level of fuel duty – witness the blockade of oil refineries and storage facilities in 2000 that brought London to within a few hours of running out of food and was arguably the biggest threat to the premiership of Tony Blair.

When the economic climate is benign, people are confident about their futures, and the cost of running a car (not least the price of fuel) is a manageable part of household budgets, then motoring taxation might be an irritant to many but not a source of mass discontent. But today everything is rather different and each time drivers visit the pumps their finances are dealt another severe blow in large part because of a tax system they increasingly resent and do not understand the reasons for. It is time for policymakers to recognise these concerns and address them.

Executive Summary

Private transport costs make up some 13% of the average household budget, and it is estimated that in 2011/12 motoring-related taxes (fuel duties and Vehicle Excise Duty, VED) will raise more than £38 billion, or almost 7% of total revenues. The benefits of a well-designed system of motoring taxes are therefore potentially substantial. This report provides a detailed examination of the current system of motoring-related taxes in the UK, assesses how well these taxes match up to the economic principles underlying good tax policy, and makes a number of suggestions for reform.

The key insights are that motoring taxes are justified primarily by the external costs ('externalities') generated by road use. These costs are not taken into account in private choices of how much to drive. Without policy action, this leads to excess motoring from the perspective of society as a whole. Taxes on motoring can increase the private costs – 'internalise the externality' – and correct this problem. Ideally, these corrective taxes should be targeted on the externalities directly (or on a close approximation to them), and set at a level equal to the marginal external cost at the socially optimal level of demand.

However, we conclude that the current tax system does a poor job at targeting these external costs. In particular, fuel taxes are completely unable to capture variation in external costs by time and location – most notably the costs of congestion. A system of road pricing or congestion charging which is able to take such variation into account more accurately would be preferable. This conclusion is not one which is new or surprising, and policymakers have shown little appetite to act on it before. However, as our findings here make clear, real impetus for reform may come from fiscal considerations. Without action, there is likely to be a long-term erosion of the motoring tax base. Road use, though, is expected to continue to increase. Road pricing not only targets the external costs of motoring more precisely, generating the potential for significant welfare gains, but also provides a more robust revenue source.

Motoring taxes are already shrinking as a proportion of total receipts, and are expected to amount to just 6% of revenues by 2016/17. This would be the lowest share since 1954. The government has pledged to increase the share of total revenues coming from environmental taxes, a target which is made more difficult by the falling share of motoring taxes. On present forecasts, the pledge will be hit with only £1 billion to spare by the end of the Parliament – less than the cost of freezing fuel duty rates for a single year. If motoring taxes remained at their current share of receipts, the pledge would be hit with more than £4 billion to spare. That said, there is no compelling environmental or economic reason for such a pledge to be made in the first place.

More pressing in the mind of the Chancellor ought to be long-term projections from the Office for Budget Responsibility (OBR) which show that, by 2029/30, fuel duty will make up only 1.1% of GDP compared to 1.7% today. For VED, the figures are 0.1% and 0.3% respectively. The total decline in motoring taxes is equivalent to £13.2 billion a year in today's terms. This is roughly the revenue generated by increasing the basic rate of income tax from 20p to 23.4p, increasing VAT from 20% to 22.7%, or increasing fuel duty by more than 50%. The OBR forecasts for VED may be unduly pessimistic, as they assume no future changes to the carbon thresholds on which VED liabilities are assessed – which, given the greening of the fleet, seems unlikely. However, the forecasts for fuel duty may be optimistic. If oil prices remain high, there will undoubtedly be resumed pressure on the Chancellor to cancel future fuel duty increases, as happened in the 2011 Autumn Statement, whereas the OBR figures assume duty rises in line with inflation each year.

There are a number of externalities associated with motoring. Some, such as carbon dioxide emissions, relate very strongly to fuel consumption, making a tax on fuel an appropriate instrument. At current carbon values, burning a litre of fuel generates a marginal externality of around 14p. Others – including noise costs, accidents and, above all, congestion – are not at all related to fuel use. Instead, they vary by time and location of driving. Department for Transport (DfT) estimates suggest that the marginal external costs associated with around half of the kilometres driven in the UK are very low – less than 5p per kilometre. However, driving in the most congested areas of the country is associated with extremely high marginal external costs of almost £2.50 per kilometre. These figures explain why a road pricing system which more precisely captured this variation could have significant welfare gains, estimated by the Eddington Review in 2006 at up to £25 billion per year in the long run.

The issues surrounding economic efficiency and revenue erosion are highlighted in particular by the potential for increased electrification of the vehicle fleet. Estimates from the Committee on Climate Change suggest that by 2030, 60% of new cars sold will be electric. In the current motoring

tax system, electric cars generate no revenue: they consume no hydrocarbon fuel and are exempt from VED. These vehicles still, though, generate congestion externalities which are at present untaxed.

There are, of course, substantial barriers to road pricing. Public opinion is likely to be hostile. By making it clear that road pricing would be largely or wholly offset by reductions in taxes on fuel, opposition may well be more muted, and perceptions of road pricing have been seen to change for the better in places where it has been introduced, both in the UK and abroad. A complex pricing structure may be costly to implement and run. Simpler systems targeted on the most congested areas could capture a large fraction of the potential benefits.

There would also be winners and losers from a move towards road pricing. Understanding who would be affected, and how, would be crucial for good policymaking. That is why the government should start preparing the ground for this kind of reform as soon as possible and allow for a proper evidence base to be formed. Failure to act is not a neutral choice: if this course is taken, the government will have to replace significant amounts of lost revenue – and that will also create winners and losers, whilst leaving a motoring tax structure that is ever more uncoupled from the external costs generated.

Excise taxes on fuel are by far the largest source of motoring tax revenue, making up 85% of motoring-related receipts. The majority of fuel is taxed at 57.95 pence per litre, with 20% VAT charged on top. The history of fuel taxes is dominated by the duty escalator which ran from 1993 until 1999, and saw real duty rates increase by more than 70%. In the decade following the end of the escalator, by contrast, there were no real-terms increases in duty rates. Indeed, the most notable feature of recent fuel tax policy has been the large amount of uncertainty about what rates will be set, with duty increases repeatedly announced, then delayed, then abandoned altogether under successive Chancellors. This is not a recipe for good policymaking, nor does it provide reliable long-term signals to road users or engender certainty in the public finances. The idea of a 'fair fuel stabiliser' – tying the rate of duty to the underlying pre-tax fuel price – has gained some traction recently. However, such a policy would be very difficult to implement for two principal reasons. Firstly, it is extremely hard to identify the trend in pre-tax prices, and thus the appropriate tax rate to set. For instance, if long-term increases in fuel prices were to be mistaken for short-term shocks, then a stabiliser would lead either to a permanent erosion of fuel duty revenue, or else sharp adjustments to duty rates once the mistake had been realised – undermining its power as a stabiliser. Secondly, increases in oil prices do not lead to any sustained increase in tax receipts, and so the policy could only further increase uncertainty about the public finances.

In the absence of a move towards road pricing, is the current level of fuel duty justified by the external costs of motoring? This is extremely difficult to answer satisfactorily. DfT estimates suggest that a kilometre driven on the current network generates, on average, a marginal external cost of 19.5p, substantially higher than current fuel duty rates. However, at *optimal* levels of road use (which is the appropriate measure for judging the correct tax) congestion externalities would be much lower than at current levels. It may also be more appropriate to weight the low externality kilometres more heavily to determine the 'correct' fuel duty rate if those driving in the most congested areas are least responsive to prices. Estimating the appropriate fuel tax rate would require detailed modelling which is beyond the scope of this report. However, the point that a single rate of duty cannot adequately capture the variation in externalities remains the crucial insight.

The other major motoring-related tax – VED – accounts for about 16% of motoring tax receipts. The most significant reform to VED came in 2001, when the tax was based for the first time on the fuel efficiency of the vehicle. The tax now provides direct incentives to buy more efficient cars. In recent years, the average efficiency of new cars has increased markedly, though the extent to which this is attributable to VED reforms, rather than resulting from tighter regulation and higher fuel costs, is very hard to know. What is clear is that the incentives within the VED system to buy more efficient cars have become far stronger. In 2001, the difference in lifetime VED payments (over 15 years) between the most and least polluting cars amounted to £2,400, whilst by 2011 it had risen to £7,020. The introduction in 2010 of a 'showroom tax', a higher VED rate for polluting cars in the first year, helps to explain this trend. This reform may be justified if people are unable to properly account for future running costs in making purchase decisions, though the evidence on this is not fully conclusive. More UK-specific research of both issues would be helpful for policymakers.

Incentives to buy more efficient cars have also been built into the system of company car and fuel taxes. Fleet sales account for around half of new car purchases, so the tax treatment of company cars is potentially very significant. The oddest feature of the company car tax system is that it penalises diesel vehicles more than petrol vehicles, whereas both fuel duty and VED treat petrol and diesel the same. From an environmental perspective there may in fact be a reason to tax diesel more heavily, since a litre of diesel emits slightly more carbon than a litre of petrol. However, it would seem the most sensible policy to treat the two fuels consistently across the set of motoring taxes.

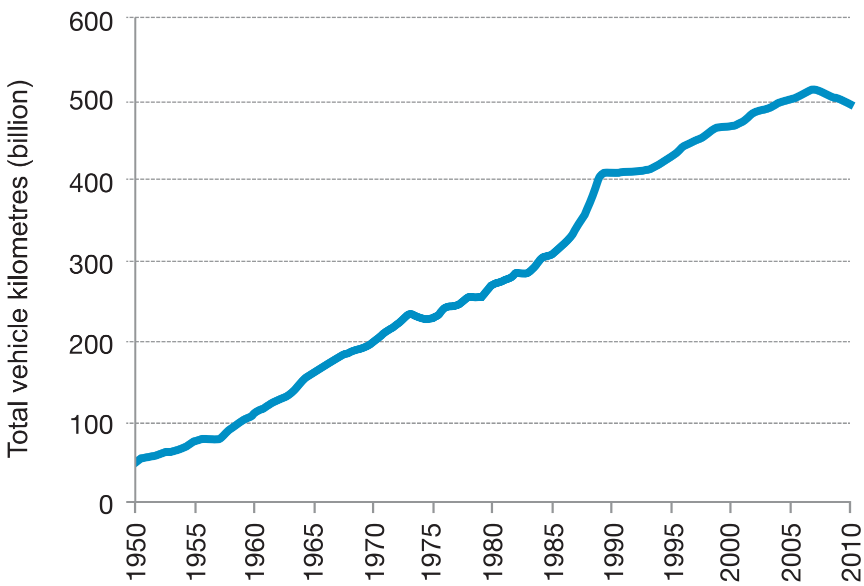
There is no compelling rationale to tax motoring more heavily than other forms of consumption on the basis of distributional concerns. Motoring taxes appear at present to be slightly progressive, having a little less impact on poorer households than on richer households. This is related to vehicle ownership: 41% of the poorest tenth of households own a car, compared to 96% of the richest tenth. There is also some evidence that richer households own larger and more-polluting cars, which are more heavily taxed. A fuller analysis of the changing distributional effect of motoring taxes, and how this might look in the future, would be a useful contribution to the debate surrounding tax reform.

1. Introduction

Motoring is an important part of daily life. More than three quarters of UK households own at least one car.[1] In 2010, the average household spent £52.80 per week on private transport, representing around 13% of total expenditure.[2] In the same year, almost 496 billion vehicle kilometres were driven on British roads. Whilst recent years have seen a small fall in road use, the long-term upward trend is clear (see Figure 1.1). Moreover, the most recent Department for Transport (DfT) forecasts predict that road use will continue to grow, with total road traffic in England predicted to be 43% higher by 2035 than it was in 2003 (table TRA9905 from DfT, 2011).

1 Authors' estimate from the Office for National Statistics (ONS) 2009 Living Costs and Food Survey.
2 ONS (2011) estimates based on 2010 Living Costs and Food Survey.

Figure 1.1: Total vehicle kilometres driven on British roads, 1950–2010



Source: DfT (2011: 1)
Note: Figures converted to kilometres using 1 mile = 1.609 km.

Motoring taxes also represent an important source of revenue for the Exchequer. In 2011/12, total receipts from the major motoring-related taxes – excise duties on vehicle fuel (including associated VAT) and Vehicle Excise Duty (VED) – are expected to be £38.3 billion, or 6.7% of total revenues.[3] The benefits of a well-targeted and effective system of motoring taxes could therefore be substantial.

This report, however, suggests that we are some way from this ideal. We provide a detailed overview of the current system of motoring taxation and how it has changed over time. We compare the main features of the current system to the economic principles which should underlie good policy in this area, and

3 Authors' calculation from Office for Budget Responsibility (OBR) November 2011 figures.

suggest options for reform. In addition, we highlight the issue of the long-term sustainability of revenues under the current system, which (together with sound economic principles) lead almost inexorably to the conclusion that, in the end, some form of pricing for road use will be necessary.

The report is organised as follows. Section 2 sets out the economic principles of road taxation, focusing on the external costs associated with road use, which form the essential rationale for intervention. Section 3 describes the current and historical structure of motoring taxes in the UK, with some assessment of how the UK's situation compares to international experience. Section 4 analyses motoring tax revenues and looks ahead to what might happen to receipts in the future, both short- and long-term. Section 5 discusses how the current system compares to the economic principles upon which an ideal system would be based, before Section 6 outlines policy options for the future, both in the context of the current set of motoring taxes and considering what might be gained from introducing new tax instruments. Section 7 concludes.

2. Economic Principles of Motoring Taxation

This section provides a non-technical discussion of the main economic principles relevant to how motoring is taxed. We argue that whilst issues such as the need to raise revenues efficiently, and distributional concerns, are relevant, the main reasons for treating the consumption of motoring differently to other consumption in the tax system are the external costs ('externalities') associated with road use. A well-designed set of motoring-related taxes should, in principle, be grounded in evidence about the scale of these costs, with tax instruments being appropriately targeted on them.

2.1 Revenue raising

As noted above, motoring-related taxes are a significant source of revenues for the Exchequer. We discuss revenues in more depth in Section 4. In general, we could consider motoring taxes as part of the wider tax system and assess what a fully 'optimal' system of taxes would look like. Such an approach would typically be based on finding the most efficient way to raise a set amount of revenue. Some early, simple results include the Ramsey (1927) 'inverse elasticity' rule, which states that when the only sources of revenue are taxes on commodities – and given a market in which there is perfect competition – taxes should be higher on goods with less price-elastic demand. Modifications to this simplified world generate other insights – for example, the Corlett and Hague (1954) finding that taxes should be lower on goods which are complements to working and substitutes for leisure, in order to reduce the labour supply distortions of taxation. Of course, in reality, the world is much more complex. There are many different sources of taxation – income, consumption, transactions of particular goods, corporate profits and so on – and a large set of imperfect markets in which people make decisions while faced with diverse incentives and incomplete information.

To the extent that the elasticity of demand for motoring is relatively low (i.e. the demand is inelastic), and motoring is associated more strongly with leisure than with work, there may be a case for taxing motoring more heavily than other forms of consumption.[4] Parry and Small (2005), for example, in their work on optimal taxes on vehicle fuel (under the assumption that this is the only form of available motoring tax) estimate that for the UK, the optimal 'Ramsey tax' (the revenue-raising component) of fuel duty is about 22% of the tax rate that would be justified by external motoring costs. We discuss the Parry and Small paper in more depth in Section 6.

4 In the UK, the general consumption tax is the Value Added Tax (VAT). This is applied to the purchase of new cars, and to vehicle fuel (and also on top of fuel duty), as well as to the costs of vehicle maintenance and servicing. For second-hand cars, VAT is payable under the 'margin scheme', on the excess of the resale price over the acquisition price by second-hand dealers (see www.hmrc.gov.uk/vat/start/schemes/margin.htm).

As discussed in Mirrlees et al. (2011), however, it seems hard to build a strong case for differential treatment of various forms of consumption in the tax system through arguments about their price elasticities or their complementarity to work.[5] There are substantial informational requirements to know how price responsiveness varies across consumption goods. In the case of motoring, it is likely that some trips will be very price elastic, and others very price inelastic; some will be leisure trips, whilst others are associated with work. It is hard to see how these differences could be easily built into an efficient revenue-raising design.

One aspect of the revenues from motoring taxes which has received some attention is the idea of the 'double dividend' (Pearce, 1991; Bovenberg & Goulder, 2002). Taxes on externality-generating activities like motoring (see section 2.3) correct a distortion and thus lead to society being better off – this is the first dividend. They also generate revenue which can be used to reduce other taxes, such as income taxes, which distort decisions over whether and how much to work – the second dividend. Perhaps not surprisingly, this is a seductive proposition for policymakers, and is also implicit in the calls for a 'green tax shift' (see, for example, the work done by the Green Fiscal Commission in the UK, which advocated that 20% of revenues come from environmental taxes by 2020).[6] However, there is considerable debate about whether the double dividend idea really holds up (see Fullerton et al., 2010, for a summary). Instituting higher taxes on environmentally damaging activities, including motoring, raises costs and prices within the economy, which, in turn, reduces real wages and reduces the incentive to work (Bovenberg & de Mooij, 1994). Therefore it is not clear-cut that, even if the revenues from motoring taxes are used to reduce taxes elsewhere, the incentives to work are made stronger.

2.2 Distributional effects

Governments might be concerned about policies which have a relatively greater impact on the poor. Distributional concerns mean that consideration will be given to weighting overall social welfare more heavily towards poorer people. Thus there may be a case for taxing motoring more heavily than other consumption if richer households make greater use of private motoring than poorer households. We provide some evidence on the distributional effects of motoring taxes in section 3.5. The general picture is that in the UK, the burden of motoring taxes falls slightly more heavily on households in the middle and upper parts of the income distribution, and slightly less heavily on those at the very bottom and very top. This is intuitive: poorer households are less likely to own cars, but as car ownership quickly rises and flattens off with income, those at the very top are hit less hard by taxes on fuel or vehicle ownership than those in the middle of the distribution.

5 See, in particular, Taxing Goods and Services, Chapter 6 of the editorial volume of Mirrlees et al. (2011), www.ifs.org.uk/mirrleesreview/design/ch6.pdf.

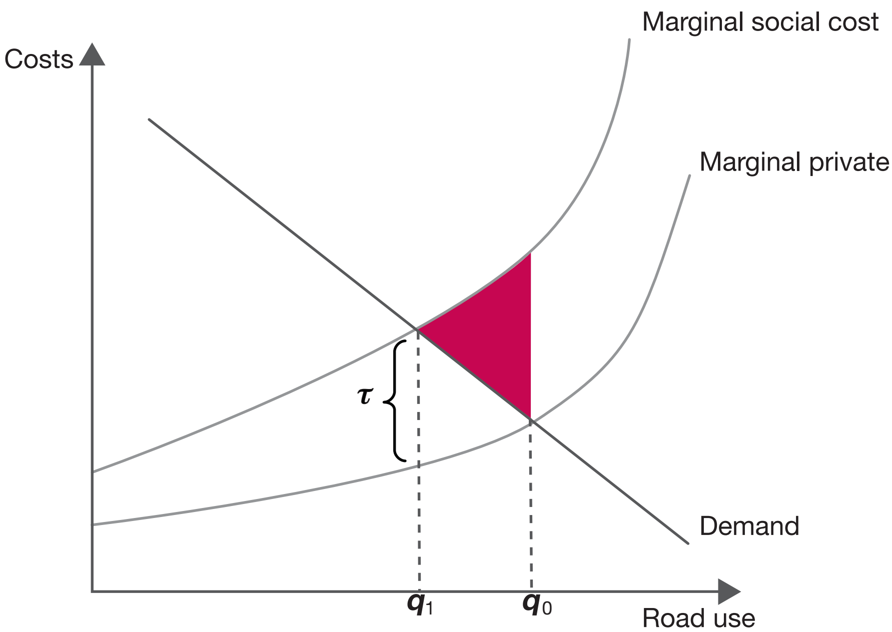
6 www.greenfiscalcommission.org.uk

In general, though, we should be cautious of using distributional arguments for differential consumption taxes. Motoring taxes are just one component of fiscal policy. To the extent that we are concerned with distributional effects, they should focus on the tax and benefit system *as a whole* rather than considering each part of it individually.

2.3 External costs of road use

The most compelling economic argument that justifies higher taxes on motoring than on other consumption is the principle of externalities. Put simply, private decisions about whether and how much to drive impose costs on other people which are not taken into account in those decisions. This leads to road use that exceeds the socially optimal level. Motoring taxes can 'internalise' these external costs and help to reduce road use to the efficient outcome. Figure 2.1 illustrates the argument graphically.

Figure 2.1: The external costs of motoring



Source: Authors' own

Imagine a motorist deciding how much to use the roads in their local area. The lower the cost, the greater the demand, as illustrated by the downward-sloping demand curve. Greater road use leads to greater private costs of motoring – more time spent in the vehicle, the costs of fuel and so on. The private costs of each additional kilometre driven are also likely to rise: for example, as road use increases, overall speed will fall as congestion rises. Thus the marginal private cost (MPC) curve slopes upwards. However, the costs to society of the road use include not only these private fuel and time costs, but also the costs imposed on others. These externalities include the costs of carbon and other greenhouse gas emissions which affect global climate change, the noise costs imposed on pedestrians and local residents, the risk of accidents, the damage caused to the road, and the fact that the presence of the motorist increases congestion which imposes additional time costs on other drivers. The marginal *social* cost (MSC) curve therefore lies above the private costs, with the difference between the two representing the marginal externality from each additional kilometre driven. At low levels of road use, costs such as congestion are relatively small. At higher levels they increase rapidly, so we might expect the marginal externality to increase with total road use.

Since people make private motoring choices based on the private costs which they incur, the total level of road use without intervention would be given by q_0, above the socially optimal level q_1. By imposing a tax t on road use equal to the size of the marginal external cost at q_1, the private cost curve shifts up (the externality being internalised into private decisions) to give a new equilibrium at the social optimum. This would generate social benefits equal to the shaded area.

Of course this is a highly simplified and stylised analysis. It assumes a single type of road and road user. But it leads to a key point: the tax should reflect the size of the *marginal external cost at the optimal level of road use*. The aim is *not* to generate total revenue which equals the total external costs: judging whether motoring is ‘overtaxed’ by comparing total motoring revenues to estimates of the total external costs attributable to motoring is inappropriate. If marginal external costs are increasing in road use – which seems plausible – then total revenues will exceed the total external cost as an optimal outcome.

It is worth noting that in the presence of externalities, the case for not taxing intermediate inputs into production (a famous result from Diamond & Mirrlees, 1971) is much weaker. For example, if one were to ignore the externalities, fuel used by commercial vehicles for business purposes ought not to be taxed, in order that production be as efficient as possible. However, the environmental and other external costs associated with motoring should be taken into account in production decisions.

There are many different externalities associated with motoring which might require multiple tax or other policy instruments. A good summary of the externalities from motoring is in Parry et al. (2007). They include:

- *Local air pollution*: exhaust pipe emissions from burning petrol and diesel, which affect local air quality and can cause respiratory problems. These include carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOCs), sulphur dioxide and particulate emissions.
- *Global pollutants*: emissions of carbon dioxide (CO_2) from burning petrol and diesel which contribute to climate change.
- *Congestion*: as traffic volumes increase in a given road space, the average speed of all vehicles slows down, and time costs are thus imposed on other road users.[7]
- *Accidents*: the costs of death and injury from traffic accidents, damage to property, lost productivity and reduced working time and so on.
- *Noise*: the costs imposed on local residents arising from the engine noise, braking and so on associated with increased traffic.
- *Road damage*: the costs imposed by one road user's contribution to wear and tear on roads for other road users.

Ideally, policymakers would be able to estimate cost and demand schedules such as those depicted in Figure 2.1 for each different externality, and impose an efficient tax directly on the externality itself. However, there are several complicating factors. It may not be possible to tax the externality directly – for example, we cannot measure the exhaust pipe emissions and noise that each motorist generates on each journey and then send them a tax bill based on this output. The issue, then, is whether or not we can find some other base for the tax which is closely related to the externality and which can be feasibly measured and thus taxed. For example, noise costs might be related to the size of the engine, local air pollution to the type of fuel used, global pollution to the amount of fuel burnt, congestion to where and when people drive, and so on. Some proxies for the different externalities may be more amenable to taxation than others. In particular, fuel use and vehicle purchase are existing market transactions, and so taxes based on fuel and the vehicle are relatively straightforward. However, monitoring where and when people drive is not currently routine, making geographic and time-specific taxes harder to implement. Varying motoring taxes by location might be extremely important in seeking to adequately capture the externality – for example, the marginal costs of local pollution, noise and congestion are likely to be much larger in densely populated urban areas than rural areas. However, there are obvious practical problems with this: for example, charging higher taxes on fuel in cities would

7 To some extent, congestion externalities can be seen as 'internal' to the group of road users, whereas externalities like climate change are more obviously 'external' to society as a whole. The principle, though, is the same: assuming that an individual road user does not take into account their own impact on congestion, they impose costs on other people. Thinking about congestion on its own, the decision to drive for an individual depends on the average cost (monetary and time) of the journey, which is less than the marginal cost of the journey (the relevant cost in determining the socially optimal level of road use) once the effect on other road users is accounted for.

lead some people living on the outskirts to drive out into rural areas to refuel. Thus for practical purposes, policymakers are often constrained in the taxes they can impose.

Even given an appropriate basis for taxation, another issue is the size of tax imposed. This requires an estimate of the marginal external costs involved. Table 2.1 displays results from three studies that have attempted to calculate the size of the main externalities associated with motoring.

Table 2.1: Estimates of the marginal costs of road transport (p/km)

Type of cost	Sansom et al., 2001 (1998 prices)		DfT, 2010 (2002 prices)	Bayliss, 2011 (2009 prices)
	Low	High		
Congestion	9.71	11.16	13.1	4.60[a]
Infrastructure	0.42	0.54	0.1	0.57
Accident	0.82	1.40	1.5	0.88
Local air quality	0.34	1.70	0.4	0.57
Noise	0.02	0.78	0.1	0.50
Greenhouse gases	0.15	0.62	0.3	0.64
Total	11.46	16.20	15.5	7.76

[a] Note that the Bayliss congestion figure is an average rather than a marginal cost (see discussion at the end of section 2.3).

The figures most commonly referenced are those of Sansom et al. (2001), which estimate the size of marginal externalities for 1998. They suggest that congestion is by far the largest component of the external cost of each additional vehicle kilometre driven, accounting for around 9.7p to 11.2p from a total marginal externality of 11.5p to 16.2p per kilometre.

These estimates are now quite outdated and it is likely that some of the costs have changed. For example, externalities associated with greenhouse gases were estimated to be between 0.2p and 0.6p/km. The cost associated with emitting a tonne of carbon has risen since the late 1990s, reflecting new evidence on the likely costs of climate change and new methods of assigning values to carbon emissions that are consistent with the various targets the government faces to reduce emissions in the future. As a result, these estimates are now too low. Burning a litre of road fuel emits roughly 2.5 kg of CO_2. At the current (non-traded) value of £56 per tonne (Department of Energy and Climate Change (DECC) estimates – see Table 1 of DECC, 2011)[8] for 2012, this is a cost per litre of 14p. At a (probably conservative) fuel economy of

8 www.decc.gov.uk/assets/decc/11/cutting-emissions/carbon-valuation/3136-guide-carbon-valuation-methodology.pdf, Table 1

10 km per litre (28 mpg) this suggests a marginal climate change externality of 1.4p per kilometre. At a (probably too high) economy of 20 km it is 0.7p per kilometre. Both of these costs are larger than the high estimate found in Sansom et al., or indeed in either of the other two studies, for the marginal external cost associated with greenhouse gases.

It is also likely that the other externalities have changed over time. Tighter vehicle emissions standards are likely to have reduced marginal costs associated with air quality. Economic growth has probably increased the marginal congestion externality (which is largely determined by estimates of the value of time, which in turn depends on wage levels).

Table 2.2 shows emissions of CO_2 and other pollutants from road transport in 1970, 1990 and 2009, and the proportion of the total emissions of each gas that comes from road transport. As can be seen, emissions rose substantially between 1970 and 1990. Since then, non-CO_2 emissions from road transport have fallen markedly. In most cases, this has been accompanied by a fall in the share of these emissions from transport, suggesting that measures such as tightening emissions standards have been effective at reducing these non-CO_2 emissions more rapidly in road transport than in other sectors. CO_2 emissions from road transport, however, rose slightly between 1990 and 2009, and now account for almost 24% of total emissions, compared to 19% in 1990 and 9% in 1970.

Table 2.2: CO_2 and other emissions from road transport, 1970–2009

Pollutant	1970		1990		2009		Changes	
	tonnes	% of total	tonnes	% of total	tonnes	% of total	1970–1990	1990–2009
Carbon dioxide	60.3m	8.8	109.4m	18.6	112.5m	23.8	82%	3%
Nitrogen oxides	573,300	22.3	1.068m	39.8	361,190	33.3	86%	-66%
Sulphur dioxide	46,000	0.7	64,000	1.7	1,000	0.3	39%	-98%
Particulates	24,000	4.8	43,000	15.4	27,000	22.7	79%	-37%
Carbon monoxide	3.327m	33.9	6.275m	69.7	1.076m	47.3	89%	-23%
VOCs	570,000	30.3	997,000	36.8	87,000	10.5	75%	-91%

Source: Authors' calculations from Department for Environment, Food and Rural Affairs (Defra) air pollution statistics and DECC emissions data

Another set of estimates of the marginal externalities was conducted as part of a study on road decongestion benefits (DfT, 2010). Estimates for the marginal external costs of congestion for different road types in 2005 are produced by using the National Transport Model (NTM), calculating the delay caused by a marginal vehicle, and then summing the value of lost time across all users on the road to give the size of the marginal congestion externality. Other marginal externalities are based on updates of the Sansom et al. estimates, and climate change costs based on Defra (2002) guidelines. Consistent with the discussion above, the estimated marginal congestion costs are higher than the Sansom et al. estimates, whilst the marginal air quality costs are at the lower end of the Sansom figures.

Another attempt to estimate these costs is made by Bayliss (2011). He updates the Sansom figures to take into account changes in prices, traffic volumes and technology over the period. However, the congestion externality is based on dividing estimates of the *total* congestion costs by the total distance driven. Using a rough estimate of a £20 billion total cost, this gives an estimated externality of just 4.6p/km, far smaller than the Sansom et al. or DfT estimates. However, it should be noted that this is therefore an estimate of the *average* congestion externality and not the marginal externality. As noted above, there is no reason to expect the two to be the same; indeed, we would expect the marginal externality to be larger than the average.

2.4 The role of non-tax instruments

This report focuses on tax policy as regards motoring. However, it is clear that non-tax policies play a significant role – most notable amongst these being the regulations on emissions from vehicles and vehicle fuel. In the UK, standards imposed by the European Union, commonly known as ‘Euro’ standards, are the relevant instruments. They first came into force in 1992. The current ‘Euro 5’ standards regulate diesel cars to emit no more than 0.5 g of CO per kilometre and 0.18 g of NO_x.[9] As noted above, it is not always easy to use tax policy when the external costs are hard to measure and tax directly; these difficulties might favour more direct regulation of this kind. The gradual tightening of Euro standards over time has almost certainly been a huge contributing factor to the overall reduction in non-CO_2 emissions from road transport noted in Table 2.1. In a world in which these sorts of emissions were directly taxable, however, these regulations would be inefficient, since they apply across the board to all new cars. Taxing the emissions would raise the price of running more-polluting vehicles, and encourage those who were more able and willing to do so to drive less or buy less-polluting cars, potentially reducing the overall cost of achieving a given level of emissions reduction. Taxes also provide dynamic incentives for motorists and manufacturers, since each unit of the emissions faces a given price, whereas regulation does not provide direct incentives to go beyond the stipulated standards.

9 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:171:0001:0016:EN:PDF

A wider point, though, is that tax policy should take account of the other instruments, including regulation, that are in place. In the externalities case, for example, the presence of regulations imposes implicit prices on the polluting activities which may at least partly mitigate the size of the tax needed to fully internalise the external costs. Christiansen and Smith (2009) argue, using a theoretical model, that in the presence of regulations combined with tax-based policies to correct externalities, tightening the regulation will have ambiguous effects on the optimal tax rate, depending on how the regulation affects the responsiveness of demand to price. If regulations are tightened, and demand responsiveness does not rise as a result, they demonstrate that the optimal tax rate falls if marginal external costs are increasing in total consumption. However, Parry (2009) looks at optimal vehicle fuel taxes in the USA and concludes that more stringent regulation of vehicle emissions would lead to a *higher* optimal fuel tax. This is for two particular reasons. Firstly, when emissions standards are higher, it is harder for motorists to respond to higher fuel taxes by improving the efficiency of their vehicle rather than simply driving less. When a large amount of the response to fuel taxes comes through efficiency rather than road use, the marginal impact of tax increases on those externalities which are more closely related to distance driven than fuel consumed (such as congestion, accidents, noise and local pollution) is reduced, which reduces the optimal tax rate. Higher emissions standards reduce this effect. Secondly, as the overall efficiency of the vehicle fleet rises, the distance travelled for each litre of fuel consumed increases. In a world in which distance-related externalities can only be captured through fuel taxes (assumed in the Parry analysis) rather than in a more direct fashion, this also raises the optimal fuel tax rate.

2.5 Other relevant issues

There are a number of other economic issues that are important when considering motoring taxation. We briefly discuss them here, and in Section 5 consider the current system of taxes in the light of some of them.

Cross-border effects: One issue which impacts on indirect taxation more widely is the incentive for people to buy the taxed goods more cheaply from other countries with lower taxes. For motoring, the most significant concern is about vehicle fuel. UK fuel taxes and prices (certainly for diesel) are higher than those in the Republic of Ireland, meaning that people living on the border in Northern Ireland have an incentive to fill up in the Republic and avoid paying UK duty. In August 2011, for example, DECC estimates suggest that a litre of diesel in Ireland cost £1.23, as compared to £1.40 in the UK. Central estimates from Her Majesty's Revenue and Customs (HMRC, 2011a) suggest that in 2009/10, around £70 million was lost in cross-border sales of diesel in Ireland by UK vehicles, amounting to about 12% of the diesel market in Northern Ireland. This loss, however, was notably smaller than in previous years; for example, in 2003/04 the cost was estimated at £210 million, or 51%

of the market. This coincides with a recent narrowing of the gap between UK and Irish diesel prices.

A related concern is the issue of 'cabotage'. Hauliers from other countries, paying lower diesel taxes, can deliver goods on the UK mainland without paying UK duty rates. In the 2002 Budget, the then Chancellor, Gordon Brown, announced the intention to introduce a lorry road-user charge, partly to "… ensure that lorry operators contribute fairly and efficiently towards the costs they impose in the UK irrespective of their nationality" (HM Treasury, 2002). The intention was for such a charge to be introduced in 2005/06, but the scheme was abandoned by then Transport Secretary, Alistair Darling, in 2005. At the time, this was justified in terms of seeking to introduce a lorry charge as part of a national system of road pricing for all road users – though no such proposals were ever subsequently introduced.

Plans for a lorry charge also featured in the Coalition agreement published by the Conservatives and Liberal Democrats following the 2010 election, with a pledge to "…work towards the introduction of a new system of HGV [heavy goods vehicle] road user charging to ensure a fairer arrangement for UK hauliers". In January 2012, a consultation was launched on a proposed system of lorry charging to achieve this goal, with a planned implementation date in 2015 (DfT, 2012). The planned charge would cover all HGVs weighing at least 12 tonnes. The heaviest lorries would pay up to £10 per day to access the UK road network. UK lorries would pay on an annual or biannual basis (with a maximum annual charge of £1,000), whilst foreign hauliers could choose to pay daily, weekly, monthly or annually. The intention is to offset the charges for UK hauliers against VED liabilities (subject to limits set by EU Directives on minimum rates of annual taxation for lorries),[10] leaving the vast majority paying no more in total. On this basis, the charge is estimated to raise net revenues of around £20 million per year from 2015/16. It should be noted that the proposed charge would not vary according to how far lorries drove or at what times, but would be a simple access charge (rather like the London Congestion Charge, see Section 3).

Hypothecation: There are frequently calls for revenues from particular taxes to be linked ('hypothecated') to specific parts of public spending. A recent report from the Environmental Audit Committee (2011) argued that increases in fuel duty receipts should be earmarked for spending on public transport, for example. In London, revenues from the congestion charge are spent on London public transport, and the US Highway Trust Fund uses receipts from federal fuel taxes there to pay for road building and some public transport.

There is in general no good economic rationale for hypothecation, as discussed in Advani et al. (2011). If all the spending on a particular public service – such as, for example, road building and maintenance – were linked directly to

10 For further details, see: www.lorry-fee-europe.org/data/2006-EUvignette-en.pdf

receipts from a particular tax, such as VED or fuel duty, then there is no reason to expect an optimal pattern of spending to emerge. The marginal pound of tax revenue should be spent in the most effective area, which may mean rather more or less should be spent on service X than is raised from tax Y in a given year: indeed, the US case is a good example, where the Trust Fund is topped up year after year with additional money. If the hypothecation is less explicit (perhaps simply promising that additional revenue from a particular tax is to be spent on a particular service), then so long as more than this incremental spending was planned to be spent on that service anyway, it would be impossible to verify that the money had indeed been hypothecated in this way.

However, as noted by Smith (1992), it may be that hypothecation has a role in building public support for particular new taxes or tax increases, without which introducing the measure may not be possible. If the tax is intended to correct some market failure, then the social costs generated by inefficient public spending following hypothecation may be smaller than the social costs of not having introduced the tax in the first place.

Other 'good practice' issues for tax policy: Subject to the wider objectives of particular taxes, in general taxes should be simple, provide taxpayers with a reasonable amount of certainty over what their current and future tax liabilities might be, and be cheap to collect. In the case of motoring taxes, particularly fuel duty, we show below evidence that there is considerable uncertainty over the path of policy, with regular changes to planned tax movements from Budget to Budget.

3. The Structure of UK Motoring Taxation

This section describes the way in which motoring is currently taxed, and how the system has evolved. We focus on the principal national motoring-related taxes: fuel duties, VED, and the taxation of company cars and fuel. We also describe briefly the London Congestion Charge. Finally we present a snapshot of the current distributional impact of fuel duties and VED.

3.1 Fuel duties

3.1.1 Current rates of duty

The overwhelming majority of road fuel purchased in the UK is subject to an excise tax, currently set at 57.95p/litre. This is the rate applied to unleaded petrol (including ultra-low sulphur and sulphur-free petrol), diesel and biofuels (bioethanol and biodiesel).[11] So-called ‘red diesel’ attracts a lower rate of 11.72p/litre, but is in principle sold only for use in off-road vehicles such as tractors and other agricultural machinery.[12] VAT, currently 20%, is applied to the cost of fuel *including* duty. This means that a 1p rise in duty rates leads to a total tax increase of 1.2p/litre. Estimates from HMRC (2011c) suggest that a 1% rise in the main rates of fuel duty on petrol and diesel raises around £260 million.[13] Thus a 1p rise in duty rates (currently some 1.7%) would raise about £450 million, equivalent to an increase in the basic rate of income tax of about 0.1p.

The decision over rates of fuel duty is taken by the Chancellor in the annual Budget.[14] The usual position is that duties are increased in line with price inflation to maintain their real value. For excise duties, the measure used is the forecast Retail Price Index (RPI) inflation rate in the third quarter following the Budget. However, there is discretion to set fuel duties at any rate, and much use has been made of this discretion in recent years. We discuss these changes below and in Appendix A, which details the main changes in motoring taxes at each fiscal event since 1989.

11 It should be noted that fuels used for local bus services are effectively taxed at lower rates because of the Bus Service Operators Grant. As of March 2011, this provides a rebate to local bus providers of 43.21p/litre of unleaded petrol or diesel.

12 In 2010/11, ‘red diesel’ accounted for about 5.3 billion litres (10.2%) of almost 51.7 billion litres of road fuels purchased (HMRC, 2011b).

13 This is the additional revenue from fuel duty alone. It is assumed that there are no additional VAT receipts, since higher VAT payments on the duty are offset by lower VAT payments on other goods and services as consumers substitute their expenditure.

14 Changes to duty rates are also sometimes announced as part of other fiscal events such as Pre-Budget Reports or Autumn Statements.

3.1.2 Historical duty rates

The most significant policy announcement for fuel duty came in the March 1993 Budget, when Chancellor Norman Lamont implemented a 'fuel duty escalator'. This policy introduced a default above-inflation minimum increase in duty rates each year. The policy was designed such that the increase applied to the 'average' real increase in duties, allowing for some discretion to apply lower increases to some types of fuel (e.g. to encourage switching to lower-emissions fuels).[15] It is notable that the announcement of the escalator came after two Budgets, in March 1990 and March 1991, when there were large real increases in fuel duty rates.

Initially the escalator was set at 3%, but was increased almost immediately in the November 1993 Budget (Ken Clarke's first) to 5%, and raised again to 6% in the July 1997 Budget (Gordon Brown's first). The escalator policy was abandoned by Gordon Brown in the 1999 Pre-Budget Report (PBR) in the face of increases in pre-tax fuel prices. It is worth noting that this happened *before* the fuel price protests which took place in Autumn 2000.

The result of the escalator was a huge increase in fuel duty rates. In nominal terms, duty rates for the most commonly purchased petrol more than doubled, from 23.43p/litre in March 1993 to 47.21p/litre in March 1999. In real terms (in September 2011 prices), the duty rate rose from 40.00p to 68.44p/litre over the same period, an increase of 71%.

Following the abandonment of the escalator, fuel duties were not increased in real terms at all until 2009. Indeed, duties were frequently not even increased in line with prices, with planned upratings postponed and then abandoned altogether in the face of continued high pump prices. For example, the 2004 and 2005 March Budgets both delayed inflation adjustment to September each year. In both cases, these adjustments were not implemented and were then cancelled altogether in the subsequent PBRs. The March 2006 Budget again announced that a planned inflation adjustment to duties would be delayed until September, which was then further delayed and only implemented in December 2006. Together this meant that there were no cash increases in the main fuel duty rates between October 2003 and December 2006.

In December 2008, the main duty rates were increased by 2p/litre. This was described in the November 2008 PBR as a move to 'offset' the temporary cut in VAT from 17.5% to 15% introduced by Alistair Darling as a stimulus measure – though the rate was not subsequently reduced in January 2010 when the temporary VAT cut expired. However, this 2p increase had originally been announced in the March 2007 Budget to occur in April 2008, was then delayed until October 2008 in the March 2008 Budget, and was finally implemented in December 2008 following the November PBR. Thus it

15 Intriguingly, the documents for the March 1993 Budget noted that "developments in charging for road use will be taken into account in determining the appropriate level of duty."

should not be viewed as a temporary offset to the VAT cut, rather a delayed implementation of a pre-announced policy.

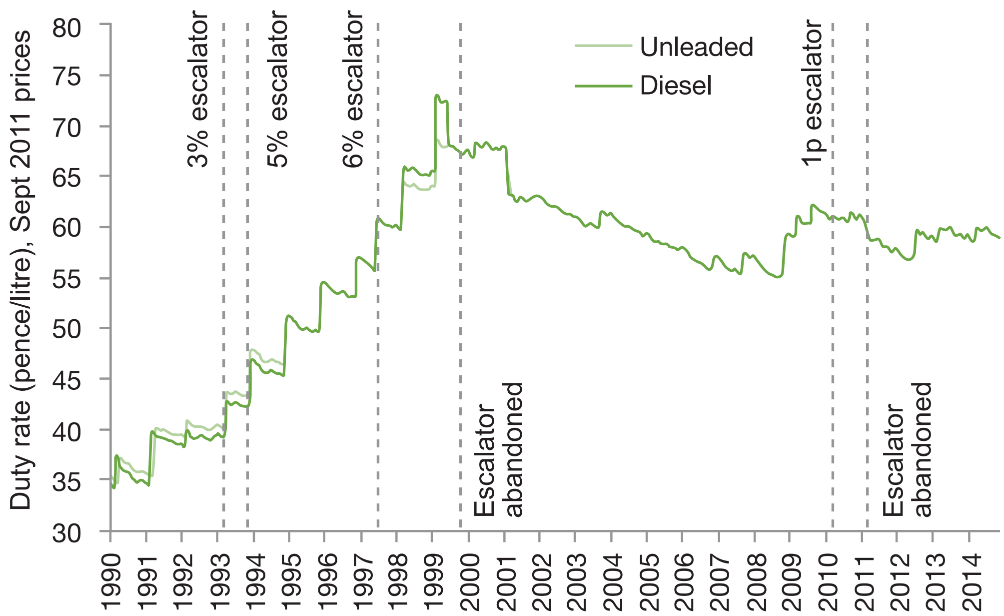
The first real-terms increase in the main fuel duty rates following the abandonment of the escalator in 1999 finally took place almost a decade later in September 2009, when duties rose by 2p/litre (as announced in the March 2009 Budget), having already been inflation-adjusted in April 2009. Real increases were, though, pre-announced earlier: the March 2008 Budget pencilled in a 0.5p real increase in the main duty rates for April 2010. Perhaps unsurprisingly, plans for two years later were reformed before they even occurred. In the March 2009 Budget, the planned April 2010 increase rose to 1p above inflation, with the same real rise announced each year until 2013. Even this announcement could not survive another year's economic news: in the March 2010 Budget (the last of the previous Labour government), the 'penny escalator' planned for April 2010 was instead split into three smaller, staged increases in April, October and January, though the escalator policy itself was extended by another year, to April 2014.

In his first Budget in June 2010, George Osborne kept this policy in place. However, less than a year later in his second Budget of March 2011, further changes were announced. Citing increases in the oil price, the penny escalator was abandoned and the main duty rates were cut by 1p/litre. The planned inflation adjustment of duty rates was postponed from April 2011 until January 2012, with the (now) inflation-only adjustment planned for April 2012 also delayed, until August 2012. However, these actions were conditional, under what was billed the 'fair fuel stabiliser'. The cost of these announcements was effectively paid for by an increase from 20% to 32% in the supplementary charge on corporation tax for North Sea oil and gas companies. However, if oil prices fall below $75 per barrel in 'a sustained way', the policies will be reversed, with the escalator re-introduced and the supplementary charge reduced to 20%. We discuss this 'stabiliser', and compare it to the 'fair fuel stabiliser' proposed by the Conservatives prior to the May 2010 election, in Section 6.

In the Autumn Statement of November 2011, yet more changes were announced to duty rates. The inflation adjustment of 3p/litre, delayed from April 2011 to January 2012, was further delayed until August 2012. The inflation adjustment in 2012, delayed from April until August, was cancelled altogether. Thus the pattern established under Labour, with pre-announced rises delayed then later cancelled, re-emerged. Indeed, assuming it does actually go ahead, the delay in the April 2011 uprating until August 2012 – a 16-month gap – would be the longest postponement of a planned duty rise since the original escalator was abolished. It does seem somewhat absurd that it was the 2012 uprating which was cancelled (rather than being implemented a mere 4 months behind schedule) instead of the 2011 uprating – though the higher inflation rate in 2011 meant that cancelling the 2012 adjustment was slightly less costly.

Figure 3.1 summarises these historical trends and shows the real rate of fuel duty applied to the most commonly purchased petrol and diesel each month since January 1990. It projects duty rates ahead to March 2015, the end of the current Parliament, under the assumption that inflation is as forecast in the most recent OBR estimates (November 2011), and that duty rates are increased as planned in August 2012, April 2013 and April 2014.

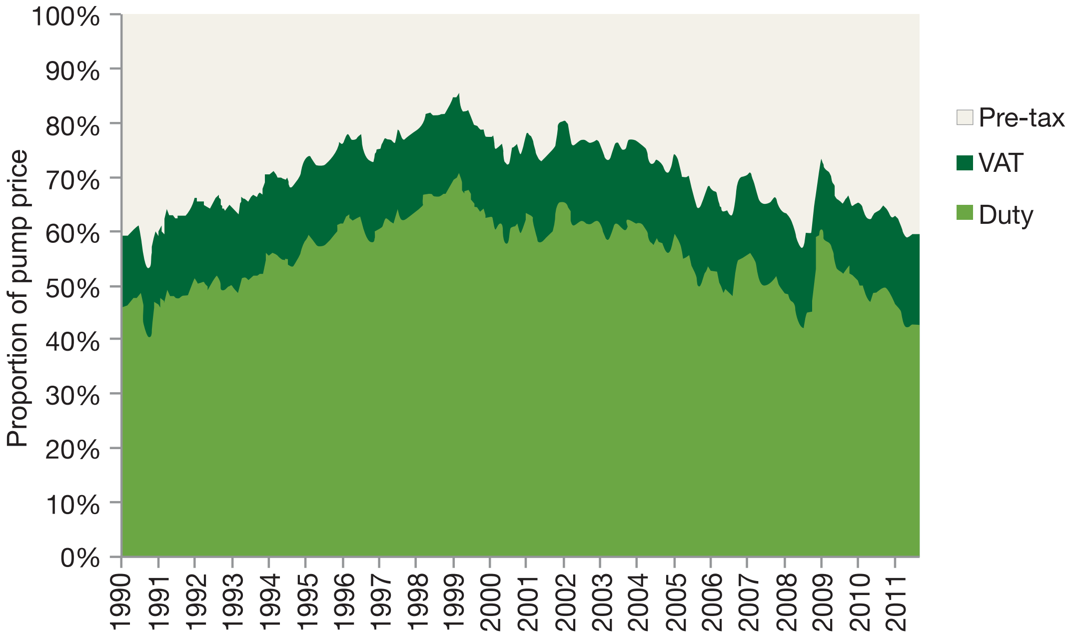
Figure 3.1: Actual and forecast real-terms duty rates on main fuels (September 2011 prices), January 1990–March 2015



Source: Authors' calculations based on HMRC UKtradeinfo data and OBR inflation forecasts.

Figure 3.2 illustrates the impact of the escalator and its subsequent abandonment on the composition of pump prices, focusing on unleaded petrol. It shows the breakdown of the pump price into duty, VAT and pre-tax components. During the escalator period, duty rose from around 50% of the pump price to 70%, whilst total taxes (including VAT) rose from around two thirds of the pump price to, at their peak in March 1999, almost 86%. Following the end of the escalator and the rise in global oil prices in the first decade of this century, tax contributed a falling proportion of pump prices. At its lowest, in July 2008, tax made up 57% of the unleaded pump price (which at that time was 131.4p/litre in September 2011 prices, a level not seen again until January 2011), the lowest proportion since November 1990 (when the real price was 81.5p/litre).

Figure 3.2: Composition of pump prices for unleaded petrol, January 1990 to September 2011



Source: Authors' calculations based on UKtradeinfo data

3.1.3 Duty differentiation

The UK is currently the only country within the EU which does not differentiate the rate of fuel duty on petrol and diesel. The UK equalised petrol and diesel duty rates in November 1994; before then diesel was taxed slightly less heavily. Indeed, in 1998, diesel began to be taxed more heavily than petrol, though this was partly about encouraging diesel users to purchase ultra-low sulphur diesel (ULSD), which continued to be taxed at the same or a lower rate than unleaded petrol. Since 2001, when virtually all petrol and diesel sold has been ultra-low sulphur or sulphur-free, the tax treatment of petrol and diesel has been the same. Despite this, recent years have seen a marked growth in the penetration of diesel into the overall market for vehicle fuel. According to estimates from

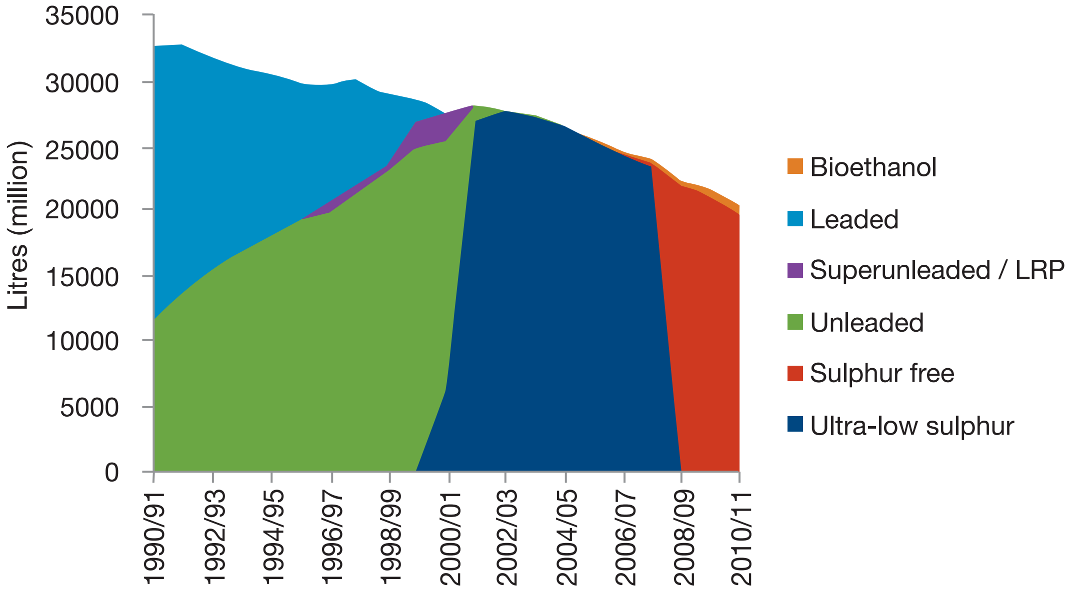
HMRC of motor fuels released for consumption, diesel (in all forms) made up around 20% of road fuels sold by volume in 1990/91, just over one third in 2000/01, and 50% by 2010/11.

Duty differentiation is not merely about petrol and diesel taxes, but also about encouraging take-up of more environmentally friendly types of fuel. The duty system has been used to encourage the take-up of unleaded petrol over leaded petrol, of ultra-low sulphur and sulphur-free versions of petrol and diesel, and (until recently) of biofuels. Figure 3.3 shows how the composition of petrol and diesel sold has changed over time. There has been rapid penetration of new fuel types as they are introduced. Unleaded petrol steadily replaced leaded petrol in the early 1990s, with the petrol market then switching almost entirely to ultra-low sulphur petrol (ULSP) in the space of around two years and sulphur-free petrol from the late 2000s. Similar trends emerge for diesel fuels.[16] In both markets, biofuels represent a small part of overall sales, making up around 3% of petrol sales in 2010/11 and 3.7% of diesel sales.

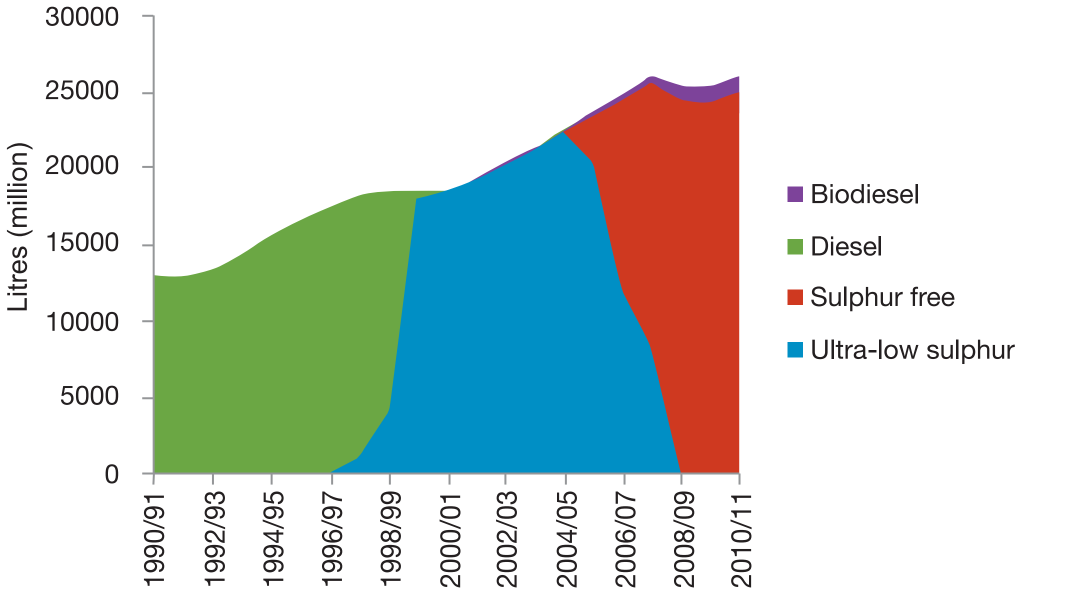
16 These figures are based on data from UKtradeinfo which breaks down quantities of fuel sold according to taxation category. After October 2007, differential treatment of sulphur-free and ultra-low sulphur fuels is removed, which means we can no longer identify a breakdown between unleaded, ultra-low sulphur and sulphur-free fuels. However, according to the UK Petroleum Industry Association, certainly by 2009 almost all fuels were sulphur free (www.ukpia.com/industry_issues/fuels/sulphur-free-petrol-diesel-and-non-road-fuels.aspx), so we make the assumption that non-biofuel petrol and diesel was all sulphur free from 2008/09 onwards.

Figure 3.3: Composition of petrol and diesel fuels sold, 1990/91 to 2010/11

Petrol



Diesel



Source: Authors' calculations based on UKtradeinfo data

All the major shifts in the use of one fuel to another occur shortly after the introduction of a differential rate between the new and the pre-existing most popular fuels, suggesting that, at least in part, tax policy has influenced which types of fuel are commonly used. For example, the March 1997 Budget introduced a 1p/litre differential between the rates of ULSD and conventional diesel to encourage the shift towards the cleaner ULSD. This was followed by an extension of this differential to 2p/litre in the 1998 Budget, and by the following year ULSD had almost entirely replaced the use of conventional diesel. This is very similar to the situation with petrol, where a cheaper rate for ULSP was introduced in the 2000 Budget, and extended in the 2001 Budget. By 2002, ULSP had completely supplanted the use of unleaded petrol. Duty differentiation alone, of course, does not explain the shift in fuels purchased. Regulation, including more stringent EU emissions standards for vehicles and fuel which limited the amount of sulphur that could be emitted, has undoubtedly had a substantial effect. Nevertheless, there may be a role for duty differentiation in speeding up the process of switchover between fuels.

Differential rates for biofuels were first introduced in the April 2002 Budget. At first, a 20p/litre reduction in fuel duty applied only to biodiesel, with this being extended to bioethanol in January 2005. These differential rates were guaranteed to be maintained for several years by each Budget, and were extended until 2009/10 in the March 2007 Budget. However, in the March 2008 Budget, it was announced that the differential would be abandoned in October 2010. This policy change resulted from the uncertainty over the overall environmental impact of using biofuels. Although the emissions levels when *using* biofuels are lower, there are concerns over the emissions levels incurred during their *production*, raising the possibility that over the entire life cycle, emissions from biofuels could actually exceed those of their low-sulphur counterparts.[17]

Duty differentiation for biofuels was replaced by the introduction of the Renewable Transport Fuel Obligations (RTFO) in 2008. Initially proposed in the 2005 PBR, the RTFO requires suppliers of road transport fuels to include a certain percentage of biofuels (the obligation is 3.5% in 2010/11, rising to 5% in 2013/14) or to pay a buyout price (30p/litre in 2010/11) for the amount undersupplied. Suppliers are issued with tradable certificates for supplying biofuels, so can achieve the target by buying surplus permits from other suppliers or from the buyout scheme. Whilst fuel suppliers are obligated to report on the type of biofuels they supply (which helps determine how environmentally sustainable they are), there is no penalty for supplying less-sustainable biofuels, so it is not clear that the RTFO provides the right incentives to supply the most environmentally beneficial fuels.

The RTFO was in part designed to help the UK achieve its obligations under the 2003 EU Biofuels Directive, which set a target of biofuel penetration of 5.75% by the end of 2010.[18] Again, concerns about the sustainability of biofuels led to a rethink. The 2009 EU Renewable Energy Directive requires 10% of transport fuels to come from renewable sources by 2020, with biofuels needing to generate greenhouse gas emissions savings of at least 35% to

17 Pickett et al. (2008) note that biofuels, used in conjunction with existing fuels, have the potential to significantly reduce future emissions. However they stress that “there are a significant number of social, economic and environmental uncertainties associated with biofuels, and policy frameworks must ensure that such issues are addressed”.

18 http://europa.eu/legislation_summaries/energy/renewable_energy/l21061_en.htm

qualify as renewable.[19] It will be interesting to see how the removal of the biofuels duty incentive and the move towards the RTFO affects the move towards biofuels in future years; we do not yet have much data dating from since the end of the duty differential with which to make any clear assessment of trends.

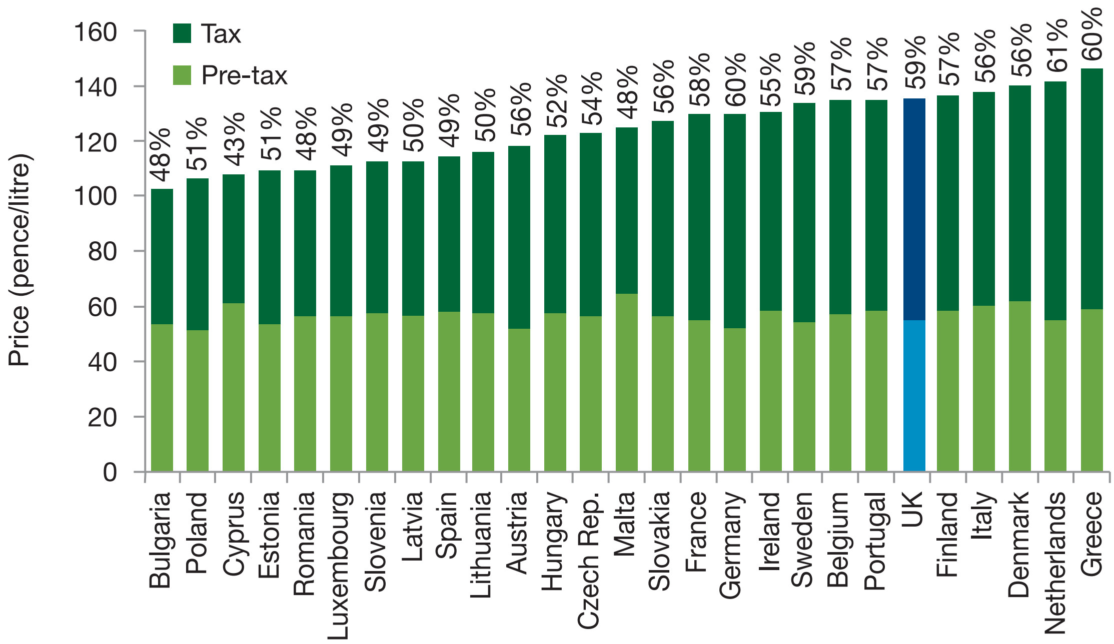
3.1.4 International comparisons

Figure 3.4 shows EU countries ranked by the pump prices of petrol and diesel, and the proportion of price accounted for by tax. There is relatively little variation in pre-tax prices across countries, but much larger variation in pump prices, driven by differences in tax policy across EU countries.

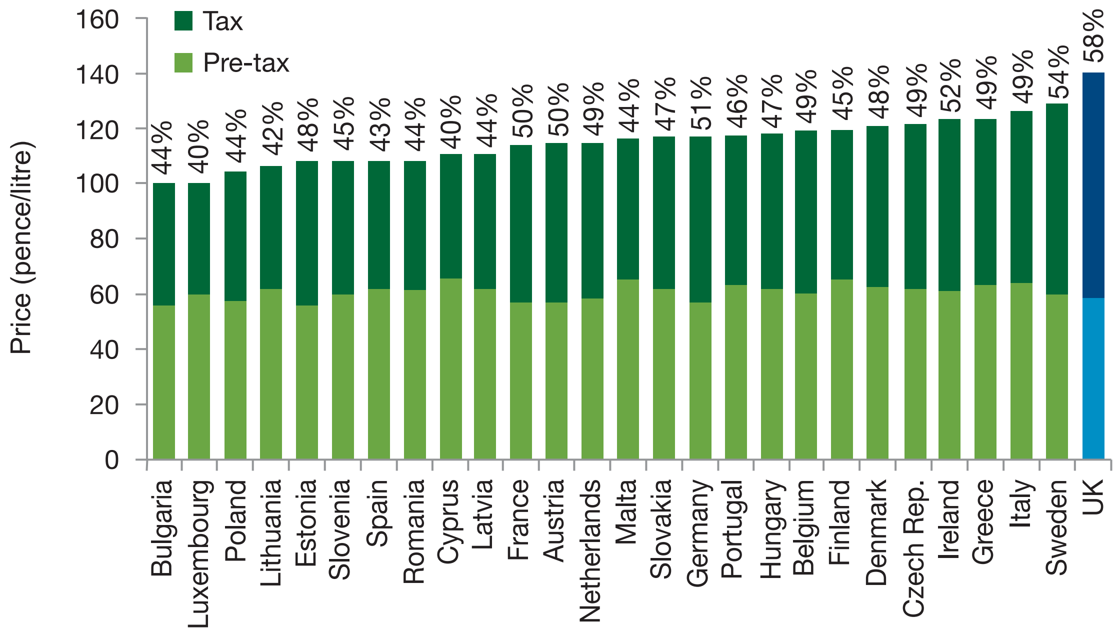
19 http://europa.eu/legislation_summaries/energy/renewable_energy/en0009_en.htm

Figure 3.4: Pump prices across the EU-27, August 2011

Petrol



Diesel



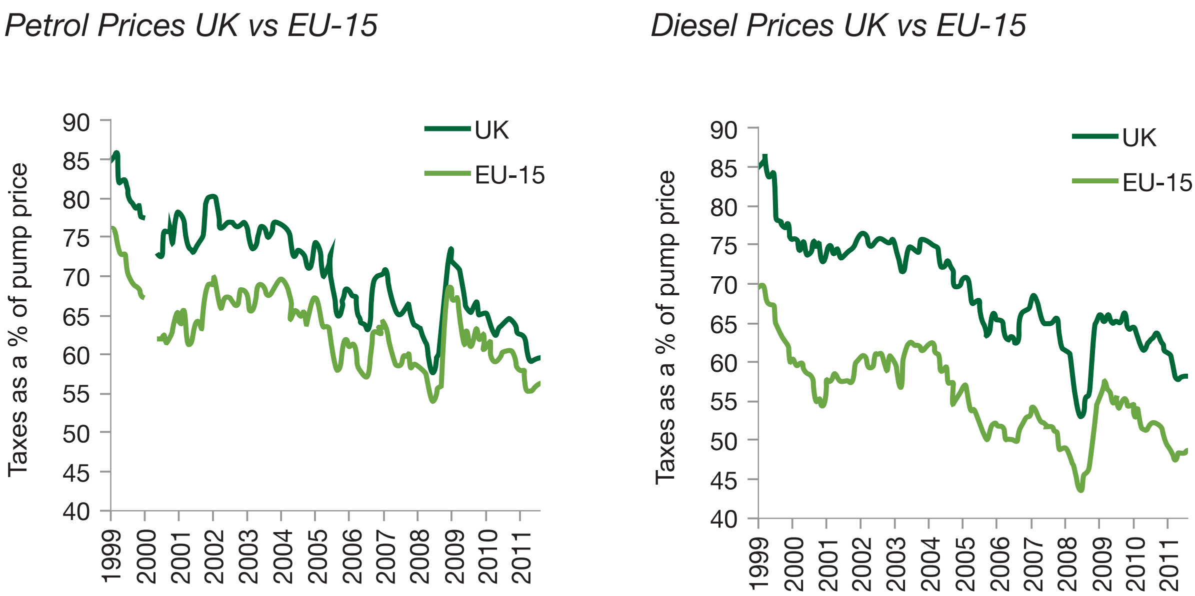
Source: Authors' calculations based on DECC energy price data
Note: Figures above bars show proportion of pump price accounted for by taxes.

In August 2011, the UK had the sixth highest pump price of petrol among the EU-27, and the third largest proportion of pump prices accounted for by taxes, behind only Greece and the Netherlands. Of the pump price, 59% was tax, compared to an EU average of 54%. For diesel, the UK had both the most expensive pump price, and the highest percentage of the pump price due to tax. As previously noted, this is driven by the UK being the only EU country not to tax diesel more favourably than petrol. Of the diesel pump price in the UK, 58% was tax, compared to an EU average of 47%.[20]

Figure 3.5 shows the proportion of the petrol and diesel pump prices accounted for by taxes for the UK, and the unweighted average across EU-15 countries, since 1999. When making these comparisons over time we focus only on those countries which have been part of the EU over the whole period: in general, as can be seen in Figure 3.4, newer EU member states tend to have lower pump prices and taxes than the EU-15.

The start of this period coincides with the height of the fuel duty escalator policy. At this time, the tax share is much higher in the UK than other EU countries: around 85% for petrol compared to an EU average of 75%, and 85% for diesel compared to an average 70%. Over time, however, the differences have narrowed for petrol. By 2011, the difference between the UK tax share and the EU-15 average was only about 3%. For diesel, though the gap has narrowed to around ten percentage points, there has clearly been much less convergence overall.

Figure 3.5: Share of pump prices accounted for by taxes, UK and EU-15



Source: Authors' calculations based on DECC energy price data
Note: Averages are simple averages across the EU-15, not weighted by population or GDP. The gap in the petrol series reflects missing data between February and May 2000.

20 It should be noted that road tolls have a significant presence in many EU countries. For example, in France, motorists paid 1.8p/km in tolls in 2009, compared to 0.1p/km in the UK (McKinsey & Company, 2011). As a result, comparisons between countries may not be as simple as they may appear.

3.2 Vehicle Excise Duty

3.2.1 Current and historic rates

Vehicle Excise Duty is levied upon road vehicles on an annual basis, representing a fixed cost to motoring.[21] As a result, the amount paid is not determined in any way by the distance driven.

Until 1999, VED was set as a flat-rate payment. From June 1999, payments varied by engine size, with smaller cars liable for a cheaper rate than larger cars. After being initially announced in the 1999 Budget, a new system was introduced in 2001, which differentiates between the relative efficiency of new cars, based on the level of their CO_2 emissions per kilometre driven.[22] For all cars registered before 1 March 2001, the old system based on engine size remains in place. Cars registered after this date are taxed using the new system, with taxes based on which emissions band the vehicle falls into. Initially there were four bands, rising to five in 2002, six in 2003 and seven in 2006. From 2006 onwards, there was also a large reduction in the rates for the lowest bands, with vehicles emitting less than 100 gCO_2/km exempt from any charge.

In 2009, 13 distinct bands were specified, helping to capture the level of emissions of each vehicle more precisely. Originally announced in the 2008 PBR, this measure caused some controversy as it was the first reform intended to apply retrospectively. This meant that all cars registered after 1 March 2001 would be affected by the changes, not just (as was the case with the move to differentiation by engine size and then carbon emissions) new cars first registered after the change. However, when the reform was formally announced in the 2009 Budget, cars originally registered between 1 March 2001 and 23 March 2006, and emitting above 225 gCO_2/km, were placed into the newly formed band K instead of being subject to the higher bands. Thus a car registered during this period emitting 226 gCO_2/km saw its annual VED payment fall from £300 in 2007/08 to £210 in 2008/09. Even in 2011/12, the rate was £260, still below the 2007/08 level. By contrast, someone who bought a new car emitting 225 gCO_2/km during this period saw their annual payments rise from £205 to £210 to £260 over the same four-year period.

In 2010, a first-year rate (dubbed a 'showroom tax') for new cars was introduced. For 2011/12, first-year rates are zero for cars in emission bands A–D and equal to those faced in subsequent years for cars in bands E–G (up to 165 gCO_2/km), with cars in higher bands paying much higher one-off rates. For example, cars that emit over 225 gCO_2/km (Band M) pay £1,000 in the first year, as compared to an annual charge of £465 in subsequent years. Table 3.1 provides VED rates for petrol cars since 2000/01.

21 In this section we focus on VED for private cars. Details of VED for other vehicle types can be found at www.direct.gov.uk/en/Motoring/OwningAVehicle/HowToTaxYourVehicle/DG_10012524. Exemptions to VED include vehicles manufactured before 1973 and those registered as not currently on the road.
22 Until 2007, diesel cars were subject to slightly higher VED than petrol cars in the same band. The rates were then aligned, consistent with the equal treatment of petrol and diesel in terms of fuel duty.

Table 3.1: VED rates for petrol cars, 2000/01 to 2011/12

	Registered before 1 March 2001			Registered on or after 1 March 2001, emissions band (gCO_2/km)												
	Standard rate	Small car	Small car threshold	A (≤100)	B (101–110)	C (111–120)	D (121–130)	E (131–140)	F (141–150)	G (151–165)	H (166–175)	I (176–185)	J (186–200)	K[a] (201–225)	L (226–255)	M (>255)
2000/01	£155	£100	1099cc	–	–	–	–	–	–	–	–	–	–	–	–	–
2001/02	£160	£105	1199cc	£100	£100	£100	£100	£100	£100	£120	£140	£140	£155	£155	£155	£155
2002/03	£160	£105	1549cc[b]	£70	£70	£70	£100	£100	£100	£120	£140	£140	£155	£155	£155	£155
2003/04	£165	£96	1549cc	£65	£75	£75	£105	£105	£105	£125	£145	£145	£160	£160	£160	£160
2004/05	£165	£96	1549cc	£65	£75	£75	£105	£105	£105	£125	£145	£145	£160	£160	£160	£160
2005/06	£170	£110	1549cc	£65	£75	£75	£105	£105	£105	£125	£150	£150	£165	£165	£165	£165
2006/07	£175	£110	1549cc	£0	£40	£40	£100	£100	£100	£125	£150	£150	£190	£190	£210	£210
2007/08	£180	£115	1549cc	£0	£35	£35	£115	£115	£115	£140	£165	£165	£205	£205	£300	£300
2008/09	£185	£120	1549cc	£0	£35	£35	£120	£120	£120	£145	£170	£170	£210	£210	£400	£400
2009/10	£190	£125	1549cc	£0	£35	£35	£120	£120	£125	£150	£175	£175	£215	£215	£405	£405
2010/11	£205	£125	1549cc	£0	£20	£30	£90	£110	£125	£155	£180	£200	£235	£245	£425	£435
			First-year rate	£0	£0	£0	£0	£110	£125	£155	£250	£300	£425	£550	£750	£950
2011/12	£215	£130	1549cc	£0	£20	£30	£95	£115	£130	£165	£190	£210	£245	£260	£445	£460
			First-year rate	£0	£0	£0	£0	£115	£130	£165	£265	£315	£445	£580	£790	£1,000

[a] Includes cars emitting over 225 gCO_2/km registered before 23 March 2006

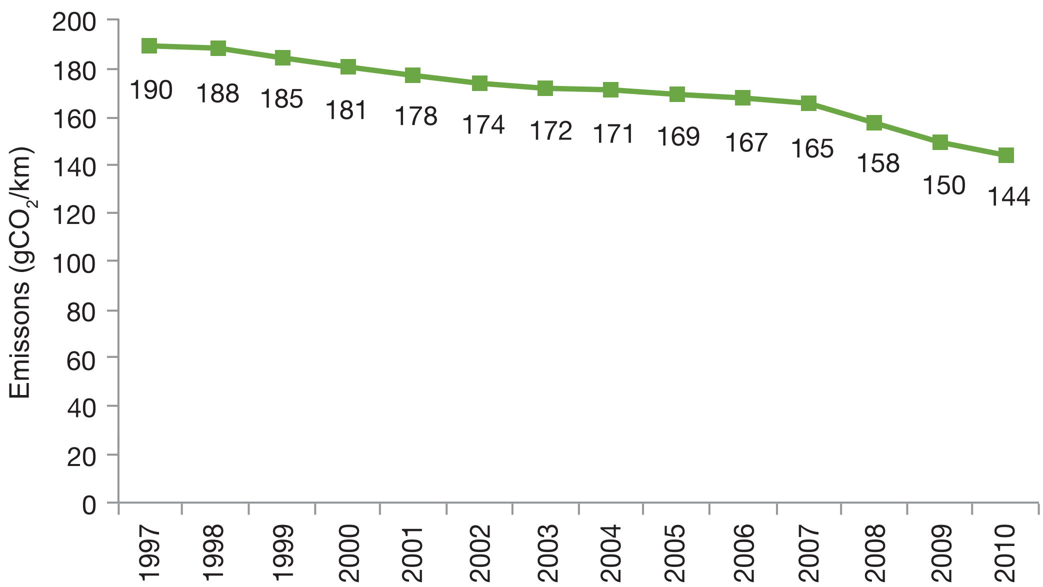
[b] Increased threshold applies from June 2001 onwards

3.2.2 The effect of VED on emissions

As VED represents a fixed cost to motoring, it provides no incentive for people to drive less. As a result, it will have little effect on the total distance driven or number of cars on the road, with the exception of that arising from the limited number of people on the margin who decide not to own a car because of the additional cost. However, it does provide incentives to buy more fuel-efficient cars, and hence should help to lower total emissions.

Over time, the efficiency of newly purchased cars has increased. This can be seen in Figure 3.6. Average new car emissions fell by over 45 gCO_2/km (24%) between 1997 and 2010. It should be noted that the downward trend began before the VED reforms were introduced in 2001, and so it may be difficult to attribute this fall in emissions solely to VED. In fact, the speed of the decline seems to have slowed in 2001, after the introduction of the new system. However, following further reforms in 2006/07, when the incentives to purchase more efficient cars were considerably enhanced, the reductions became larger, suggesting that car purchasers did respond to the changing rates of VED. In general, though, in seeking to understand the causes of these changes, it is difficult to assess the impact of VED reforms separately from higher fuel prices and tightening emissions standards.

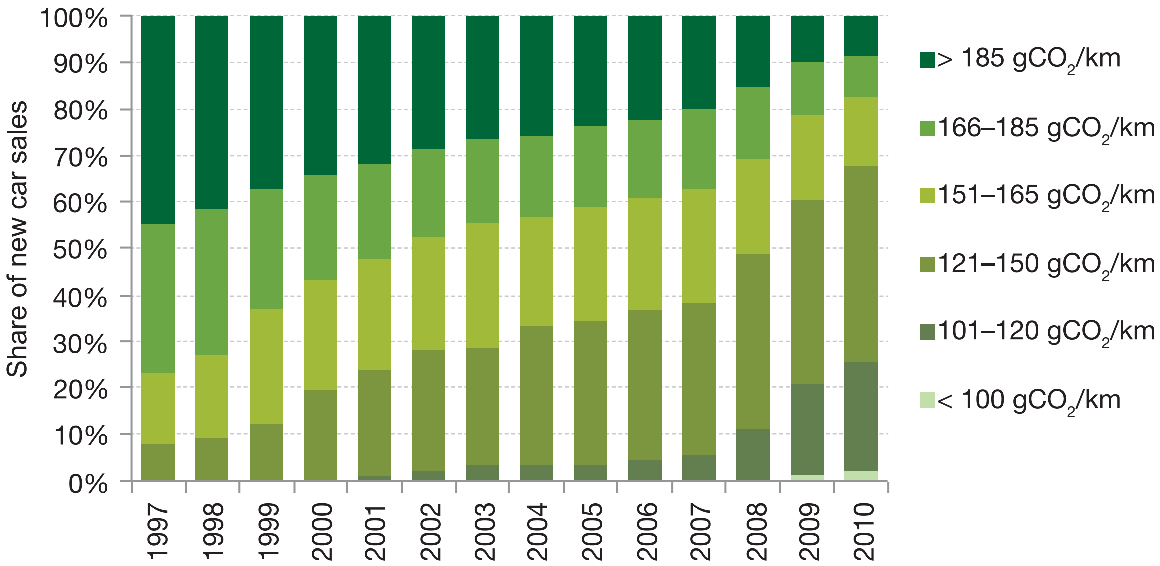
Figure 3.6: Average new car CO_2 emissions, 1997 to 2010



Source: SMMT (2011a)

Figure 3.7 shows how the market share of new cars by VED band has changed over time, using the 2005 bandings for consistent comparisons over the period. The market share for low-emissions cars has grown since 1997, whilst the market share for cars with very high emissions has shrunk. Cars emitting more than 185 gCO_2/km accounted for over 45% of new purchases in 1997, but only 8.5% in 2010. Once more, this trend had already begun before 2001, but the growth in the market share of cars with emissions less than 120 gCO_2/km since 2007 is substantial (SMMT, 2011a).[23] This follows large reductions in the VED rates for cars in these bands, and may well indicate that car purchasers have reacted to these greater incentives.

Figure 3.7: New car sales by 2005 VED bands, 1997 to 2010



Source: Authors' calculations based upon SMMT data (2011a)

Overall, it is hard to identify the exact effect that VED has had on car purchasing behaviour. Although new car efficiency has improved vastly in recent years, this trend began before VED was changed to its current structure, and will be influenced not only by VED rates but also the costs of fuel, technological changes and regulations, a shift towards diesel fuels, changing consumer preferences, and so on. Since more than half of the new car market is driven by fleet sales (see section 3.3), it will also depend to a large extent on corporate purchasing policies, which in turn will also be determined by a complex set of factors. To attempt to isolate the impact of VED changes would require good micro-level data on consumer vehicle purchases, including information on which cars were chosen, the characteristics (including prices and VED liabilities) of the chosen cars and other available vehicles, and the characteristics of the purchaser. However, we are not aware of such data being available for the UK.

23 Figures in 2009 and 2010 will also be affected by the scrappage scheme which ran from May 2009 to March 2010 and offered £2,000 off the cost of a new car for people scrapping a car that was at least ten years old. Estimates suggest that new cars bought under the scheme were, on average, lower-emissions vehicles than other new cars bought during the same period (Crossley et al., 2010).

3.2.3 International comparisons

In contrast to the situation as regards fuel duty, where a similar system is in place across the majority of different countries, it is much harder to directly compare VED across countries. Twelve countries within the EU now charge annual taxes that depend on vehicle CO_2 emissions.[24] Countries such as Denmark, Ireland and Luxembourg penalise high-emitting cars by severely increasing taxes on these vehicles; for example, rates in 2010 were four times higher for petrol cars emitting over 220 gCO_2/km in Ireland than in the UK. It is also interesting to note that many of these countries charge different rates for diesel and petrol cars. In the case of Portugal, diesel cars are exempt from annual taxes, whilst in countries such as Denmark, Luxembourg and Sweden, taxes are higher for high-emitting diesel cars.

In addition, many other countries have one-off purchase taxes on cars, differentiating between high- and low-emitting cars. A flat-rate purchase tax previously existed within the UK (the Car Tax), but was abolished in 1992, and had no explicit links to emissions levels. However, in many countries, purchase taxes are in place, and these are linked explicitly to CO_2 emissions (and in the case of some countries, such as Austria and Spain, also linked to the vehicle price). This provides further incentives to choose less-polluting cars, and in countries which do not differentiate annual taxes based upon CO_2 emissions, provides environmental incentives *in place* of these taxes.[25]

3.3 Company car and fuel taxation

Company cars and fuel provided by employers are important examples of benefits in kind. For taxation purposes, an equivalent cash value is attached to these benefits in kind, which is then treated as additional income for the purposes of income tax and National Insurance Contributions (NICs).

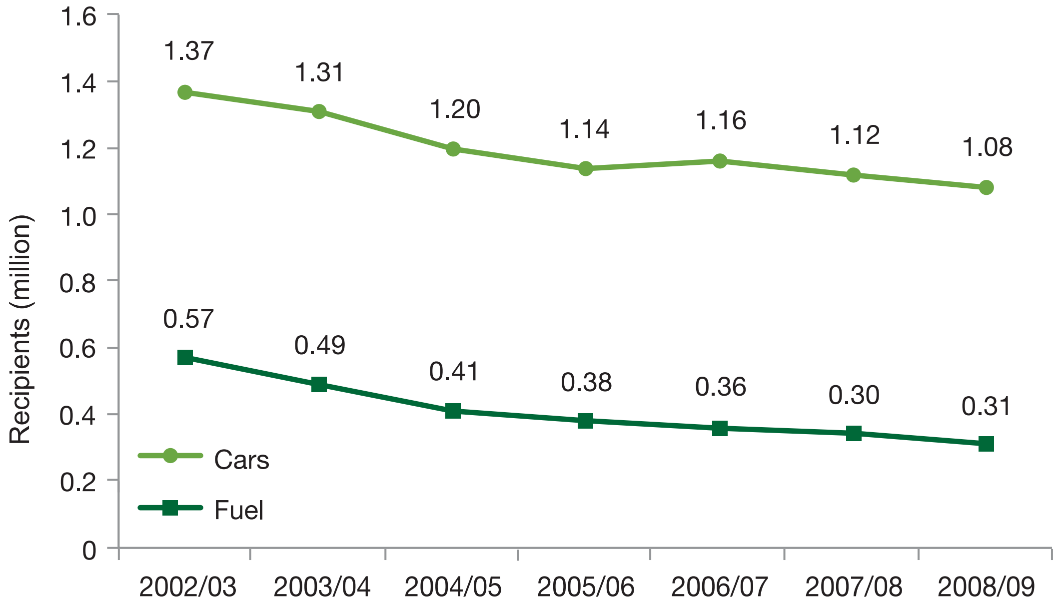
Almost 48% of newly registered cars in 2010 were company-registered, a figure which has remained roughly stable in recent years (SMMT, 2011b). Companies therefore play an important role in choosing the types of cars found on UK roads. The way in which these vehicles are taxed is therefore important, as the incentives provided by the tax system should play a large role in this purchasing choice.

Figure 3.8 shows recent trends in the number of people who have a company car, and of those who are provided with fuel by employers. It is clear to see that the number of people who receive either of these benefits in kind has fallen over this period. However, despite these downwards trends, in 2008/09, around 1.1 million people still enjoyed the use of company cars, whilst 310,000 received fuel from their employers.

24 For a full overview of CO_2-based motor taxes in the EU, see www.acea.be/images/uploads/files/20110330_CO2_tax_overview.pdf

25 For a more in-depth analysis of international comparisons, and to examine tax rates across different countries, see http://www2.oecd.org/ecoinst/queries/MotorVehicleCO2.htm.

Figure 3.8: Number of taxpayers receiving company car and fuel benefits



Source: HMRC data on taxable benefits-in-kind (www.hmrc.gov.uk/stats/taxable_benefits/menu.htm)

3.3.1 Company car taxation

Before April 1994, the valuation of the equivalent income provided by a company car depended on a number of factors. These included the age of the car at the end of the year of registration, the engine size, the mileage, and the price of the newly bought car. For example, in 1994, cars worth up to £19,250, under four years old at the end of the year of registration, and with an engine size less than or equal to 1,400cc, were allocated a value of £2,310 per year. For engines between 1,401cc and 2,000cc, this figure rose to £2,990 per year, with a jump to £4,800 per year for cars with engines larger than 2,000cc. Charges for cars valued at above £19,250 did not depend on engine size, falling into two separate value bands (those above or below £29,000), and depending only on the age of the vehicles within these bands. For all cars, the equivalent income of vehicles older than four years was considerably lower.[26]

This system did not provide particularly strong incentives for companies to purchase less environmentally damaging cars. For example, the charge for a car with an engine size of 1,999cc was the same as for a car with a 1,401cc engine, despite the obvious difference between the two, and so no incentive existed to choose a car towards the bottom of this range.

This system was then reformed in April 1994, linking the value of the benefit to the list price of the car. Income tax would now be levied on 35% of the

26 For full details of previous company car tax rates, see www.hmrc.gov.uk/stats/taxable_benefits/tc1-8788-0102.pdf.

list price of the car, with reductions for business mileages above certain thresholds. Initially, business mileages between 2,500 and 17,999 miles reduced this figure by a third, whilst mileages over 18,000 miles reduced this figure by another third. Cars over four years old at the end of the year of registration qualified for another reduction, of one third of the remaining figure. This system was adjusted slightly in April 1999, setting a level of 35% of the list price for cars with a business mileage of less than 2,500 miles, 25% of the list price for business mileages between 2,500 and 17,999 miles, and 15% of the list price for business mileages of 18,000 and above. A further 25% discount was applied for cars older than four years.

By linking the value to list price, companies were encouraged to buy cheaper cars. However, no explicit link existed between charges and pollution, and as a result, the system still lacked explicit incentives to choose less-polluting vehicles. Further, the system provided inherent incentives for greater use of the vehicle by considering less income to be derived from it the higher the business mileage driven.

Company car taxation was again reformed in 2002/03. This new system was directly linked to the emissions levels of the car, with the percentage of the list price that was taken as assumed income being lower for less-polluting cars. In addition, the link between distance and the implicit income was removed, ending the incentive to drive more. In 2011/12, whilst a petrol car emitting 230 gCO_2/km is still valued at 35% of the list price, a petrol car that emits only 135 gCO_2/km is valued at 17% of the list price.

Table 3.2 provides a full list of the percentages applied to different emissions bands for the years 2006/07 to 2011/12. Over time the incentives to choose low-emissions vehicles have been increased, though as with VED the presence of an upper limit above which the same percentage applies mutes the disincentives to buy the most-polluting vehicles. Within this system, diesel cars are subject to a flat-rate 3% supplementary charge in most categories. However, this is not the case in the highest bands once the cap of 35% is hit. Furthermore, in the lowest emission bands, this supplementary charge means that the taxable value of diesel cars is 30% higher than the cost of a similarly emitting petrol car. However, this difference shrinks as the emissions bands rise, with only a 10% difference in costs existing in the 200–204 gCO_2/km band, and no difference at all existing in the upper bands. This structure does not seem to make much sense. Either there is a rationale for a supplementary charge for diesel vehicles, in which case there should not be any cap at 35%, or there is not, in which case there should be no differentiation at all. Indeed, the continued differentiation between petrol and diesel in company car taxes seems somewhat at odds with the fact that the fuels are treated equally in terms of fuel duty and VED.

Table 3.2: Company car percentages of list price assumed for calculating value of benefit in kind

Emissions (gCO_2/km)	2006/07[b]		2007/08		2008/09		2009/10		2010/11		2011/12	
	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel
1–75[a]	15%	18%	15%	18%	10%	13%	10%	13%	5%	8%	5%	8%
76–120	15%	18%	15%	18%	10%	13%	10%	13%	10%	13%	10%	13%
121–129	15%	18%	15%	18%	15%	18%	15%	18%	15%	18%	15%	18%
130–134	15%	18%	15%	18%	15%	18%	15%	18%	15%	18%	16%	19%
135–139	15%	18%	15%	18%	15%	18%	15%	18%	16%	19%	17%	20%
140–144	15%	18%	15%	18%	16%	19%	16%	19%	17%	20%	18%	21%
145–149	16%	19%	16%	19%	17%	20%	17%	20%	18%	21%	19%	22%
150–154	17%	20%	17%	20%	18%	21%	18%	21%	19%	22%	20%	23%
155–159	18%	21%	18%	21%	19%	22%	19%	22%	20%	23%	21%	24%
160–164	19%	22%	19%	22%	20%	23%	20%	23%	21%	24%	22%	25%
165–169	20%	23%	20%	23%	21%	24%	21%	24%	22%	25%	23%	26%
170–174	21%	24%	21%	24%	22%	25%	22%	25%	23%	26%	24%	27%
175–179	22%	25%	22%	25%	23%	26%	23%	26%	24%	27%	25%	28%
180–184	23%	26%	23%	26%	24%	27%	24%	27%	25%	28%	26%	29%
185–189	24%	27%	24%	27%	25%	28%	25%	28%	26%	29%	27%	30%
190–194	25%	28%	25%	28%	26%	29%	26%	29%	27%	30%	28%	31%
195–199	26%	29%	26%	29%	27%	30%	27%	30%	28%	31%	29%	32%
200–204	27%	30%	27%	30%	28%	31%	28%	31%	29%	32%	30%	33%
205–209	28%	31%	28%	31%	29%	32%	29%	32%	30%	33%	31%	34%
210–214	29%	32%	29%	32%	30%	33%	30%	33%	31%	34%	32%	35%
215–219	30%	33%	30%	33%	31%	34%	31%	34%	32%	35%	33%	35%
220–224	31%	34%	31%	34%	32%	35%	32%	35%	33%	35%	34%	35%
225–229	32%	35%	32%	35%	33%	35%	33%	35%	34%	35%	35%	35%
230–234	33%	35%	33%	35%	34%	35%	34%	35%	35%	35%	35%	35%
235–239	34%	35%	34%	35%	35%	35%	35%	35%	35%	35%	35%	35%
240+	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%

Notes: [a] Zero-emissions cars attract no company car tax. From 2008/09, a new 2% discount was introduced for cars which can run on E85 fuel.
[b] 3% discount is applied to diesel cars (registered before 1 January 2006) meeting Euro IV emission standards, as announced in Budget 2006. This discount was removed from April 2011 onwards (as announced in the 2009 Budget).

3.3.2 The taxation of employer-provided fuel

The provision of free fuel by an employer is also a benefit in kind. Until 2002/03, the system for deriving imputed taxable income from fuel closely mirrored the company car tax system, with the car attracting a 'fuel scale charge' (being the amount of taxable income imputed) which was dependent on engine size. For example, in 2001/02, a charge of £1,930 per year applied to petrol cars with an engine size of up to 1,400cc, increasing to £2,460 for cars up to 2,000cc and £3,620 for cars above this threshold.[27] This meant that an individual who drove a petrol car with an engine size of 1,500cc, and who paid income tax at the higher rate of 40%, would pay £984 (£2,460 x 0.4) in tax on fuel each year. This figure did not change in any way with the actual amount of fuel used, and therefore provided no incentive to limit the consumption of fuel. So long as the private cost of fuel was higher, there were strong incentives in the system to provide fuel through the employer instead. In an attempt to reduce the number of employees receiving free fuel, the scale charge increased sharply in the final years in which the old system applied, more than doubling for each band between 1997/98 and 2002/03.

In 2003/04, the system was reformed, to treat fuel in a similar way to the company cars themselves. Fuel charges were linked to the emissions band of the vehicle, with the assumed income in kind found by multiplying the same percentage as found in Table 3.2 by a fixed scale charge, originally introduced in 2003/04 at £14,400. Thus people with more efficient company cars also pay less tax on the fuel used. The fixed scale charge for fuel remained constant in cash terms until 2008/09, and was then increased sharply to £16,900 in 2008/09, and was further increased to £18,000 in 2010/11 and £18,800 in 2011/12. This means that an individual who drives a vehicle that emits 189 gCO_2/km is assumed to derive a benefit in kind from fuel of £5,076 (£18,800 x 0.27) per year for a petrol car, or £5,640 (£18,800 x 0.3) per year for a diesel car.

These recent changes should have two effects: firstly, to encourage the choice of more efficient cars, as more-polluting cars face far higher charges; secondly, to discourage receipt of employer-provided fuel altogether by increasing the income in kind assumed to be derived. In general, the incentives to take employer-provided fuel will depend on how the value of the scale charge compares to private fuel costs: if fuel prices rise whilst the fuel scale charge is held fixed, this increases the incentives to take it up. For those that do, however, there remain no incentives to reduce fuel use, since the assumed income remains unrelated to fuel consumption. Further, those employees who drive the least efficient cars, and therefore face a larger private fuel cost, will still have stronger incentives to accept the offer of employer-provided fuel.

27 For full details of rates between 1997/98 and 2002/03, see www.hmrc.gov.uk/stats/taxable_benefits/tc3a-8788-0203.pdf

3.4 London Congestion Charge

The London Congestion Charge was introduced in February 2003, as a fee liable for motorists who wished to drive within central London. It was introduced originally as a £5 per day charge for any vehicle that entered the ‘congestion zone’ between 7 a.m. and 6.30 p.m. on a weekday (excluding public holidays). In July 2005 this fee rose to £8, and was further increased to its current level of £10 in January 2011 (though charging hours now end at 6 p.m.). Exemptions from the scheme exist for a number of vehicles including taxis, motorcycles, bicycles, buses, disabled badge holders, emergency vehicles and some vehicles that run on alternative fuel. Additionally, residents living in the zone receive a 90% discount. The charge raised £158.1 million in 2010, net of operating costs (TfL, 2011a). These revenues are hypothecated towards the improvement of public transport in London, as is required by the Greater London Authority Act 1999.

The original zone comprised an area bounded by the Inner Ring Road, covering approximately eight square miles. In February 2007, this was extended to include additional parts of Westminster, Kensington and Chelsea. This ‘Western extension’ was abolished in December 2010, returning the zone to its original area.

The effect of the scheme on traffic levels and congestion is quite difficult to determine. The most recent estimates come from Transport for London (TfL, 2008) suggesting that traffic in 2007 was around 18% lower in the central congestion zone relative to pre-charging levels (and 36% lower for car traffic). However, *congestion* levels in 2007 appeared to be no lower than they were in 2002 (though they were cut during 2003 to 2006) – though of course to fully assess the impact of the charge requires us to estimate the counterfactual level of congestion in its absence. TfL (2008) suggests that congestion was lower in 2007 than it would have been without the charge, after taking into account factors such as an increased level of road maintenance work and changes to traffic signal timings. Unfortunately, the 2008 report was the last available – they are no longer published annually by TfL. Instead, information on congestion is included as part of a wider annual report on transport in London. The most recent (TfL, 2011b) suggests that removing the Western extension increased traffic entering that area by about 8%, and congestion by about 3%.

It should be noted that the congestion charge does not explicitly target congestion. Motorists who pay it have unlimited use of roads within the zone during that day. Therefore, the charge does not take into account the distance driven, the location, or the time (within the specified hours) of the journey. Motorists who cause a greater congestion externality through driving greater distances at busier times are charged the same amount as other drivers causing smaller external costs.

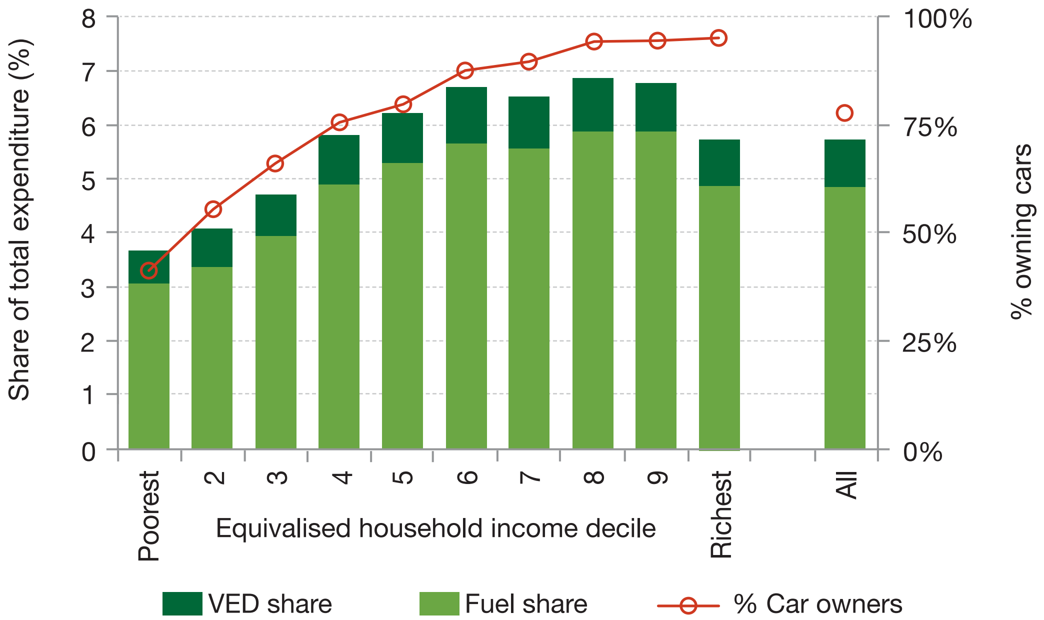
3.5 Distributional aspects of motoring taxes

As discussed in Section 2, one aspect of taxation which receives considerable attention is how the burden of taxes falls across the spectrum of income distribution. This sub-section provides a snapshot picture of the current distributional impact of the main motoring taxes – fuel duties and VED – taking household income as a measure of living standards against which to judge distributional effects. Future work could explore whether these effects have varied over time, how this relates to changes in policy, the impact of other motoring taxes such as company car taxes and congestion charging, whether income is the right measure of living standards for analysing distributional issues, and what the distributional effects of a reformed motoring tax system might look like.

Figure 3.9 uses data from the 2009 ONS Living Costs and Food Survey (LCFS) to examine how important vehicle fuel and VED payments are in overall household budgets. The LCFS is an annual, nationally representative cross-sectional survey of around 6,000 households who are asked to record all of their expenditures, including any purchases of vehicle fuel, over a two-week period. Detailed demographic and income information about the households is also collected via interviews with each household member. The interview also asks households about their regular expenses, including VED payments. Using the 2009 data (the most recent available), we calculate the proportion of the total non-housing budget allocated to vehicle fuel and VED for each household, and show how these budget shares vary on average across ten equally sized income groups ('deciles'). Incomes are measured as total after-tax income from all sources (wages, benefits, investments and so on), adjusted for household composition using the OECD equivalence scale.

If there is relatively little variation in the price of fuel (other than between petrol and diesel) across regions, and households of different income levels are sampled randomly throughout the year, then variation in fuel expenditures across income groups should closely reflect variation in fuel consumption, and thus the amount of fuel duty paid. On average, vehicle fuel made up about 4.9% of total expenditure in 2009, with a smaller impact for the poorest 10% of households (where it accounted for 3% on average). The largest fuel budget shares are towards the top of the income distribution – those in the eighth and ninth deciles spent on average 5.9% of their budgets on fuel. Those in the richest decile spent 4.9%, about the same on average as those in the fourth decile. The patterns are similar for VED, which made up 0.9% of spending on average across all households but just 0.6% for the poorest decile. The largest impact of VED was felt towards the middle and upper parts of the income distribution: it made up 1% of spending for those in the sixth to eighth deciles. Overall, there is no sense from this data that the main motoring taxes are regressive; rather, they appear to be broadly progressive, though with a noticeably smaller impact on the very richest households.

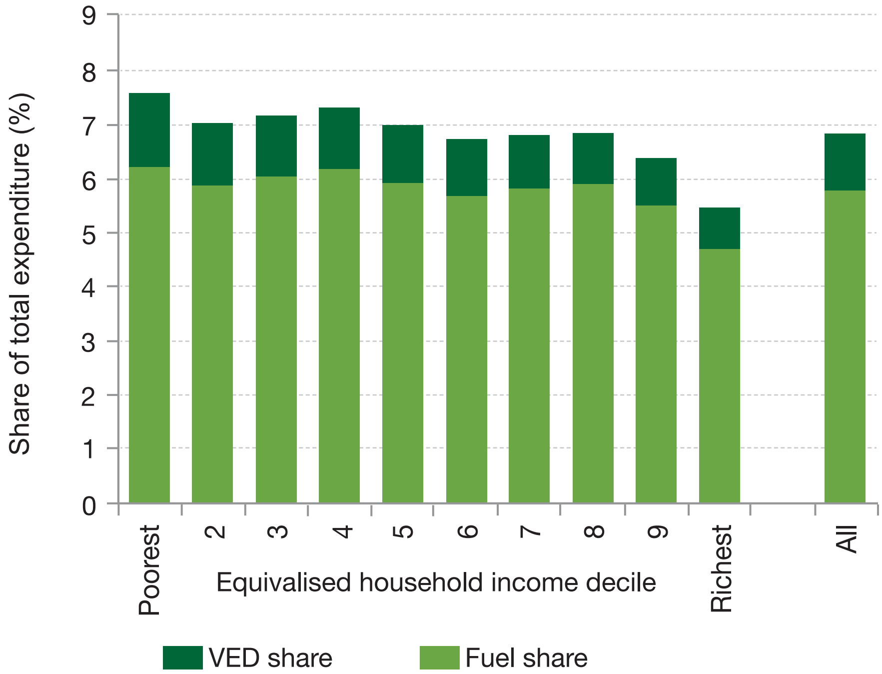
Figure 3.9: Average budget shares of vehicle fuel and VED, by income decile, 2009



Source: Authors' calculations based on 2009 ONS LCFS data
Notes: Households with incomes or expenditures of less than £20 per week in total are excluded, as are households who spend in excess of 25% of their budget on vehicle fuel or over 5% on VED. This excludes households with very unusual spending patterns or extremely low incomes or expenditures where we may be concerned about data quality. 1.9% of the sample are excluded. Figures are weighted to account for sampling variation using weights supplied with the data.

Clearly, the pattern of these effects is strongly related to vehicle ownership. In the 2009 LCFS data, only 41% of those in the poorest income decile owned a car or van, compared to 96% of those in the richest, and 78% of all households. Figure 3.10 shows the fuel and VED shares amongst car-owning households only (that is, the deciles are recalculated to show the poorest 10% of car owners through to the richest 10%). Amongst car owners, motoring taxes appear to be broadly regressive. Fuel costs make up 6.7% of the budget for the poorest tenth of owners compared to 5.0% for the richest tenth. For VED, the figures are 1.4% and 0.8% respectively. It is striking, though, that the distributional effects are broadly neutral across the vast range of the income distribution from around the second up to the eighth income decile amongst car owners.

Figure 3.10: Average budget shares of vehicle fuel and VED, by car-owner income decile, 2009



Source: Authors' calculations based on 2009 ONS LCFS data
Notes: Households with incomes or expenditures of less than £20 per week in total are excluded, as are households who spend in excess of 25% of their budget on vehicle fuel or over 5% on VED. This excludes households with very unusual spending patterns or extremely low incomes or expenditures where we may be concerned about data quality. 1.9% of the sample are excluded. Figures are weighted to account for sampling variation using weights supplied with the data.

The distributional effects of fuel duty and VED will both be influenced by variation in the types of car owned across income groups, since this will influence vehicle efficiency and also have a direct impact on VED liability by means of the graduated system. Information on the type of vehicle owned is not available in the LCFS. We therefore turn to the most recent data from the National Travel Survey (NTS) from 2008, a cross-sectional study of around 8,000 households who are asked to record a diary of all their journeys over a one-week period. In this survey, information on the vehicles owned by each household is collected, and includes their type, age and emissions band.

Again, we offer here only a snapshot of the current data rather than any historical analysis. The NTS data include a categorisation of households into five income groups (quintiles) based on gross (pre-tax) household income, though it is worth noting that the income data in the NTS are much less detailed than in the LCFS, which makes any attempt to differentiate households more finely by income groups difficult.

Table 3.3 shows how the type of vehicles owned varies by income group, classified into five size-groups for cars, as well as for light vans and other vehicles. Unsurprisingly, richer households in general own larger vehicles: amongst the richest fifth of households, over 27% of vehicles are large cars or 4 x 4s compared to just 18% amongst the poorest fifth. In contrast, small and small/medium cars make up a much larger share of cars owned by those in the lowest income quintile (48%) compared to the richest (37%).

Table 3.3: Car sizes owned, by income quintile, 2008

Quintile	Small car	Small / medium car	Medium car	Large car	4 x 4	Light van	Other vehicle
Poorest	16.6%	31.7%	28.0%	12.2%	5.4%	3.4%	2.7%
2	16.2%	30.7%	28.1%	11.9%	4.6%	4.4%	4.1%
3	13.0%	28.4%	29.6%	14.8%	5.1%	4.8%	4.4%
4	15.7%	27.9%	26.3%	15.8%	4.9%	4.9%	4.6%
Richest	12.8%	24.6%	26.8%	20.7%	6.8%	3.4%	5.0%
All	14.5%	27.9%	27.6%	15.9%	5.5%	4.2%	4.4%

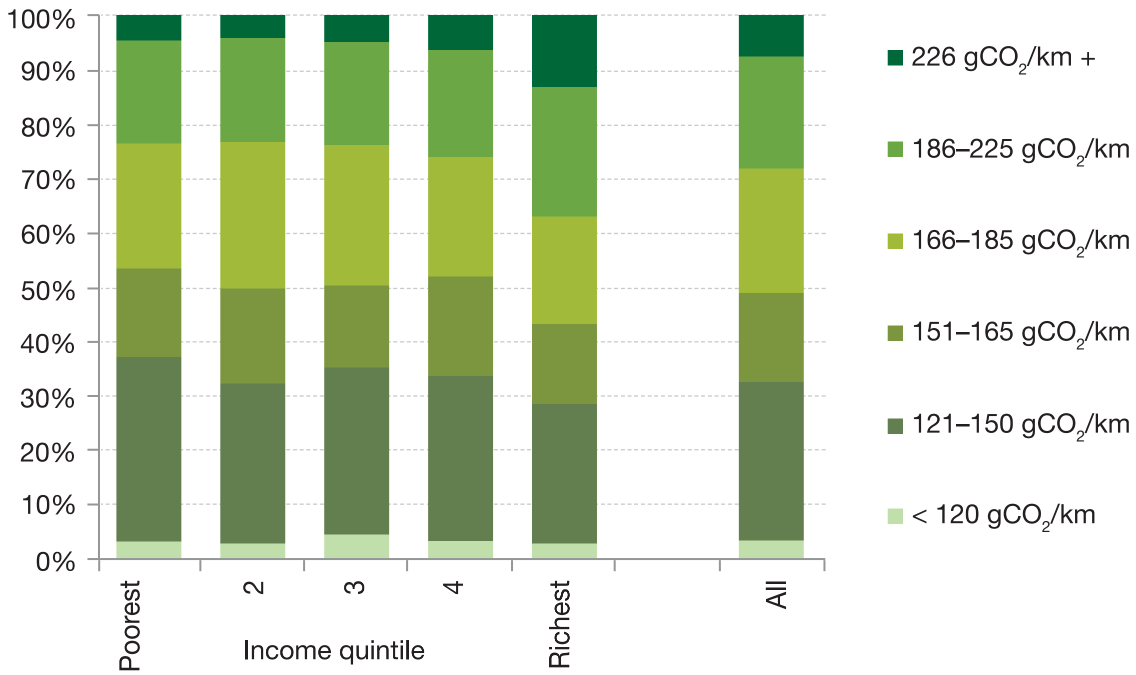
Source: Authors' calculations based on NTS data
Note: Figures are weighted.

We can also use the NTS data to look at which emissions bands each vehicle falls into for VED purposes. The data here are patchy – we only observe an emissions band for around half the vehicles in the data, the majority of which are under five years old due to missing data for vehicles that exceed this age. Nevertheless, at least for those households who drive vehicles which are part of the graduated VED system, this information tells us something about how its impact varies by income group.

Figure 3.11 shows, for each income quintile, the proportion of vehicles falling into each broad emissions band where it is known. We group cars into six emissions bands (120 gCO_2/km or less, 121–150 g, 151–165 g, 166–185 g, 186–225 g, and 226 g or more). The main findings mirror those found when looking at car size, with high-emitting cars being much more prevalent in higher income groups than in lower ones. In the poorest quintile, 37% of cars emit less than 150 gCO_2/km, compared to 28% in the richest quintile. The proportion of cars emitting 226 gCO_2/km or more (the group liable to the highest annual and first-year VED rates) in the two groups is 5% and 13% respectively.

Overall, we saw that the distributional impact of VED was broadly 'hump-shaped' over the income distribution from the LCFS data, though regressive amongst car-owning households. From the NTS data, it seems likely that the move towards a graduated VED system has made the system broadly more progressive than it would otherwise have been, since poorer households tend to own smaller and less-polluting cars. However, it is worth reiterating that the publicly available NTS dataset does not contain full information on emissions or other vehicle characteristics for all households, in particular for those owning older vehicles. Thus poorer households with relatively new cars tend to choose less-polluting vehicles, but poorer households with old cars would still pay higher rates of VED.

Figure 3.11: Emissions of vehicles owned by income quintile, 2008



Source: Authors' calculations based on NTS data

A fuller analysis of the distributional effects of VED and how it has been affected by policy would be very interesting – in particular to assess the impact of the increasing sharpening of the differential between graduated rates for more- and less-polluting cars and the impact of the 'first-year' rate, and to examine other factors which affect VED payments, such as the age and engine size of vehicles owned. This, however, requires more up-to-date NTS data and ideally more disaggregated data which break down income more finely and define key variables of interest more precisely.[28]

28 More disaggregated and less restrictive NTS data are available from the DfT under special licence, though whether these data would contain all the information necessary for a full analysis is not clear.

4. Motoring Tax Revenues

This section describes how revenues from motoring taxes have changed over time, and looks ahead to future projections for receipts. Motoring taxes, in particular fuel duty, have historically accounted for a significant share of total revenue. In recent years since the abolition of the fuel duty escalator, though, this contribution has declined somewhat, and on current forecasts this trend is set to continue in the future. In the short term, this will hamper the government's objective of increasing the share of revenues coming from environmental taxes. In the longer term, this erosion of the motoring tax base is potentially quite significant, leading to serious questions about how best the revenues should be replaced.

4.1 Current and historical revenues

Figure 4.1 shows (in 2010 prices) real-terms revenues over the last 45 years from the major motoring taxes – fuel duty, VAT on duty, VED and Car Tax (a tax on the purchase of new cars which was abolished in November 1992). Figure 4.2 shows revenues as a share of total receipts and of GDP.

Figure 4.1: Real revenues from major motoring taxes, 1965–2010

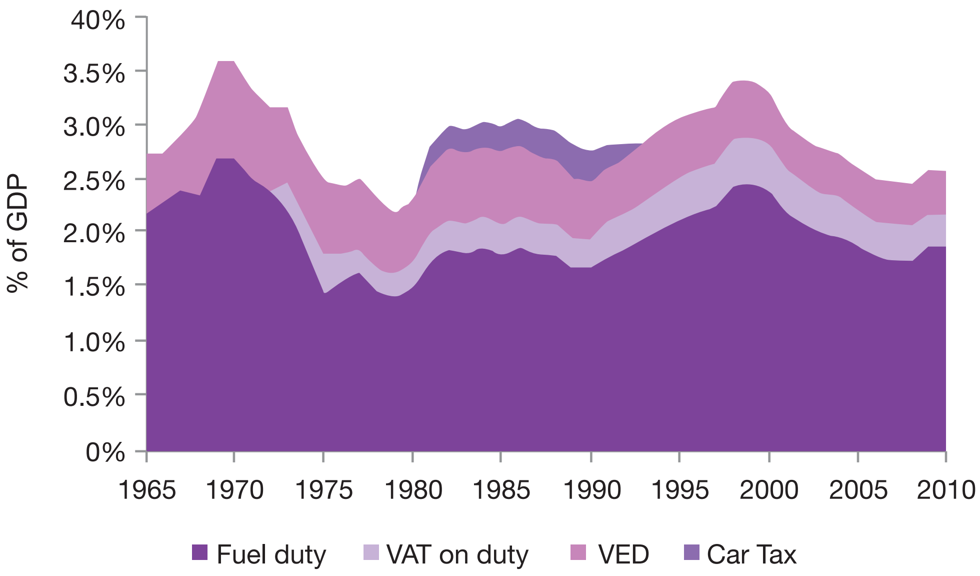
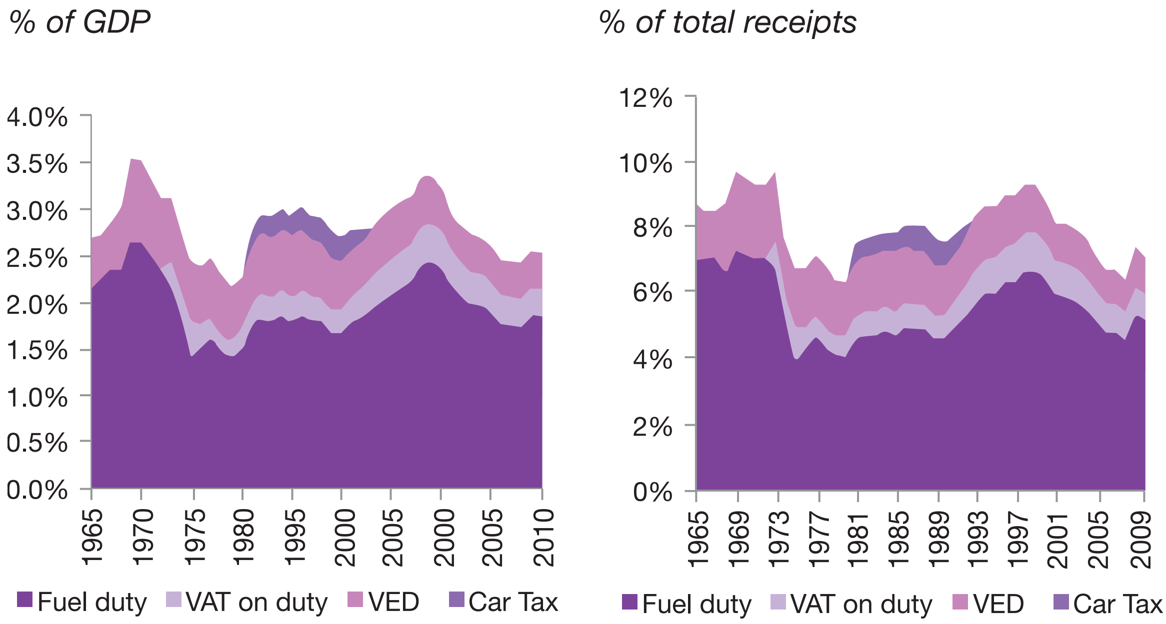


Figure 4.2: Motoring taxes as a proportion of total revenue and GDP, 1955–2010



Source: Authors' calculations based on ONS data

As can be seen, the overwhelming majority of the receipts generated by the major motoring taxes come from fuel duty. In 2010, excluding VAT, fuel duty revenues were £27.0 billion, equivalent to 5.2% of all tax receipts, 1.9% of GDP, and 73% of total motoring taxes. Including VAT, they amounted to £31.1 billion, 6.0% of tax receipts, 2.1% of GDP, and 84% of motoring taxes.

Real-terms fuel duty receipts rose in the 1960s, peaking at just over £15 billion (in 2010 prices) in 1970. This was followed by a steep drop in the mid-1970s and a gradual recovery. Real fuel duty receipts only returned to their 1970 level in 1990 (though once we account for the introduction of VAT on duty in 1973, the 1970 level was reached in 1984). Following the introduction of the escalator in 1993, there was a sharp rise in real receipts from duty, peaking at £29.2 billion in 2000 (£34.3 billion including VAT). More recent nominal freezes in duty rates correspond with a fall in real receipts, which have hovered around £25–27 billion each year since 2002 (or £30–32 billion including VAT).

These changes are also reflected in the changing shares of fuel duty relative to total receipts and GDP. At the peak, fuel duty made up 7.2% of total taxes in 1969 and 2.6% of GDP in 1970. Including VAT, the peaks were 7.8% of taxes in 1999 and 2.8% of GDP in the same year. The trend increase during the escalator period, and the subsequent decline, are also clear. Both measures rose in 2009. For example, fuel duty (including VAT) as a proportion of total receipts rose from 4.6% in 2008 to 5.3% in 2009. This largely reflected underlying weakness in other receipts that year owing to the financial crisis, whilst duty receipts were more resilient to the downturn.

VED also produces quite substantial revenue for the Exchequer, although the amounts are small in comparison to those produced by fuel duty. In 2010, receipts were £5.7 billion, equivalent to 1.1% of total receipts, 0.4% of GDP, and 16% of motoring taxes. As with fuel duty, real VED revenues rose in the late 1960s but fell in the 1970s. The upward trend was resumed in the 1980s and, following a drop in the late 1980s and early 1990s, real revenues peaked at £6.2 billion in 1999. This figure fell quite substantially following the reform of the VED system, with real receipts (in 2010 prices) remaining relatively stable from 2003 onwards, between £5.4 billion and £5.8 billion. This has been reflected in a falling share of GDP and total taxes throughout this period, until a small increase occurred in 2009, again largely due to underlying economic weakness rather than any particular increase in VED receipts.

Between 1981 and 1992, the Car Tax also generated revenue. This was a tax levied on the purchase of each new car, charging the purchaser a specified percentage on the value of the car. In 1992, this percentage was first halved from 10% to 5% in March, and then abolished altogether in November. Receipts from car tax were not insignificant – around £1.5 billion (in 2010 prices) in 1990.

The government also receives revenue from income tax and NICs levied on the value of benefits in kind, such as company cars and employer-provided fuel. Figure 4.3 presents nominal receipts generated from these two benefits in kind for the period between 2003/04 and 2008/09. Receipts have declined from £2.9 billion to £2.2 billion over this period, reflecting the decrease in the number of people who have company cars or use company fuel.

Figure 4.3: Receipts from company car and fuel taxes, 2003/04 to 2008/09

Source: HMRC data on taxable benefits-in-kind (www.hmrc.gov.uk/stats/taxable_benefits/menu.htm)

4.2 Revenues in the future

4.2.1 Short-term revenue projections

As we saw above, road transport receipts peaked around the turn of the century in real-terms and as shares of national income and total receipts. Revenues fell on all of these measures over most of the last decade, halted only by the recession which reduced GDP and other receipts more sharply than road taxation revenues.

Looking a few years ahead, the downward trend in road taxation receipts looks set to resume. Table 4.1 shows the most recent forecasts from the OBR for total receipts and motoring tax receipts to 2016/17, the end of the current forecasting period. We have converted receipts to real 2011/12 values and also express motoring taxes as a share of GDP and total revenues. We also include VAT on fuel duty, which is not separately specified in the OBR figures. However there are no projections for company car and fuel receipts, which are subsumed into income tax and NIC revenue estimates.

In real terms, motoring tax receipts are forecast to rise very slightly, from £38.3 billion in 2011/12 to £39.0 billion in 2016/17, an increase of 2%. However, this is less than the real growth forecast for total receipts, of around 13%. Thus motoring taxes are projected to fall from around 6.7% of total receipts in 2011/12 to 6.0% by 2016/17. Based on long-term revenue data from the ONS, the last time motoring-related taxes made up less than 6% of total receipts was in 1954. By 2015/16, motoring taxes are forecast to make up around 2.3% of national income, which would be the lowest proportion since 1980.

Table 4.1: Motoring tax revenue projections to 2016/17 (real-terms, £ billion, 2011/12 prices)

	Out-turn	Out-turn	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Fuel duties	27.6	28.0	27.0	26.6	27.0	27.2	27.8	28.1
VAT on duty	4.3	5.1	5.4	5.3	5.4	5.4	5.6	5.6
VED	5.9	6.0	5.9	5.7	5.6	5.5	5.3	5.2
Total motoring	37.8	39.0	38.3	37.6	38.0	38.2	38.6	39.0
Total receipts	542.7	567.4	575.5	579.9	592.4	608.1	624.6	648.5
% of GDP	2.56%	2.58%	2.52%	2.45%	2.42%	2.36%	2.32%	2.27%
% of receipts	6.99%	6.90%	6.66%	6.50%	6.41%	6.26%	6.16%	6.01%

Source: OBR Economic and Fiscal Outlook March 2011 and November 2011, HM Treasury GDP deflator figures, authors' calculations
Notes: Cash figures expressed in 2011/12 values based on GDP deflator.

4.2.2 Raising the share of green taxes in total receipts

The agreement released by the Coalition on coming to power in 2010 included a pledge to "increase the proportion of tax revenue accounted for by environmental taxes". More than 18 months later, there is still no formal definition of how this target should be judged: it is not clear what definition of 'environmental taxes' is being used, or what the baseline and end periods over which the green tax share should rise are.

The pledge is certainly still a live one: for example, it was referenced in the 2011 Budget documentation.[29] In the absence of a clear definition of the target, previous research by the IFS (Leicester & Levell, 2010; 2011) has examined whether the pledge is on course to be met, making various sensible assumptions about the definition of 'green taxes' and working on the basis that

29 http://cdn.hm-treasury.gov.uk/2011budget_complete.pdf, page 32.

the intention is to ensure the green tax share is at least no lower at the end of the current Parliament (2014/15) than it was at the end of the last Parliament (2009/10). The most recent IFS estimate, based on OBR forecasts at the time of the March 2011 Budget, was that the green tax share of receipts was set to rise from 7.8% in 2009/10 to 8.0% by 2014/15, meaning that the pledge would be met with around £1.4 billion to spare.[30] Here, we revisit the issue based on the November 2011 OBR revenue forecasts which also underlay the short-term projections above.

Road transport taxes make the dominant contribution to environmental receipts. In 2011/12, fuel duty (with its associated VAT) and VED combined are forecast to generate some £38.3 billion in revenue. Other green taxes (Air Passenger Duty, the Climate Change Levy, Landfill Tax, the Aggregates Levy, EU Emissions Trading Scheme (ETS) auction receipts, the Carbon Reduction Commitment, Social Tariffs, Feed-in Tariffs and the Renewables Obligations) together account for just £6.7 billion, meaning that motoring-based taxes make up 85% of green tax receipts.

As we saw in Table 4.1, however, motoring taxes are set to decline over this Parliament from 7.0% of receipts in 2009/10 to 6.3% by 2014/15. This means that to meet its green tax commitment, non-motoring environmental tax receipts will have to rise by at least 0.7% of total receipts over the same period. On current forecasts this is – just – set to happen: other green taxes will rise from 0.8% of receipts to 1.7%. Thus total green tax receipts will rise from 7.8% to 8.0%, and we now estimate that the pledge will be met with only £1 billion to spare.[31] Figure 4.4 shows where the increase in non-road transport green taxes is coming from. Resource-based taxes (on aggregates and landfill) are set to remain flat, at about 0.3% of receipts. A small contribution comes from Air Passenger Duty, forecast to rise from 0.4% to 0.5% of receipts. The largest effect comes from energy-related taxes, however, which rise from 0.2% to 1.0% of receipts. If these forecasts are accurate, then by 2014/15, road transport taxes will fall to 78% of all green tax revenues.

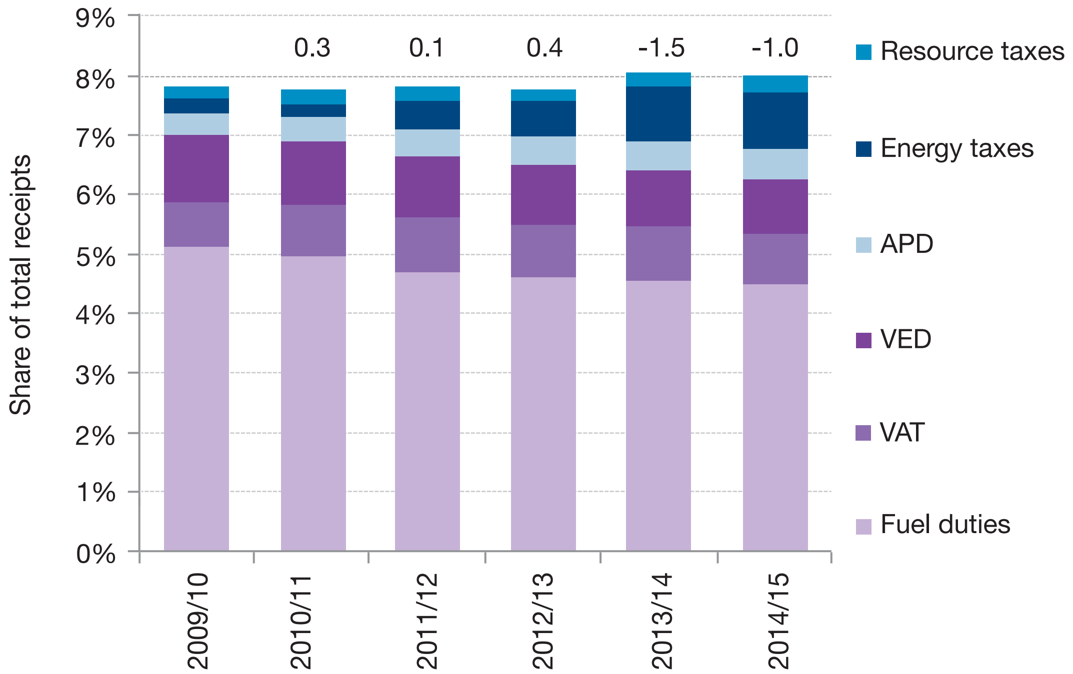
It is worth emphasising just how small a margin £1 billion represents: it is roughly the revenue cost today of cutting fuel duties by around 4% (or just over 2p/litre on the main fuels). This is smaller than the cost of cancelling a single year's inflation uprating of duty rates, as happened in the 2011 Autumn Statement. Thus, even though on current forecasts other green taxes will just about take up the slack caused by the drop in motoring receipts, there is surely a significant likelihood that the pledge will be missed, given the uncertainties in forecasting even a few years ahead. Without the forecast drop in motoring taxes there would be much more room for manoeuvre. If motoring taxes remained at their 2009/10 level of 7.0% of receipts throughout the current

30 This figure assumes that total revenues remain unchanged, that is, assuming any changes in green tax receipts are offset by compensating changes to non-environmental revenues.

31 The pledge only applies to the end of the current Parliament, which we assume to be 2014/15. Current OBR forecasts run to 2016/17. Green tax receipts in 2016/17 are forecast to be 7.87% of the total, just 0.04% higher than the share at the end of the last Parliament.

Parliament, other green taxes were unchanged from forecast, and total receipts also unchanged, then by 2014/15 green taxes would make up 8.7% of receipts and the government would have £4.3 billion to spare after meeting the pledge.

Figure 4.4: Actual and forecast share of green tax receipts in total revenues, 2009/10 to 2014/15



Source: Authors' calculations based on OBR Economic and Fiscal Outlook, November 2011.
Note: the figure above each column shows the amount (in £ billion) which has to be found to ensure that green tax receipts in that year match those (as a share of total receipts) in 2009/10. Negative figures indicate that receipts exceed the target share. Figures assume that any increase in green tax revenues is offset by a reduction in other tax revenues, leaving total receipts the same. APD – Air Passenger Duty.

It is also worth making some more general comments on the pledge to raise the share of green taxes. There is no good economic rationale for committing some proportion of receipts to come from particular tax sources. Taxes should be raised in the most efficient way possible: higher green taxes should be justified by the environmental costs imposed by different activities. Having an essentially arbitrary target for total green tax receipts could lead to poor policymaking if motoring or other green taxes were indiscriminately raised in order to meet it. Further, the share of receipts from green taxes should not be taken as some measure of the 'greenness' or otherwise of a government. The environmental incentives built into the tax system can be made sharper without raising revenues – the graduated VED and company car tax systems by emissions are good examples – and as people react to these incentives, and reduce damaging behaviours such as burning vehicle fuel, green tax receipts could erode as a natural and desirable consequence (we return to this point shortly). Governments also use non-tax instruments, such as regulation, to achieve environmental objectives. Finally, the share of receipts from green taxes is also very sensitive to the size of the total tax base, which can be heavily influenced by macroeconomic conditions. For example, between the March and November 2011 projections by the OBR, total forecast receipts in 2014/15 were revised down by £40.1 billion owing to the less favourable economic forecast. It was this, rather than any increase in green revenues, which meant that the Chancellor could announce further reductions in fuel duties whilst still technically meeting the pledge to raise the green tax share over the Parliament. Total green tax revenues in 2014/15 were forecast at £56.1 billion in March 2011, compared to £52.5 billion in November 2011. Without the reduction in non-environmental revenues, the changes to fuel duty announced in the November Autumn Statement would have meant that the pledge would be forecast to be missed.

4.2.3 Long-term projections

In June 2011, the OBR published its first *Fiscal Sustainability Report*, setting out long-term tax and spending projections based on current policies (OBR, 2011). This included detailed projections for fuel duty and VED receipts as a share of national income to 2030. The central forecast was that, between 2011/12 and 2029/30, fuel duty receipts (not including VAT) would fall from 1.7% to 1.1% of national income, and VED receipts from 0.4% to 0.1%. The projections are illustrated in Figure 4.5.

Taken together, this implies that receipts from the main transport taxes will be almost 0.9% of national income lower in 2029/30 than today – equivalent to about £13.2 billion in current terms. To put this into perspective, £13.2 billion is approximately equivalent to:

- a 3.4p increase in the basic rate of income tax; or
- a 2.9p increase in all income tax rates; or
- a 1.7ppt rise in the main employee and employer rates of NICs; or
- a 2.7% increase in the main rate of VAT to 22.7%; or
- a 51% increase in the main rates of fuel duty, to over 87p/litre.[32]

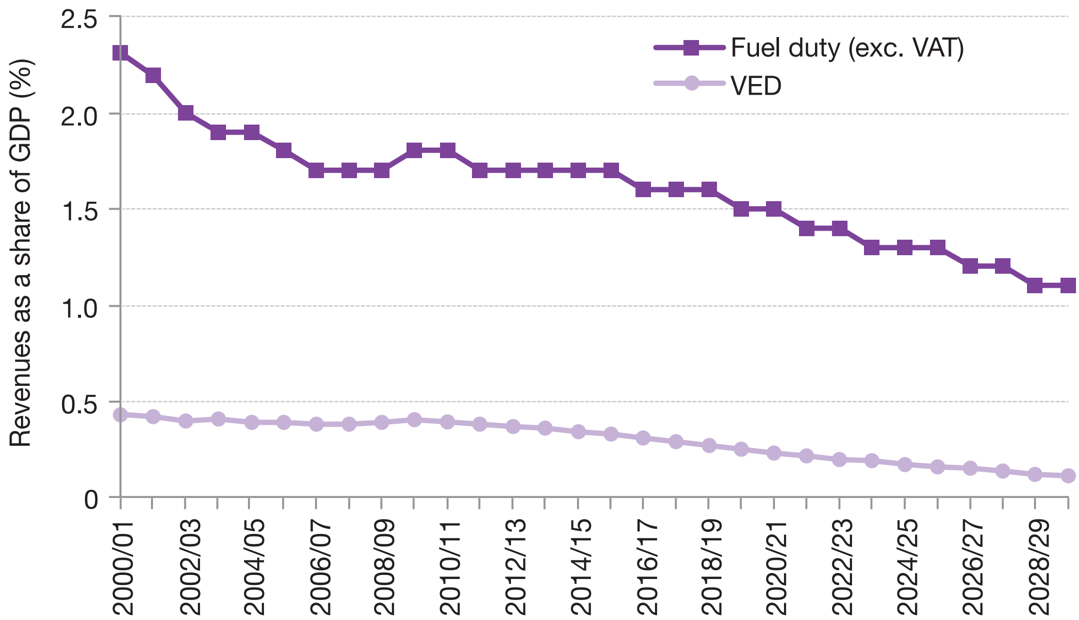
What is driving this downward long-run trend in motoring taxes relative to national income? The decline in fuel duty between 2000/01 and today has been largely attributable to falling real-terms duty rates. However, the OBR forecasts of further declines assume that duty rates are maintained in real terms (based on RPI inflation); instead, the key contribution to further declines in revenues comes from increased fuel efficiency of the vehicle fleet. The OBR assumes that efficiency rises by the amount suggested to be necessary by the Committee on Climate Change (CCC) (2010) if the UK is to be on a credible

32 Estimates are based on the HMRC Ready Reckoner. Note that the revenue impacts of tax changes in the Ready Reckoner are calculated for marginal changes (and, in the case of fuel duty, include assumed demand responses), and so may not be appropriate for extrapolation when the tax changes are very large.

path to meeting its carbon budget obligations: to reduce greenhouse gas emissions by 60% in 2030 compared to 1990 levels.[33] Thus it is assumed that by 2030 the average efficiency of new cars purchased, measured in grams of CO_2 per kilometre driven, will be 49 g, compared to 144 g in 2011. For the overall fleet, efficiency is expected to rise from 168 g to 76 g. This increase will take into account zero-emissions electric vehicles, forecast by the CCC to comprise 16% of new car sales in 2020 (and 5% of the overall fleet), rising to 60% of new car sales in 2030.

33 See www.theccc.org.uk/carbon-budgets/scenarios-to-meet-budgets and http://downloads.theccc.org.uk.s3.amazonaws.com/4th%20Budget/4th-Budget_Chapter4.pdf

Figure 4.5: OBR long-term motoring tax revenue projections, June 2011

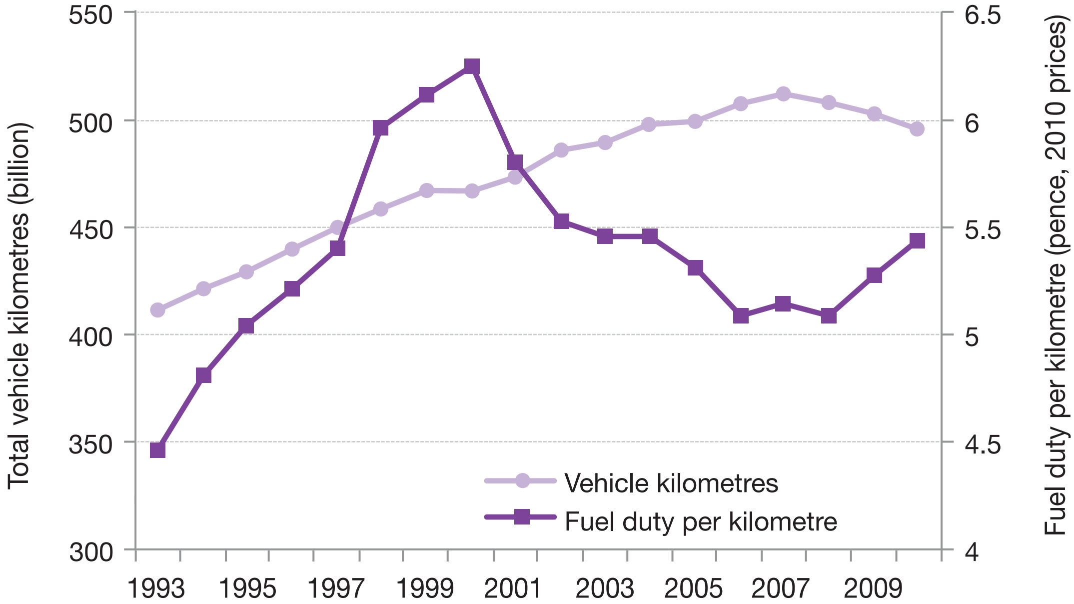


Source: OBR (2011)

It is important to note that the fall in receipts as a share of GDP is not a result of reduced car *use* – the CCC estimates that total distance driven will rise from around 516 billion vehicle kilometres in 2010 to 637 billion by 2030. Despite this, the improvement in vehicle efficiency means that overall fuel consumption is forecast to decline by 20%, from around 44.3 billion litres in 2011/12 to 35.4 billion in 2029/30. Not only is less fuel forecast to be purchased, meaning that fuel duty receipts fall, but cars also fall into progressively lower VED emissions bands as they get more and more efficient: the OBR forecasts suggest that by 2030, 85% of new cars would be exempt from VED altogether.

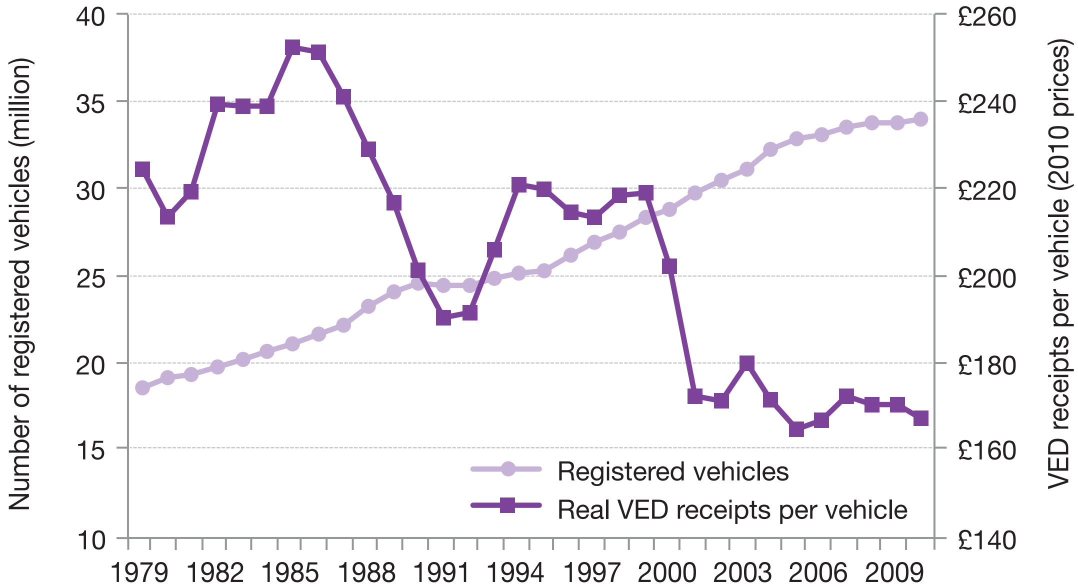
If these efficiency gains are realised, they will only be an acceleration of recent trends which have seen the average VED payment per vehicle on the road and the average fuel duty paid per kilometre driven decline over time (see Figures 4.6 and 4.7). Between 2000 and 2010, following the end of the escalator period, real-terms (2010 prices) fuel duty receipts per kilometre driven fell by from 6.3p to 5.4p (and were as low as 5.1p in 2006). Although the number of registered vehicles continues to increase, the average real-terms payment of VED per vehicle on the road has also fallen. Peaking at around £250 in the mid-1980s, this fell to around £220 in the mid 1990s and, since the introduction of the graduated system, has recently fallen further, to around £170 per vehicle.

Figure 4.6: Real fuel duty receipts per kilometre driven, 1993–2010



Source: Authors' calculations based on DfT and ONS data
Note: distance driven is data for Great Britain, whilst duty receipts are UK totals (i.e. with Northern Ireland included); thus the receipts per kilometre will be slightly overstated.

Figure 4.7: Real VED receipts per registered vehicle, 1979–2010



Source: Authors' calculations based on DfT and ONS data
Note: the number of vehicles is data for Great Britain, whilst VED receipts are UK totals (i.e. with Northern Ireland included); thus the receipts per vehicle will be slightly overstated.

Some comments on the assumptions which underlie the long-run OBR forecasts are worth making. First, the forecasts assume that VED rates rise in line with inflation, but the emissions bands for new cars which determine the rate payable are not adjusted. This seems unrealistic: it is highly likely that as the efficiency of new cars increases, the government will choose to move the thresholds such that it requires people to make progressively cleaner and cleaner vehicle choices if they are to enjoy low VED payments. This has already been happening with company car taxes – the cash income equivalent assumed for someone receiving a petrol-driven company car emitting 144 gCO_2/km in 2006/7 was 10% of the list price, a figure that has now risen to 18% for the same car in 2011/12. However, even under the strong assumption that VED receipts remain unchanged as a proportion of national income to 2030, the decline in fuel duty revenues alone is equivalent to £9.1 billion in today's terms – the amount raised by an increase of around 2.3p on the basic rate of income tax, a rise in VAT to 21.9% or a 35% increase in current rates of fuel duty.

In terms of the assumptions underlying the fuel duty forecasts, the OBR figure is based on a real-terms freeze in duty rates (uprating each year in line with RPI inflation), an increase in oil prices of 2.7% each year, and the efficiency of the fleet evolving as assumed by the CCC to 2030. The main pressure which might mean that the OBR figures *understate* the likely decline in fuel duty receipts relative to GDP would be if oil prices rise more rapidly. This would lead to pressure for duty rates to rise more slowly (which has already happened, given further duty cuts in the Autumn Statement) and to greater incentives to take up more efficient or zero-emission vehicles, which would further erode fuel sales.[34] Of course, if oil prices increase rather less quickly, or even fall from their current levels in a sustained way, then the reverse would be true. Nevertheless, in the absence of what appears to be any likelihood of a sustained, substantial real-terms rise in duty rates akin to that which took place in the 1990s, it seems somewhat unlikely that the long-term trajectory of fuel duty receipts relative to GDP will be upward.

34 It is worth pointing out that there is some uncertainty about the effect of fuel prices on the efficiency of new vehicle purchases in the academic literature. Clerides and Zachariadis (2008), for example, find significant effects of prices in increasing the efficiency of new cars, based on EU-level data; whereas Schipper et al. (2010) do not, based on pooled data from nine OECD countries. There seems to be little evidence that is UK-specific. Klier and Linn (2011) estimate that an increase in UK petrol prices of around 20% would improve fuel economy for new registrations by around 0.19 mpg. However, understanding the relationship between UK fuel prices and the decision to buy more efficient vehicles would benefit from further research.


Controlled
ZONE

5. Do UK Motoring Taxes Accord with the Economic Principles?

This section investigates how closely the current set of motoring taxes matches up to the economic principles we outlined in Section 2. We first examine motoring taxes in relation to the external costs of motoring, and note in particular how fuel duty is unable to reflect the substantial variation in congestion externalities on different roads at different times. We also show how the incentives inherent in the structure of VED to purchase more efficient vehicles have been sharpened over time. We end by briefly assessing issues around simplicity and consistency of taxation, and illustrate how frequent revisions to fuel duty in recent years have potentially undermined the case for pre-announcing future rates when there seems so little likelihood that any plans will be adhered to.

5.1 Taxes and the external costs of motoring

5.1.1 Fuel taxes and marginal externalities

As explained in Section 2, the key justifications for motoring taxes are the externalities associated with road use. The main purpose of taxes is to 'internalise' this externality and thus reduce motoring to a socially optimal level. Motoring generates a number of externalities. Some are related to fuel use – carbon emissions from burning a litre of petrol or diesel, for example. Others relate more to the distance driven, the time and location of driving and so on, rather than fuel consumption directly.

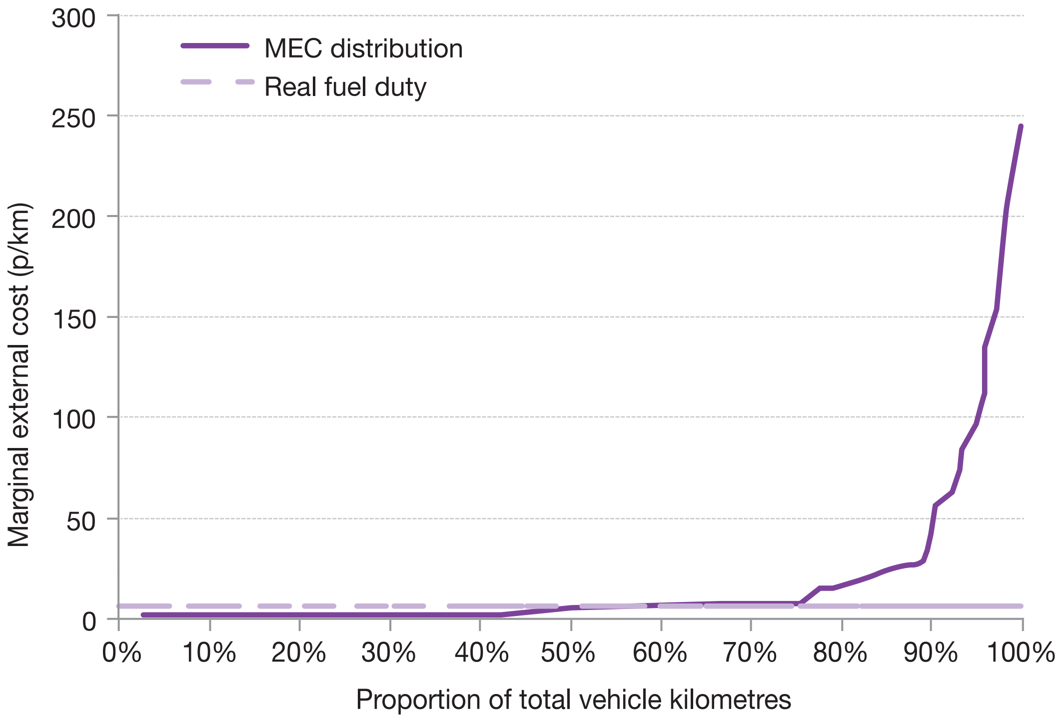
The most significant of these is congestion: the marginal external cost of congestion is much higher in urban areas at rush hour than in a rural area in the middle of the night. This variation results in a distribution of marginal external costs across the total number of vehicle kilometres driven in the UK. This distribution can be estimated using figures from the NTM, which appear in the DfT (2010) study on the benefits of road decongestion. Estimates of the marginal external cost (from congestion and other externalities) for different roads in different areas are made. Together with data on the proportion of total distance driven, we can produce an estimate of the distribution of marginal external costs, as shown in Figure 5.1.

The marginal externality varies greatly across different vehicle kilometres, with a particularly high externality (approaching £2.50 per kilometre) in the most congested areas. On the other hand, for around half the kilometres driven the marginal external cost is very low – perhaps 5p per kilometre or less. It is worth stressing that Figure 5.1 will understate the variation in marginal externalities since it does not capture very time- and location-specific problems, and focuses on eight road types and five congestion bands within each type.

Taxes on fuel – overwhelmingly the largest of the current set of motoring taxes – are clearly unable to capture this sort of variation in marginal external costs.

The amount of fuel duty paid remains (roughly) constant for each kilometre driven irrespective of where or when driving occurs.[35] In 2010, fuel duties amounted to around 5.5p per kilometre driven. This suggests that around 50% of total kilometres are taxed (slightly) more heavily than justified by the marginal externality, around 25% are taxed at about the levels justified by the marginal externality and around 25% taxed less, in extreme cases substantially less.

Figure 5.1: Distribution of the marginal external costs of motoring



Source: Authors' calculations based on DfT (2010) data.
Notes: The marginal external cost (MEC) distribution is derived using estimates of the total motoring externality for all major types of road (conurbation, urban and rural) across different congestion bands. These have been weighted to construct the distribution by using 2010 values of the proportion of total distance driven on each combination of road type / congestion band. These weights are derived by linearly interpolating 2000 and 2025 values given by the DfT (2010).

It is worth clarifying that this distribution of marginal external costs includes some externalities – most importantly climate change costs associated with greenhouse gas emissions – which are virtually the same for each kilometre driven, since they depend on fuel consumption not time or location.[36] For these

35 In fact, fuel duty per kilometre will vary very slightly across time and location, as driving in heavily congested areas will burn an increased amount of fuel, therefore raising the amount of fuel duty paid per km by a small amount. However, this variation is very small, especially when compared to the variation in the motoring externalities that it attempts to correct for.

36 The DfT estimates show some variation in greenhouse gas marginal externalities by road type and congestion level, reflecting differences in fuel consumption from driving at different speeds. But this variation is small, ranging from 0.35p/km to 0.46p/km. By contrast the marginal congestion externality ranges from 0.03p/km on uncongested motorways in rural areas to £2.40/km on heavily congested A roads in conurbations.

externalities, a tax on fuel is a highly effective way of internalising them. But for externalities which are not closely related to fuel consumption, and are instead more related to distance driven and location, fuel duty is an extremely blunt instrument. A system of motoring taxes which varied more directly with the marginal externalities generated would clearly be preferable. People driving in heavily congested areas, or built-up areas (hence generating greater noise externalities), would pay higher taxes than those driving in uncongested, unpopulated areas. We return to this in Section 6 when discussing options for reform – but Figure 5.1 provides a compelling sense of the sorts of efficiency gains which might be available from a better-targeted system of taxation.

5.1.2 Duty differentiation between petrol and diesel

In Section 3, we noted that the UK currently is the only EU member state to tax diesel as heavily as petrol. Whether or not this is sensible depends largely on the external costs associated with the different fuels and the vehicles which use them. In terms of CO_2 emissions, DECC (2011) figures suggest that burning a litre of petrol generates 2.302 kg of CO_2 whereas burning a litre of diesel generates 2.641 kg, which would tend to favour a higher tax on diesel. However, offsetting this is the fact that diesel cars tend to be more fuel efficient than their petrol equivalents, by between 10% and 20% for some popular examples cited by the SMMT (2011a), though their latest figures also show that, at least for new car sales, the average efficiency of new petrol and diesel cars since 2007 has been broadly similar (SMMT, 2011b: 20–22). However, as the carbon externality depends on the quantity of fuel used, not the distance driven, it seems that there is little basis for a more favourable treatment of diesel based on carbon emissions. Similarly, in terms of other environmental pollutants, there does not appear to be a strong case favouring diesel fuel. A 1993 report in the UK by the Quality of Urban Air Review Group for the Department of the Environment noted that diesel use was associated with higher emissions of particulates in urban areas, associated with respiratory problems; this report was influential in the decision to equalise the duty treatment of petrol and diesel in the UK in 1994.

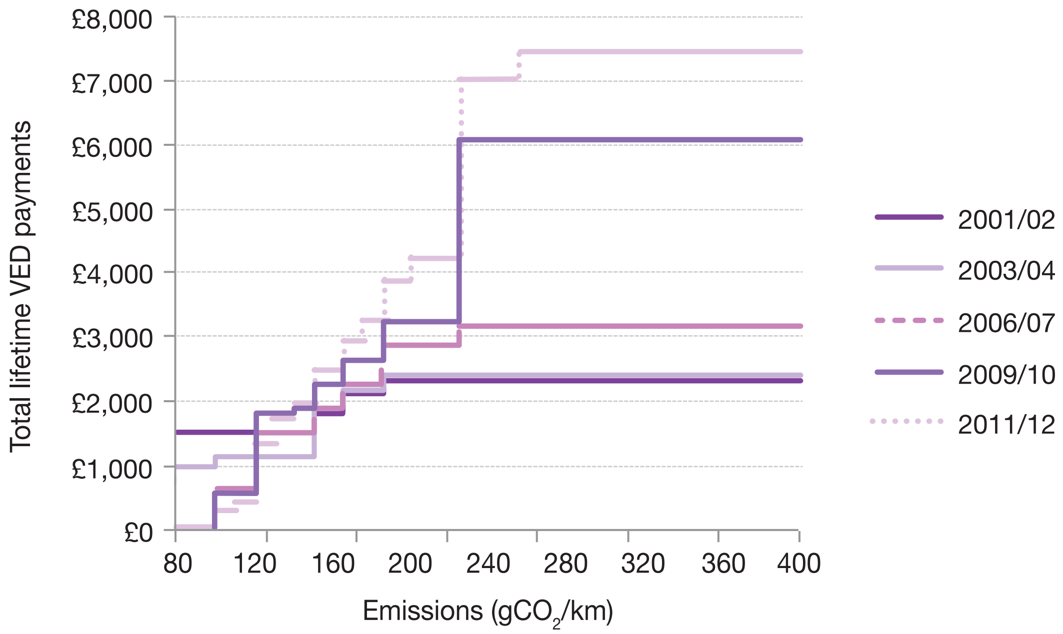
The environmental case for lower diesel duty is therefore weak: if anything, the facts point to higher diesel taxes per litre. Environmental issues are not the only factor behind the decision in many countries to tax diesel more favourably. Traditionally, diesel was used largely by commercial vehicles. Lower taxes on diesel may therefore be a way to favour domestic industries, and might be designed with cross-border issues in mind to the extent that some commercial vehicles (such as freight trucks) are driven internationally. In the UK, this issue is particularly pertinent at the border between Northern Ireland and the Republic, as discussed in Section 2. Over time, diesel engines have become more commonly used in non-commercial vehicles, where the cross-border issues (other than for people living very close to national borders) are probably less severe.

5.1.3 The role of Vehicle Excise Duty

As discussed in Section 3, since VED payments are a fixed annual cost, they do not provide incentives to drive less. Since the move to a graduated system, the clear intention of VED has been to influence vehicle purchase decisions towards lower-emissions options, which, for a given total distance driven, will generate smaller external costs.

Figure 5.2 illustrates how changing VED rates since 2001 have affected these incentives. It shows, for vehicles of different emissions levels, the total VED that would be paid over a vehicle's lifetime, under the assumption that VED rates remain unchanged over the ownership period.[37] Figures are shown for the VED regime in place in different years. The sharpening of the environmental incentives over time is clear, particularly for the more-polluting vehicles. In 2001/02, when graduated VED was first introduced, a car emitting 230 gCO_2/km would incur a lifetime charge of £2,400 whilst a car emitting 95 gCO_2/km would have paid £1,500, 38% less. By 2011/12, thanks in part to the first-year rate, the lifetime payment for the more-polluting car rose to £7,020, whilst that of the less-polluting car fell to zero.

Figure 5.2: Lifetime VED payments by vehicle emissions

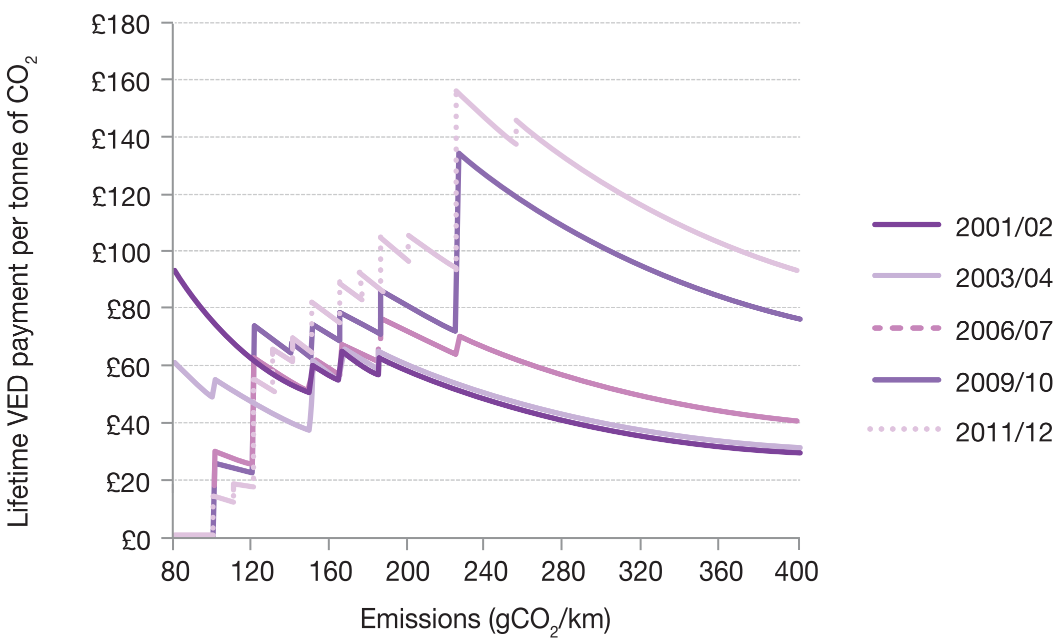


Source: Authors' calculations

37 This uses the assumption that a vehicle's lifetime is 15 years, and that it is driven 200,000 km. We could apply some annual inflation uprating or discount factors to the assumed future VED figures, but this would simply change the levels, not the pattern across different VED regimes, which is the main focus of the figure. Data is for petrol cars.

Figure 5.3 expresses this as VED paid per tonne of CO_2 emitted over the vehicle's lifetime. The 'step-and-slide' nature of the lines reflects the banding of VED, such that within bands more-polluting vehicles pay less per tonne of CO_2 emitted. What is striking is that in the first year of the graduated system, less-polluting cars would actually have paid more per tonne than more polluting cars driven the same distance. By 2006/07, a clear gradation favouring lower emissions vehicles had emerged, but variation in the per-tonne payments across the bulk of the emissions range was low. By 2011/12, there were stronger signals across the range of emissions levels. Given the upper bound on the top band of emissions, though, it is still the case that very highly polluting vehicles will pay less per tonne emitted.

Figure 5.3: Lifetime VED payments per tonne of CO_2, by vehicle emissions



Source: Authors' calculations

Aside from helping sharpen the environmental incentives, the 'first-year' VED rate introduced in 2010 may have other economic rationales if, in making vehicle choices, consumers fail to account properly for the lower fuel consumption, and thus lower running costs, of more efficient but more expensive vehicles.[38] In principle, consumers ought to be indifferent between two cars, where one has a £1 higher upfront purchase cost but costs (in future discounted terms, including the costs of financing the purchase) £1 less to run

38 Note that for a given total lifetime distance, less-polluting (more efficient) cars will use less fuel and so incur lower running costs. On a per-tonne-of-CO_2-emitted basis, however, the payments of fuel duty are the same, since for each additional litre of fuel consumed, an additional fuel duty payment is made. Thus the equivalent chart for fuel duty of Figure 5.3 would simply be a horizontal line depending on distance driven.

over its lifetime, including the future costs of annual VED payments. However, there is some evidence that this is not the case. A literature review by Greene (2010) of 25 estimates finds 12 which suggest consumers undervalue fuel efficiency (in that they are not willing to pay as much as £1 for a £1 reduction in discounted running costs), eight which suggest consumers value it roughly correctly and five which find they *overvalue* it.[39]

The evidence is not therefore totally conclusive, but if consumers do tend to undervalue future running costs, that may be because it is a somewhat difficult calculation, whereas the upfront costs of purchasing are highly visible and salient to consumers. Consumers may also exhibit what is known as 'hyperbolic discounting' (Laibson, 1997), where the immediate future is discounted very heavily in making current choices whereas the more distant future is less heavily discounted against future choices. In either case, a higher first-year VED payment optimally front-loads some of the additional costs of buying less efficient cars.[40] Front-loading the entire payment and replacing annual VED with an upfront purchase tax would, though, mean that there were no ongoing incentives to influence vehicle purchases in the second-hand market, assuming that the purchase tax only applied to new cars.

39 Only two of the studies cited in the paper are from the UK. In general, estimating willingness to pay for future running costs and upfront price requires detailed data on vehicle purchase decisions, including the characteristics of the vehicles and the purchasers. Data in UK household-level datasets, notably the National Travel Survey (see section 3.5), are very limited in this respect, since little is known about precisely which type of car is owned. Aggregate data on vehicle purchasing are limited for this kind of analysis since we do not have information about the purchasers. This means it is very hard to use econometric modelling to estimate what the impact of VED is on vehicle purchase decisions, and thus to inform policymakers about how VED ought to be optimally structured. The lack of good micro-level data on vehicle ownership and purchasing is a limitation in the UK which ought to be addressed.

40 There is discussion in the academic literature about whether the 'undervaluing' of future running costs relative to upfront purchase prices really reflects failures on the part of consumers to understand running costs, or whether it is simply an artefact of the empirical methods typically used. Bento et al. (2010), for example, argue that consumers who care a lot about running costs are more likely to buy efficient (low-cost) cars. Since this preference is not observed as a variable in the data, it is excluded from econometric models of vehicle choice, giving rise to an omitted variable bias which pulls the estimated impact of running costs on vehicle choice towards zero. The authors show that models which explicitly account for these unobserved differences in preferences give results in which running costs are valued properly.

5.2 Other economic principles

5.2.1 Simplicity

As a whole, the system of motoring taxes is relatively simple. There are two major taxes on motoring for most road users – taxes on fuel and vehicle ownership. As discussed in the previous sub-section, however, this simplicity comes at the cost of poor targeting of the external costs associated with motoring. Simplicity in itself, whilst desirable, is not necessarily a feature of optimal tax policy. There is a trade-off between simplicity and the efficiency with which taxes meet often complex economic goals.

There has been a move towards greater simplicity in the fuel tax system with fewer differentiated rates for different fuel types (diesel, leaded fuel, biofuels and so on). For ownership taxes, the move has been in the opposite direction, with a single annual per-vehicle tax rate replaced by a more complex set of tax rates based on vehicle age, engine size, fuel efficiency and year of registration. Of course, this additional complexity arises because of a desire to influence vehicle choice more directly at the time of purchase. Once the vehicle is purchased, only a single rate applies each year for the duration of ownership.[41]

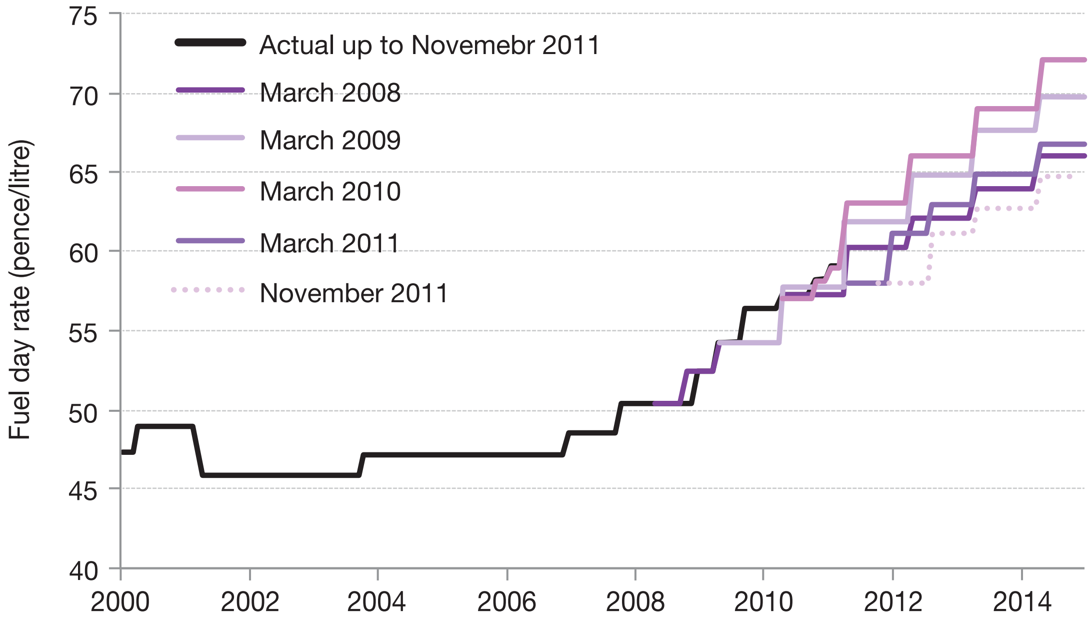
5.2.2 Consistency

As is clear from the discussion of historical policy development in Section 3 (and the details in the Appendix), there has been quite a lot of inconsistency in road taxation policy over time. By inconsistency, we mean in particular that pre-announced changes to taxes have been later amended or dropped altogether, creating uncertainty for motorists as to the likely future direction of policy. This is most notable for fuel duties since the ending of the escalator in 1999. Figure 5.4 shows the out-turn main rate of fuel duty since January 2000, and what the path of duty rates to 2015 would have been had the pre-announced policy towards fuel duty in place in 2008, 2009, 2010 and 2011 actually been followed through.[42] Someone deciding which car to buy in March 2010 following Alistair Darling's final Budget would, on the basis of policy at the time, have expected a duty rate of something like 72p/litre by April 2014. Someone buying in March 2011, just one year later, would have expected a duty rate of 66.7p, and someone buying in November 2011 a rate of 64.7p – little different from the 65.9p rate which would have resulted from the stated fuel duty policy at the time of the March 2008 Budget. This uncertainty makes long-term planning difficult, and begs the question as to why governments seek to set out a path for fuel duty several years in advance, given that there is little expectation that those plans will be stuck to. This making and breaking of plans for fuel tax rates also adds additional uncertainty to the public finances.

41 The rate charged for a particular vehicle is of course subject to annual change and uprating as part of the Budget process, but it is notable that, so far at least, major changes to the structure of VED have not been applied retrospectively, meaning that people who purchased a vehicle under a particular regime continue to pay according to the pre-reform structure.

42 We base forecasts of future policy on out-turn inflation rates up to September 2011 and take forecasts of inflation rates from the November 2011 OBR forecasts up to 2014 Q3.

Figure 5.4: Nominal fuel duty rates implied by policies in place at different times



Source: Authors' calculations based on stated fuel duty policy as announced in various Budgets, PBRs and Autumn Statements, out-turn RPI inflation rates to September 2011 and forecast future inflation rates from the November 2011 OBR forecasts.


UNITED KINGDOM
ENGLAND
WALES
IRISH SEA
Glasgow
Ayr
Southern Uplands
Dumfries
Stranraer
Newcastle upon Tyne
Sunderland
Middlesbrough
Darlington
Scarborough
Solway Firth
Workington
Isle of Man
Barrow-in-Furness
Lancaster
Morecambe
Blackpool
Preston
Southport
Bradford
Blackburn
Leeds
York
Huddersfield
Humber
Kingston upon Hull
Grimsby
Manchester
Sheffield
Bolton
Stockport
Stoke-on-Trent
Mersey
Liverpool
Anglesey
Holyhead
Bangor
Chester
Crewe
Derby
Mansfield
Nottingham
Lincoln
Leicester
The Wash
King's Lynn
Norwich
Snowdon
Shrewsbury
Birmingham
Coventry
Rugby
Northampton
Cambridge
Bedford
Stevenage
Cardigan Bay
Aberystwyth
Worcester
Oxford
Luton
Cheltenham
Gloucester
Cotswold Hills
Swindon
Thames
London
Fishguard
Newport
Cardiff
Swansea
Reading
Woking
Crawley
Hastings
Basingstoke
Bristol
Salisbury
Bristol Channel
Taunton
Exmoor
Southampton
Portsmouth
Brighton
Bournemouth
Weymouth
Isle of Wight
Exeter
Dartmoor
Torquay
Plymouth
Channel
Dublin
Dun Laoghaire

6. Policy Options for the Future

This section draws together our findings so far to discuss possible options for policy reforms in the future. We start by focusing on policy reforms based around the current set of motoring taxes, and in particular exploring 'optimal' fuel taxes. We then move on to look at how the story might change in a world in which other policies – notably road pricing – were added to the mix.

6.1 Reforming the current set of motoring taxes

6.1.1 Are fuel taxes 'too high'?

We start by asking whether the current rate of fuel duty – 57.95p/litre for petrol and diesel – is too high, too low, or about right. We assume a world in which (aside from VED), fuel duty is the only available tax on motoring. The main issue is how fuel taxes compare to the marginal external costs of motoring. Figure 5.1 demonstrated a wide variation in the marginal externality associated with different roads, whilst fuel taxes are roughly constant. If we were constrained to pick a single rate of fuel duty, what would be the appropriate figure?

One answer would be to take an average of the marginal external costs, weighted by current road-use patterns. That would give a measure of the marginal externality associated with a kilometre of road use added randomly to the current network. From Figure 5.1, based on DfT (2010) estimates, this gives a figure of 19.5p/km, compared to actual fuel duty of about 5.5p/km in 2010. On the face of it, this would seem to call for significantly higher rates of fuel duty based on the externalities argument. However, this conclusion is likely to be invalid for several reasons:

1. Diamond (1973) shows that taking a simple weighted average of the marginal externalities is only appropriate when (a) the demand for the externality-generating good depends on its price but not directly on the externality itself, and (b) all consumers have the same price responsiveness. Neither is likely to hold in this case: for a given price of fuel, the level of congestion will have a significant direct effect on the demand for road use, and some kilometres will be more responsive to price than others. The appropriate single tax rate will be lower than a simple weighted average of the marginal external costs if the demand of those motorists generating the highest costs is relatively price insensitive[43] and relatively sensitive to the level of the externality (by far the most significant amongst which is

43 Note that the result depends on price responsiveness – that is, the derivative of demand with respect to price – rather than the price elasticity which multiplies this term by (price ÷ demand). For a given price responsiveness, someone with a higher demand will be less price elastic.

congestion). Why? As the fuel tax increases, it reduces demand for some kilometres (by raising the price) but, by discouraging congestion, it can also simultaneously raise demand for others. If these additional kilometres are associated with higher marginal externalities, then the optimal tax is reduced. It seems plausible that the largest externalities are associated with relatively price-insensitive consumers if they come from peak-time commuter travel in urban areas. This would tend to favour giving a higher weight to the smaller marginal externalities.

2. Figure 5.1 showed the distribution of marginal external costs for current levels of road use. As we discussed in Section 2, however, the appropriate tax depends on the marginal externality at the *optimal* level of road use. This marginal externality is likely to be substantially lower if optimal patterns of use for the current network were associated with significantly reduced congestion. Nash et al. (2004), for example, suggest that in some cases small changes in demand could lead to congestion costs falling to 20% of their pre-change levels.
3. Significant increases in fuel duty would also change the shape of the distribution of marginal externalities from that shown in Figure 5.1. As noted in point 2, small changes in demand on congested roads could lead to much reduced marginal external costs on those roads. In the longer run, much higher duty rates would also speed up the diffusion of fuel-efficient vehicles. This would have two additional effects: first, it would further pull down (on a per-kilometre basis) the marginal external costs, as driving a kilometre would be associated with less fuel consumption. It would also pull down the implied fuel duty per kilometre (the horizontal line on Figure 5.1). Ultimately, then, the challenge would be to use simulation and modelling techniques to assess how higher duties would affect the position of both curves on Figure 5.1 and (following Diamond, 1973) to understand the correct way to weight the distribution of marginal external costs to arrive at a point where the marginal costs equate to the fuel duty rate on a per-kilometre basis.

4. This discussion has omitted any reference to other motoring taxes currently in place besides fuel duty. To the extent that VED (and perhaps non-tax regulations) can be somehow converted to a per-kilometre basis, this would pull up the level of existing explicit and implicit taxation. Existing road pricing, in particular the London Congestion Charge, might also be (imperfectly) capturing some of the larger marginal external costs in Figure 5.1 which would suggest that they should be down-weighted in any averaging to arrive at an appropriate duty rate.
5. Distributional concerns may also play a role: if, for example, motorists generating lower marginal external costs tended to be poorer, this might pull down the optimal tax.

Taking all this together, it is clearly very hard to derive the ‘correct’ rate of fuel duty. Using modelling tools such as the National Transport Model, it would perhaps be possible to assess what the distribution of marginal external costs at ‘optimal’ levels of usage of the current road network would look like. In section 6.2, we go on to discuss evidence on optimal road charging schemes based on this kind of modelling exercise. Given this distribution, we would then need to derive an appropriate set of weights based on estimates of how demand for different kilometres driven responds to prices and to congestion levels.

An alternative approach to estimating appropriate fuel duty rates is taken by Parry and Small (2005). They take a model in which the government seeks to maximise social welfare whilst raising revenues, and ask, given estimates of the external costs associated with motoring, what the optimal (welfare-maximising) fuel duty rate in the UK would be. They conclude that the UK rate is substantially above optimal. Their estimate is an optimal fuel tax of $1.34 per gallon (excluding VAT), equivalent to around 22p/litre at current exchange rates. This is around 36p/litre less than the current fuel duty in the UK. Does this appear to be a plausible result?

Parry and Small start from a world in which the only motoring taxes are those on fuel. Their estimate of the optimal tax is based on a model which has three parts: an adjusted Pigouvian (externality-correcting) tax; a Ramsey tax (for revenue-raising); and a ‘congestion feedback’ component (which relates to the positive impact on labour supply, and hence social welfare, from reduced congestion).

From a Pigouvian perspective, they note that the optimal tax is that which balances the marginal reduction in external costs from a higher duty rate with the marginal increase in costs for motorists. Increases in fuel prices directly reduce demand for fuel, and thus fuel-based externalities. However, the effect on distance driven is indirect. Distance depends on fuel consumption and fuel efficiency; as we discussed above, higher fuel prices will lead to increases in fuel efficiency, which offsets some of the demand reduction. Thus the marginal reduction in distance-based externalities resulting from higher fuel prices is much smaller than would be obtained from simply converting per-kilometre congestion and accident costs into per-litre fuel charges (see also Parry, 2009).

Instead, they must be adjusted by the extent to which the response to taxes occurs through driving less as opposed to driving the same distance, but with greater fuel efficiency.

This adjustment explains in part why their optimal fuel tax is low for the UK. However, a number of the assumed values for the externalities in Parry and Small's study appear to be far too low for the UK. For example, they assume a congestion externality of just 7 cents per mile, which at current exchange rates corresponds to around 3p/km. This is substantially smaller than all of the estimates in Table 2.1, or any apparently sensible weighting of the distribution of externalities from Figure 5.1. They also understate carbon costs relative to the most recent DECC estimates. Their paper includes sensitivity analyses which allow one parameter of the model to be changed at a time, and using these to assume much higher congestion externalities would yield optimal UK duty rates which are at, or even higher than, current levels.

Thus there seems to be evidence that current UK fuel duty rates, in a world in which no other motoring taxes are available, are perhaps below optimal levels, though certainly not by the extent implied from simply comparing the average marginal external cost per kilometre with the implied rate of duty per kilometre as it stands. It is, though, very difficult to put a precise figure on what the duty rate should be, given the complexities highlighted in this section. This, of course, only goes to show the absurdity of using fuel taxes which cannot vary by place or time to try to internalise marginal external costs which have such vast spatial and temporal variation.

However, there are a number of points to make which suggest that, as policy progresses, it is likely that the optimal fuel duty rate will rise (assuming that, as now, fuel duty remains the dominant motoring tax). Firstly, higher fuel efficiency standards will make it increasingly difficult for the response to fuel prices to be expressed in terms of efficiency rather than distance driven. This would imply higher optimal fuel taxes on the basis of the Parry and Small (2005) approach. Secondly, the cost of carbon consistent with the UK meeting its emissions obligations is set to increase. Thirdly, congestion costs are also likely to rise, given forecast increases in road traffic and (at least once the economy returns to growth) increases in the value of time.

6.1.2 A 'fair fuel stabiliser'

Recent years have seen a growing discussion about the possibility of using fuel duties to try and offset fluctuations in global oil prices in order to reduce the volatility of pump prices. In 2008, the Conservatives in opposition published a consultation document on the possibility of implementing a so-called 'fair fuel stabiliser' (FFS) which would see fuel duties cut when oil prices rose, and vice versa (Conservative Party, 2008). As described above, in the March 2011 Budget, the Chancellor enacted what he called a 'fair fuel stabiliser' of a rather different form: having abandoned the 1p above inflation escalator, he announced that real increases in fuel tax rates would only resume if oil prices fell below a certain level – suggested at $75 per barrel – in a 'sustained way' (though exactly what this means is not defined). This provides a link between oil prices and the path of fuel duty policy, but clearly in a much less direct way than the original intention underlying the FFS back in 2008.

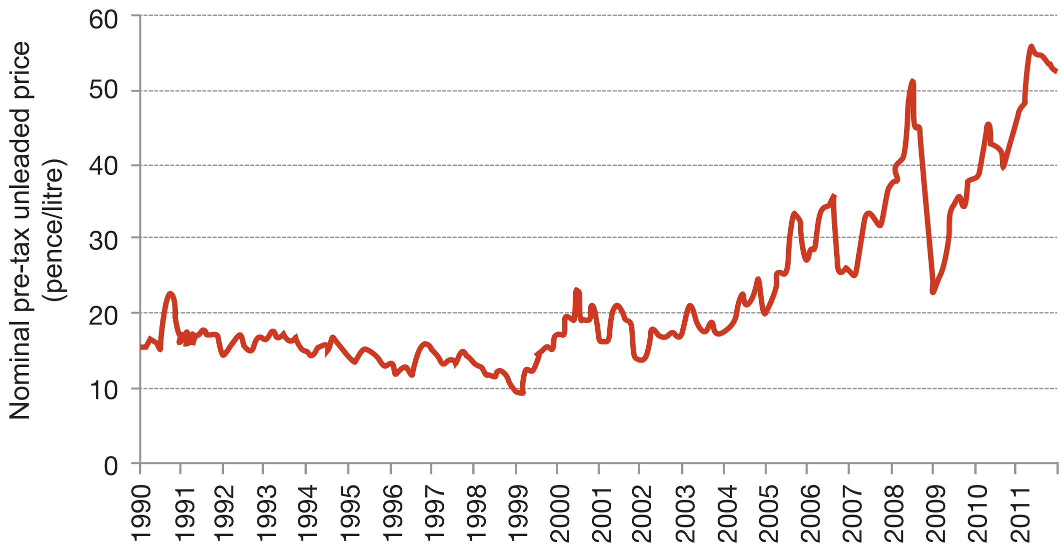
There are two main arguments in favour of a stabiliser policy for fuel prices. First, there may be an economic rationale for tying the duty rate to the pre-tax price of fuel: if prices rise and road use falls, the level of congestion will fall and so too will the marginal congestion externality. Thus the optimal rate of duty may fall as oil prices rise. However, this does not imply that duty changes should offset oil price fluctuations altogether.

The second argument centres around certainty. A successful stabiliser policy would help households and businesses plan their budgets more easily. Vehicle fuel is a relatively large component of overall expenditures. Based on figures in ONS (2011) derived from the 2010 LCFS, for example, average household vehicle fuel expenditure was £21.60 per week, or 5.7% of total spending after housing costs. Fluctuations in fuel costs can therefore have significant effects, particularly for low-income households having to plan regular expenses. For example, Gicheva et al. (2007) find that when fuel prices rise in the USA, consumers respond to short-term falls in their disposable income by buying fewer meals out, and reducing food spending in other ways, such as buying more promotional items in stores. A stabiliser policy might also create more certainty in policymaking. As discussed in section 3.1 and detailed in Appendix A, policy towards fuel duty in recent years has been epitomised by short-term reactions to global conditions, with planned increases in duty announced, then postponed, then abandoned.

However, these arguments need to be set against the difficulties of implementing a stabiliser policy in practice. First, the policy would presumably not aim to fix pump prices in cash terms for evermore from that time on: this would quickly erode duties away to zero, assuming that the long-term trajectory for oil prices (and thus pre-tax fuel prices) is upwards. Thus, the intention would be to stabilise the path of prices around this long-term trend.

The main problem is identifying what this trend is, and, perhaps even more crucially, when movements in the oil price represent short-term deviations from this trend (which should be offset by tax policy) and when they represent a new trend (which should not be thus offset). For example, Salmons (2011) fits a quadratic trend to long-run oil prices as a basis for assessing how successful a stabiliser policy might be. However, there are clearly many ways in which 'trend' oil prices could be estimated. Even more troublesome for any stabiliser policy would be structural breaks when prices move onto a new long-run trend. Figure 6.1 shows the nominal pre-tax price per litre for unleaded petrol since January 1990. There appears to be at least one clear structural break in the trend in 1999, with prices trending gently downwards over much of the period before that and then quite strongly upwards after.

Figure 6.1: Pre-tax unleaded petrol price, January 1990 to December 2011



Source: DECC energy price data

With a long time series of data it may be relatively easy to spot changes in the trend; the problem, though, is identifying changes as they occur. Take the spike in price between 2007 and mid-2008: observed before oil prices fell away again in the latter half of 2008: this might have appeared to be a move to a new, more rapid upward trend in prices. A failure to react quickly to a new trend could lead to large adjustments having to be made to duty rates later on, once the new trend had been identified, which would undermine the supposed stability introduced by the policy. A related issue is how frequently duty rates would have to be adjusted, particularly in a world in which oil prices themselves were quite volatile. Infrequent adjustments could see duty adjustments *reinforce* rather than offset oil price fluctuations – for example, if a spike in oil prices led to a cut in duty weeks or months later, by which time oil prices could be reverting to trend. More frequent adjustments would possibly require new legislation to allow tax rates to be changed outside of the usual Budget process.

Crucial issues for any stabiliser policy are the nature of the market for fuel, both on the supply and demand sides; the relationship between oil prices, fuel taxes and fuel prices (both wholesale and retail); and how a stabiliser policy could change the incentives of different agents in the market. Whilst UK fuel demand is probably not sufficiently large for a stabiliser to affect world oil prices, the domestic market may clearly be impacted. For example, if wholesalers believe that an increase in oil prices would be offset wholly or partly by cuts in duty rates, they may be more willing to pass on higher oil costs into wholesale prices than in a world without such a policy, where the higher costs might be absorbed instead. There is some evidence to support this hypothesis: based on a study of the Italian fuel market, Di Giacomo et al. (2009) estimate that a stabiliser policy which reduced excise taxes by €1 for a €1 increase in oil prices would raise wholesale petrol prices by around 3% compared to the case where there were no offsetting duty changes. Such a reaction would make part of a duty cut following an oil price increase a transfer to the industry rather than providing an effective tax cut for fuel consumers.

Subject to the various problems already identified, even if a stabiliser did help to smooth out household budgeting, it would almost certainly not have that effect on the public finances. Both in their 2008 consultation document and in statements made upon coming to power, the Conservatives implied that higher oil prices led to revenue windfalls for the government which could be 'shared' with motorists through lower duty rates. The main arguments were that higher oil prices translated directly into higher revenues accruing from oil and gas company profits, and from the VAT spent on fuel. However, these increases do not take into account effects on other economic activity. If higher oil prices act as a drag on the wider economy, then profits in other sectors, and hence corporate tax receipts elsewhere, would fall. And if consumers spend more on fuel, then they presumably spend less elsewhere, thereby reducing VAT receipts. Indeed, in his first Budget in 2010, George Osborne asked the independent OBR to provide an assessment of the fiscal effects of higher oil prices. The OBR report concluded that a temporary (one-year) $10-per-barrel rise in oil prices would raise £0.1 billion in the year of the price rise but then reduce receipts by £0.7 billion in the following year owing to these wider effects (OBR, 2010). A permanent $10 increase would have a revenue effect estimated at between +£1.2 billion and -£0.7 billion in year 1, and a loss ranging between -£1.5 billion and -£3.5 billion in year 4. Based on these figures, there is no revenue windfall from higher oil prices which would allow a stabiliser to be paid for without transferring uncertainty from household and business finances to the government.

The politics of a stabiliser would also be interesting. Whilst undoubtedly it would be preferable to have a credible, long-term plan for fuel duty than the *ad hoc* nature of recent policy, it is not at all clear that a stabiliser mechanism would be free from political decision-making. Firstly, the decision about the precise nature of the mechanism linking oil prices and duty rates would almost certainly be as much a political as an economic one. Secondly, whilst it would certainly be easy to win support for duty cuts when oil prices rose, it might be much harder to push through significant duty rises if and when oil prices fell back. This could lead to a 'ratchet' effect which ultimately reduces the fuel tax take, adding additional uncertainty to the public finances.

The environmental impact of a stabiliser for fuel prices is also unclear, in particular in terms of the incentives to buy more fuel-efficient vehicles. Individuals may choose to do so not only because the cost of fuel has risen on average, but also precisely as a way of insuring against the volatility of fuel prices. That is to say that, other factors being equal, the likelihood of buying a more efficient vehicle could rise both with the mean and the variance of fuel prices, such that reducing the variability of fuel price but holding its average value unchanged could lead to a less efficient vehicle fleet overall. Of course, this does not imply that an optimal environmental policy would involve random fluctuations to fuel duties – but it does cast doubt on claims that a stabiliser would have environmental benefits.

Overall, there are clear political attractions to having a fuel price stabiliser, and there may be benefits for household and business financial planning. However, the practical difficulties of implementing the policy would be significant, and it could only be done at the cost of injecting (more) uncertainty into public finances. Perhaps these concerns help to explain why the 'stabiliser' announced by the Chancellor in March 2011 was in reality nothing of the sort, being rather a change in policy towards fuel duty with a condition under which the policy would be re-examined. Spelling out these conditions, at least, is helpful, but it is unlikely to prevent further pressures being heaped on the Chancellor when oil prices are high to make more concessions to pre-announced fuel duty policy – as evidenced by further duty cuts in the 2011 Autumn Statement.

6.1.3 Reforms to other existing motoring taxes

Aside from fuel duty, our discussion of VED and company car taxation in earlier sections suggests some other sensible reforms. Firstly, in relation to VED, it seems sensible that the thresholds for each emissions band be adjusted on an ongoing basis to reflect changes in the composition of the efficiency of the vehicle fleet and to provide ongoing incentives to buy less-polluting cars. Whilst very few vehicles are currently sold in Band A (i.e. emitting 100 gCO_2/km or less), this is unlikely to be true in a few years' time, meaning that attention needs to be paid to the incentives at the bottom as well as the top of the emissions distribution. As we noted in Section 4, without such changes, current long-run forecasts suggest VED receipts will be all but eroded away in the next 20 years. Ultimately, it may be possible to devise a VED system which does away with banding altogether, and links payments directly to emissions levels on a continuous basis. This would eliminate the problem of motorists choosing less efficient cars within emissions bands, at the cost perhaps of additional complexity.

Within the company car tax system, there have been increasingly strong incentives to purchase low-emissions vehicles. The oddest part of the structure remains the 3% diesel supplement which is at odds both with the tax treatment of fuel and the VED system, and should be removed. The basic fuel scale charge should also be maintained against the price of fuel in order that incentives to take employer-provided fuel are not enhanced too greatly by increases in fuel costs for private motorists.

6.1.4 Multi-part instruments

The costs associated with motoring are not always straightforwardly amenable to single tax instruments. A tax on fuel is a good instrument for carbon emissions, as they depend entirely on fuel consumption. However, non-carbon pollutants will depend also on other factors such as the age of the vehicle, what pollution control measures are installed, driving style, the characteristics of the engine and so on. As discussed in Section 5, other costs, such as congestion and noise, also depend on non-vehicle-specific characteristics such as time and location of driving.

Rather than relying on single tax instruments, one option for policymakers is to use a combination of measures – 'multi-part instruments' – which together do a better job of approximating the various costs involved. One option for reform would be to consider how existing motoring taxes could be changed in this way.

Research on this area has focused largely on emissions-related externalities (both carbon and non-carbon). Without exhaust fume monitoring, direct measurement of non-carbon emissions, which might serve as an appropriate base for taxation, is not possible. Fullerton and West (2002) develop a simple theoretical model which confirms that, if the level of emissions were perfectly observable, then a single-rate emissions tax would indeed be optimal. This is the case even in the presence of heterogeneous car owners, who adjust their behaviour in a variety of ways in response to this tax, and do so in the most cost-effective way for each individual (for example, some individuals may buy a smaller car and still drive the same distance, whilst others may simply reduce the distance that they drive).

However, it is difficult to collect information on emissions directly, due to technological and cost constraints, ruling out the use of this 'first-best' option as a practical solution. The issue, then, is how existing tax policy – a combination of taxes on fuel and vehicle ownership – could achieve the next best solution. Whilst at present VED (at least for relatively new cars) depends only on the efficiency of the vehicle and whether or not it is a brand new car, it would in principle be possible to base an ownership tax on other observable vehicle characteristics as well. This might include engine size, fuel type, vehicle age and the presence of pollution control equipment. This is tested in a computational model by Fullerton and West (2010), using data on thousands of cars in California. Eight different tax scenarios are simulated and compared to a baseline situation where motoring is completely untaxed. The welfare gain from introducing the 'optimal' emissions tax is measured, and then compared to the welfare gain produced by each scenario. The greatest welfare gain produced by any of these options is achieved when implementing a combination of a fuel tax, and a tax on two vehicle characteristics (engine size and vintage). This multi-part instrument achieves a welfare gain equivalent to 71% of the total possible welfare gain. This is driven mostly by fuel taxes – without ownership taxes, the fuel tax alone achieves 62% of the optimal gain. Fullerton and Karney (2010) also discuss how other policies such as subsidies to low-emissions vehicles and scrappage incentives for old cars could form part of an optimal policy mix that combines multiple measures.

The existing research addresses only the issue of the externalities associated with *emissions*, whilst ignoring the much larger congestion externality and other location-based costs such as accidents and noise. As a result, it appears extremely doubtful that a multi-part instrument that does not include road pricing, at least to some extent, could successfully mimic the effects of an 'optimal' congestion tax.

6.1.5 Building congestion-related payments into existing instruments

Two recent papers discuss the potential for reforming the main existing motoring taxes – VED and fuel duty – in an attempt to provide more explicit incentives relating to location-based externalities such as congestion and noise. Wadsworth (2011) suggests a flat-rate VED payment for all cars, with a discount on the next annual payment for cars which do not use the most congested parts of the road network. Carey (2011) discusses changes to fuel duty in a similar spirit, with a high basic duty rate (reflecting the marginal external costs of driving on the most congested roads) payable by all cars, and rebates paid when refuelling for those who travel in the least congested areas. Both cases would require some form of monitoring of where and when people drive – in the former case to assess the number of days on which the most congested roads had been used, in the latter to calculate the total rebate due on the next tank of fuel. Carey (2011) suggests making the technology that carries out the monitoring (such as an in-car GPS) voluntary in order to avoid possible concerns about compulsory monitoring, which are commonly expressed when it comes to road pricing. Anyone wishing to claim duty rebates would, though, need the technology to be installed. Clearly, if fuel duty were set at very high levels, it would then be optimal for almost all motorists to install the monitoring device. However, there could be greater acceptance of this approach than a compulsory system if motorists felt the purpose behind monitoring their driving was to ascertain how much money they might save, rather than how much they would need to pay under a charging scheme. One danger of this opt-in approach, though, is that there are many examples (most obviously in domestic energy efficiency) of consumers failing to act on what appear to be quite strong money-saving incentives.

Both proposals are interesting, and take what might be seen as a pragmatic approach in trying to better approximate the various costs of motoring using clever adaptations of existing taxes, rather than a new pricing regime which might wholly or partly replace them. To the extent, though, that both ultimately rely on the same sort of monitoring of driving location as would be required under a road pricing scheme, there seems to be little to gain from implementing them in preference to road pricing itself.

6.2 Introducing new instruments

The discussion in section 6.1 is based on a world with a strictly limited set of policies available for the government. We now move on to examining a scenario where other policy options – notably road pricing – are introduced, describing the benefits from using such policies and investigating the issues that surround their implementation.

As we saw in the previous subsection, the questions concerning the level of the ‘optimal’ fuel tax were based largely around how such a tax compares to the marginal external costs of motoring. We noted that, as the marginal external costs of congestion (as well as other time- and location-based costs such as noise and accidents) vary greatly whilst fuel duty remains constant, deriving a single optimal duty rate is extremely difficult. It is also likely that, over time, fuel duty will capture these costs less accurately. As fuel efficiency rises and the market penetration of electric vehicles gathers pace, total fuel consumption from motoring will fall, even if traffic volumes continue to rise. This will result in congestion becoming an ever larger part of the total externality from motoring, and make fuel duty an ever poorer instrument to target it accurately.

The availability of other policy options makes addressing these issues easier. In particular, road pricing is a particularly attractive option, facilitating the ability of the government to target the marginal externalities more directly, and leaving taxes on fuel to internalise fuel-based marginal costs such as carbon-related ones. Revenues from road pricing would depend on total traffic levels, and where and when motoring occurred, and would therefore be much less vulnerable to erosion in the way that is currently forecast for fuel duty receipts.

Empirical estimates of the impact of a national road pricing scheme have identified large potential welfare gains from the more accurate targeting of the costs of motoring. Eddington (2006) estimates that the introduction of a relatively sophisticated national road pricing scheme comprising 75 different pricing bands could lead to annual welfare gains (in 2002 prices) of £25 billion by 2025, though with considerable uncertainty about the magnitude of this figure.

The logic of road pricing becomes particularly clear once we consider the potential for widespread electrification of the vehicle fleet. As we noted in Section 4, estimates from the CCC are that by 2030 around 60% of new car sales will be of electric vehicles. Taken to an extreme, we could imagine a world in which all cars were electric, with the result that marginal externalities from greenhouse gases, local pollutants and (largely) noise were eliminated. On that basis, using the DfT estimates which underlie Figure 5.1, the average of the marginal external costs from a random kilometre of road use added to the network would fall – but only slightly, from 19.5p to 18.4p. As we have stressed repeatedly, the congestion externality would still remain (as would smaller externalities from accidents and road damage), even in a world where all vehicles were electric. Yet in this world, receipts from fuel taxes and VED would be eliminated altogether under the current regime. Electricity consumption could of course be higher. So long as the carbon costs of electricity generation were appropriately internalised into electricity prices (as is the case at present under the EU ETS), the climate change externality would be accounted for.[44] But the other external motoring costs would not.

Despite these potential gains, practical difficulties abound when implementing road pricing, with several important barriers remaining. Firstly, identifying the correct price to be charged for each type of road, at each time, is very complex. Although the direct targeting of the externalities is the very benefit of the scheme that is most desirable, producing reliable and timely estimates for the actual size of these costs is difficult. In particular, as noted in section 6.1, the challenge is to identify the appropriate price at the *optimal* level and pattern of motoring across the network. This requires model-based estimates from something like the DfT's National Transport Model. Such an attempt is made by Glaister and Graham (2004), who model a set of 'fully efficient' road user charges and their overall effects on both car users and the Exchequer. They use DfT data from 2000 covering 8,960 combinations of location, road type, and time and direction of travel. Many of their optimal charging estimates are based on Sansom et al.'s (2001) marginal external cost calculations (see Table 2.1); new estimates based on more up-to-date figures would be useful for thinking about the practical implementation of a road pricing system.

Were a charging regime established from such modelling, it would almost certainly require an initial period of adjustment and feedback as the system bedded in and real observable behavioural responses took place. This could generate an early period of uncertainty. Experience from the introduction of the London Congestion Charge showed that initial estimates understated the true response in terms of traffic volume.

A number of other practical issues also exist. In particular, this includes the set-up and running costs of the technological requirements for implementing the system, and the public acceptability of such a scheme. The initial costs of implementing a national pricing scheme would likely be high. DfT (2004) feasibility study and Eddington (2006) envisage a system that requires on-board units (OBUs), that monitor the time, location and distance driven, to be fitted on each vehicle. It would be costly to retrofit the entire existing car parc with OBUs, although this cost would fall over time with new cars being automatically fitted with this technology. It may also be possible to piggyback on the widespread use of GPS technologies such as satnav systems.

44 Note that UK emissions which are covered by the EU ETS, such as those from electricity generation, have a lower 'carbon price' than is assumed for emissions not covered by the ETS, such as those from vehicle fuel. The gap between 'traded' and 'non-traded' emissions reflects the fact that UK targets for emissions reduction take the ETS price as given, and estimate the necessary price in the non-traded sector compatible with meeting these objectives. Current DECC estimates for 2012 give a value of £56 per tonne of CO_2 in the non-traded sector and £14 in the traded sector.

A large range of estimates exist for these start-up costs. The DfT (2004) study suggests that they could range anywhere between £10 billion and £60 billion, whilst Banks et al. (2007) give a range from £10.7 billion to £28.1 billion. This range is due largely to uncertainty over the cost of the required technology in the future and the possibility of 'optimism bias', where initial cost estimates tend to be revised upwards rather than downwards. Aside from these initial start-up costs, annual running costs may also be high. The DfT (2004) suggests a figure in the range of £2 billion to £5 billion. Eddington (2006) also produces an almost identical figure, largely reflecting administration costs, whilst Banks et al. (2007) suggest estimates between £2.1 billion and £2.8 billion. The costs of collection and enforcement of a road pricing system would almost certainly be much higher than those for fuel duty.

Public opinion also clearly presents a significant hurdle to national road pricing. For example, 1.8 million people signed an e-petition in 2007 against the introduction of national road pricing. Referenda held on the possible introduction of city congestion schemes were defeated in Edinburgh in 2005 (74% voting "no") and in Manchester in 2008 (79% voting "no"). Numerous studies have been undertaken to explore public attitudes towards congestion charging, and to identify the concerns of those who oppose the scheme. The DfT (2010) finds that 52% of respondents agreed to some degree that the method of road charging should be changed, focusing on where and when people drive. However, when asked directly whether they think that motorists who drive on busier roads should be charged more, only 22% agreed to some degree. When asked if they thought that road pricing would reduce congestion, only 29% of respondents in 2010 agreed, suggesting as one reason for a relative lack of support considerable scepticism about the policy having any positive impact. Another clear concern was about the cost

of charging. However, when asked if they would be “prepared to accept road pricing as long as there was no overall increase in the amount of taxation paid by motorists as a group, even if this meant some people paying more than they do at present?”, slightly more agreed than disagreed (38% to 34%). This suggests that road pricing could have greater public acceptance if the overall cost of motoring did not rise. These results are largely reflected by the findings of Owen et al. (2008) and Arnold et al. (2010), where the latter reviews international experiences of introducing road pricing or congestion charges and highlights public acceptability as a key issue.

Perceptions can also change over time. Before the imposition of the congestion charge in 2003, only 40% of Londoners were in favour of it. However, by 2006, by which time the scheme was an established policy, this increased to 59% (Dix, 2007). Similar results emerge from international experience. Between January and June 2006, a pilot congestion charge was introduced in Stockholm. Following this trial period, the charges were reintroduced permanently in August 2007. Public support stood at roughly 36% before the trial was introduced, but rose to 74% by 2010 (Walker, 2011). A similar trend is observed in Norway following the introduction of toll ring roads in the cities of Bergen and Oslo. However, support for the scheme appears to be strongly negatively related to prices: road pricing becomes less acceptable if it is perceived as too costly. It would be interesting to see whether support for the London scheme has fallen in recent years as the charge has risen.

Public acceptability of road pricing would seem to be at least partly contingent on issues related to perceived fairness and a sense of whether it was adding to the tax burden on road use. Our discussion in section 6.1 made clear that it was hard to determine whether current levels of motoring taxes were appropriate, in large part because of uncertainty about the distribution of optimal road charges and the difficulties of assessing optimal taxation using such poorly targeted instruments. Based on the Parry and Small (2005) analysis of optimal taxation with more appropriate estimates of carbon and congestion externalities, there might be a case for some overall increase in motoring-related taxes, though probably not a substantial one. Certainly, a system of road pricing targeted on where and when people drove which was able to relatively accurately capture congestion and other location-based marginal externalities would only be justified with a substantial cut in fuel duty towards levels rationalised by the carbon costs of fuel. In Section 2 we suggested that these levels were around 14p/litre at current estimates of carbon costs. This will rise in the future with the carbon price. To the extent that there are other fuel-related emissions and a revenue-raising component to fuel taxes, there would be a case for a duty rate somewhat above this level even after road pricing were introduced. The role of VED in a post-charging world might, if anything, become more important. Assuming that fuel duty rates were cut substantially, the incentives in the tax system to purchase more fuel-efficient vehicles would come more strongly through annual VED payments than fuel excise duty.

The result of a comprehensive road pricing scheme would certainly be to raise motoring costs for urban motorists and reduce them for rural motorists. Within areas there would also be groups of winners and losers – for example, urban motorists using the network outside of peak hours could actually be net beneficiaries, whilst those using roads at peak times could be significant net losers. An important part of any planned scheme would be to attempt to understand in detail which groups would be affected, whether there are significant resulting distributional concerns, and what possible compensatory measures might be desirable. Graham et al. (2009) model the impact of a national road pricing scheme and explore the impact at a finely detailed regional level. They find that on average the most deprived 20% of areas would face the largest charges, as they tend to be more heavily urbanised and thus congested. However, there is little evidence on the subject of how a charging scheme might impact high- and low-income households within more- and less-deprived areas.

Clearly, introducing a national system of road pricing faces many barriers. As a result, it would take some time to address these issues and to introduce such a system. There would need to be a thorough consultation exercise to determine the proper charging regime, and a pre-announced commitment to introducing the scheme a number of years in advance to allow households and businesses the time to adjust.

Whilst the potential welfare benefits from a national road pricing scheme are significant, there may be substantial gains to be had from simpler schemes that target particular areas or key road types. These might appropriate most of the welfare gains at smaller cost. Eddington (2006), for example, estimates that a pricing system introduced in urban areas alone would reduce total congestion by 43%, only slightly less than the 48% fall projected under a national system. Glaister and Graham (2004) come to similar conclusions when investigating the effect of waiving a charge on distances that incur a marginal external cost below a specific threshold, and focusing charging only on urban areas. They estimate that these waivers would reduce the proportion of traffic affected by the charges from 92% to 45%, whilst reducing revenues by only 20%. Leape (2006) also agrees that charging schemes in urban areas would yield much of the benefit that a national road pricing system would produce.

All of the above suggests that simplified, localised systems can potentially achieve many of the gains of a more complex, national system for a much smaller cost. One issue for such a scheme is how fuel taxes ought to be adjusted as a result – to the extent that not all the marginal congestion or other location-specific externalities are adequately captured, there would still appear to be a case for fuel taxes in excess of the marginal carbon cost per litre, but the difficulties discussed in section 6.1 concerning how to estimate the appropriate price would remain. There may also be a greater sense of unfairness amongst those affected if it is perceived that not all motorists are facing the same pricing and taxation regime.

A final important issue is whether any road pricing regime ought to take the road network as a given, or consider it variable in determining the optimal pricing structure. In the short run, taking the network as fixed is clearly appropriate, the aim of charging being to optimise use of the network as given through the price mechanism. In the long run, however, there are two effects that would be important. Firstly, investment in the road network can create new capacity which would change the optimal structure of charging. For example, a heavily congested (and thus heavily priced) road could have additional lanes added which substantially reduce congestion, and thus also the optimal price for that road. Secondly, the response of road users to charging in the short run might involve changing where and when driving takes place. In the long run, however, responses might include changing location decisions for housing and business, perhaps moving away from high-charge areas towards low-charge areas. This alters long-term demands on the network and so would affect optimal pricing in different areas as people responded to these incentives. A report commissioned by the New Zealand Ministry of Transport (2005) describes the difference between short- and long-run marginal cost pricing for road use taking these sorts of responses into account. The long-run marginal cost (which potentially also includes the marginal cost of capacity provision) allows for optimal adjustment of the network in response to changes in demand and may be a better basis for pricing to give the appropriate long-run price signals to road users. For example, a new motorway may have low short-run costs if it is uncongested; if this stimulates local demand for housing and businesses, then demand for the road in the long term increases, pushing up congestion costs and thus appropriate road charges. If this were priced into the road to begin with, it might lead to better long-run location decisions. Clearly, though, the challenge of identifying these long-run costs is formidable.

7. Conclusions

This report has assessed to what extent the current system of UK motoring taxes falls in line with good economic principles. The main reason why governments should intervene in motoring decisions is that motoring generates external costs which lead to an inefficiently high private demand for road use. These external costs are overwhelmingly dominated by the costs of congestion. Existing motoring taxes, particularly taxes on vehicle fuel, are completely incapable of being deployed in a manner that effectively accounts for the costs of congestion, since they do not vary according to where and when people drive; however, where and when people drive is the key determinant of congestion costs.

For this reason, a much more efficient system of motoring-related taxes would have at its core a road pricing scheme which varied along these dimensions and so more precisely targeted the costs associated with motoring. Once introduced, it would appear very hard to rationalise current levels of fuel duty in the light of non-congestion external costs alone. Instead, fuel duty should be reduced to better reflect the costs of carbon emissions and perhaps also other harmful emissions associated with fuel use, with the road pricing scheme being an appropriate instrument to deal with area- and time-specific costs, including congestion, road damage costs, accidents and noise.

The economic benefits which such a scheme could generate are potentially very large, and the principles behind such a reform have been known for a long time. It may be that what finally propels policymakers to act is not this economic logic, but instead the pressure on the public finances that may be brought to bear by a gradual erosion of receipts from fuel taxes and perhaps also from Vehicle Excise Duty (VED), as motorists choose ever more efficient vehicles and even zero-emission electric vehicles which use no onboard carbon-based fuel at all. Current estimates suggest that, based on forecasts of future vehicle efficiency, receipts from fuel duties and VED could fall by the equivalent of more than £13 billion in today's terms by 2029. These losses could be offset by increases in other taxes, or by very substantial increases in fuel taxes on the shrinking base of motorists who continue to rely on conventional fuels for motoring. To raise an additional £13 billion from fuel duty alone, though, would require enormous increases in duty rates, perhaps in excess of 50%. Whilst at present it does not appear that motoring taxes have a particularly greater impact on poorer households, it may be that in the long term, if it is low-income households who are less able to respond to the incentives to buy low- or no-emissions vehicles, the scale of duty increases required to maintain receipts would lead to these taxes becoming increasingly regressive.

There are perhaps formidable barriers to implementing a national road pricing scheme. These include the costs of setting up and running the system, and the constraints imposed by public opinion, which is at present largely hostile. The net benefits of simpler schemes which apply only to certain areas or key roads could capture a large proportion of the benefits of a more complex, national system whilst being simpler to administer. In terms of public acceptance, policymakers ought to be making a clear case for reform now, and laying the ground for change in the medium term without putting off reform indefinitely. Where road pricing has been introduced in localised forms, public opinion has tended to become more favourable once the policy is in place than it was beforehand. Pointing out the likely benefits, including reduced congestion and the fact that fuel duty would be substantially cut, could also help to change the public mood.

In the meantime, a clearer and more consistent approach to setting fuel duty rates would be desirable. It is extremely hard to pin down the 'right' rate of fuel duty, given that the tax is rationalised for the most part by congestion. Detailed modelling work might give us a clearer answer, though it is not obvious that current duty rates are much too high (or indeed much too low). Whether or not there is currently scope for increased duty rates, what is clear is that the recent history of fuel duty policy is far from an example of good policymaking at work. Since the duty escalator was abandoned in 1999, there have been repeated cases where duty increases were introduced, then postponed, then abandoned altogether. This generates uncertainty for consumers, businesses and the public finances. A better approach would be to refrain from setting out duty rates years in advance – almost in the expectation that the plans will not be followed through – but instead to set out broadly the circumstances in which duty would be increased or reduced in real terms. A move in this direction was made with the so-called 'stabiliser' which set out a threshold oil price below which real-terms duty increases would resume. However, this was followed up almost immediately by further short-term concessions on duty in the face of public pressure and continued high pre-tax prices. The case for a genuine 'fair fuel stabiliser' which adjusts duty rates automatically to pre-tax prices is, though, weak.


LOOK RIGHT
LOOK LEFT

8 References

Advani, A., Leicester, A. & Levell, P. (2011). *Hyping Hypothecation: Should Green Tax Revenues be Earmarked?* IFS Observation. Retrieved 29 February 2012 from www.ifs.org.uk/publications/5622.

Arnold, R., Smith, V. C., Doan, J., Barry, R., Blakesley, J., DeCorla-Souza, P., Muriello, M., Murthy, G., Rubstello, P. & Thompson, N. (2010). *Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore*. Washington, DC: Federal Highway Administration. Retrieved 29 February 2012 from http://international.fhwa.dot.gov/pubs/pl10030/pl10030.pdf.

Banks, N., Bayliss, D. & Glaister, S. (2007). *Motoring Towards 2050: Roads and Reality*. RAC Foundation. Retrieved 29 February 2012 from www.racfoundation.org/research/economics/Roads-and-Reality.

Bayliss, D. (2011). 'A speculative estimation of direct road user charging impacts'. Published as Appendix to Glaister, S., Lytton, L. & Bayliss, D. (2011), *Funding Strategic Roads*. RAC Foundation. Retrieved 29 February 2012 from www.racfoundation.org/assets/rac_foundation/content/downloadables/funding_strategic_roads-glaister_lytton_bayliss-291111.pdf.

Bento, A. M., Li, S. & Roth, K. (2010). *Is There an Energy Paradox in Fuel Economy? A Note on the Role of Consumer Heterogeneity and Sorting Bias*. Resources for the Future (RFF) Discussion Paper 10-56. Retrieved 29 February 2012 from www.rff.org/RFF/Documents/RFF-DP-10-56.pdf.

Blow, L., Leicester, A. & Smith, Z. (2003). *London's Congestion Charge*. IFS Briefing Note 31. Retrieved 29 February 2012 from www.ifs.org.uk/bns/bn31.pdf.

Bovenberg, A. & Goulder, L. (2002). Environmental taxation and regulation. In Auerbach, A. and Feldstein, M. (eds.), *Handbook of Public Economics*, 3. Amsterdam: North Holland Elsevier.

Bovenberg, A. & R. de Mooij (1994). Environmental levies and distortionary taxation. *American Economic Review*, 84(4): 1085–1089.

Carey, P. (2011). *A Fairer Way of Paying to Drive: Making Fuel Duty More Intelligent*. RAC Foundation. Retrieved 29 February 2012 from www.racfoundation.org/assets/rac_foundation/content/downloadables/a_fairer_way_to_drive-carey-181011.pdf.

Christiansen, V. & Smith, S. (2009). Externality-Correcting Taxes and Regulation. *CESifo Working Paper Series No. 2793*. Retrieved 29 February 2012 from http://ssrn.com/abstract=1479478.

Clerides, S. & Zachariadis, T. (2008). The effects of standards and fuel prices on automobile fuel economy: an international analysis. *Energy Economics*, 30: 2657–2672.

Conservative Party (2008). *A Fair Fuel Stabiliser: A Consultation on the Future of Fuel Taxation*. Retrieved 6 March 2012 from www.conservatives.com/~/media/Files/Downloadable%20Files/A%20Fair%20Fuel%20Stabiliser%20A%20consultation%20on%20the%20future%20of%20fuel%20taxation.

Corlett, W. & Hague, D. (1954). Complementarity and the excess burden of taxation. *Review of Economic Studies*, 21(1): 21–30.

Crossley, T., Leicester, A. & Levell, P. (2010). 'Fiscal stimulus and the consumer'. In Chote, R., Emmerson, C. & Shaw, J. (eds.), *The IFS Green Budget 2010*. IFS. Retrieved 29 February 2012 from www.ifs.org.uk/budgets/gb2010/10chap3.pdf.

DECC (Department of Energy and Climate Change) (2011). *Annex A: Energy and Commodity Balances, Conversion Factors and Calorific Values*. Retrieved 6 March 2012 from www.decc.gov.uk/assets/decc/11/stats/publications/dukes/2293-dukes-2011-annex-a.pdf.

DfT (Department for Transport) (2004). *Feasibility Study of Road Pricing in the UK*. London: DfT.

DfT (2010). *Transport Analysis Guidance (TAG) Unit 3.9.5: MSA Major Schemes Appraisal Road Decongestion Benefits*. Retrieved 29 February 2012 from www.dft.gov.uk/webtag/documents/expert/pdf/unit3.9.5.pdf.

DfT (2011). *Transport Statistics Great Britain: 2011*. Retrieved 29 February 2012 from www.dft.gov.uk/statistics/releases/tsgb-2011-roads-and-traffic/.

DfT (2012). *Charging Heavy Goods Vehicles*. Retrieved 29 February 2012 from www.dft.gov.uk/consultations/dft-2012-03/.

Diamond, P. (1973). Consumption externalities and imperfect corrective pricing. *The Bell Journal of Economics and Management Science*, 4(2): 526–538.

Diamond, P. & Mirrlees, J. (1971). Optimal taxation and public production I: production efficiency. *American Economic Review*, 61(1): 8–27.

Di Giacomo, M., Piacenza, M. & Turati, G. (2009). *Are "Flexible" Taxation Mechanisms Effective in Stabilizing Fuel Prices? An Evaluation Considering the Italian Fuel Markets*. University of Turin, Department of Economics and Public Finance "G. Prato" Working Paper 7. Retrieved 29 February 2012 from http://web.econ.unito.it/prato/papers/n7.pdf.

Dix, M. (2007). *An update from London: the evolution of the scheme*. EU Road User Charging Conference, London.

Eddington, R. (2006). *The Eddington Transport Study*. London: DfT.

Environmental Audit Committee (2011). *Budget 2011 and Environmental Taxes*. The Stationery Office Limited. Retrieved 29 February 2012 from www.publications.parliament.uk/pa/cm201012/cmselect/cmenvaud/878/878.pdf.

Fullerton, D. & Karney, D. H. (2010). 'Combinations of instruments to achieve low-carbon vehicle-miles'. In OECD (2010), *Stimulating Low-Carbon Vehicle Technologies*. OECD Publishing. Retrieved 29 February 2012 from http://works.bepress.com/cgi/viewcontent.cgi?article=1059&context=don_fullerton.

Fullerton, D., Leicester, A. & Smith, S. (2010). 'Environmental taxes'. In Mirrlees, J., Adam, S., Besley, T., Blundell, R., Bond, S., Chote, R., Gammie, M., Johnson, P., Myles, G. & Poterba, J. (eds.), *Dimensions of Tax Design: The Mirrlees Review*. Oxford University Press. Retrieved 29 February 2012 from www.ifs.org.uk/mirrleesreview/dimensions/ch5.pdf.

Fullerton, D. & West, S. (2002). Can taxes on vehicles and on gasoline mimic an unavailable tax on emissions? *Journal of Environmental Economics and Management*, 43: 135–57.

Fullerton, D. & West, S. (2010). Tax and subsidy combinations for the control of car pollution. *The B.E. Journal of Economic Analysis and Policy,* 10(1): Article 8.

Gicheva, D., Hastings, J. & Villas-Boas, S. (2007). *Revisiting the Income Effect: Gasoline Prices and Grocery Purchases*. National Bureau of Economic Research Working Paper 13614.

Glaister, S. & Graham, D. (2004). *Pricing Our Roads: Vision and Reality*. The Institute of Economic Affairs. Retrieved 29 February 2012 from www.iea.org.uk/sites/default/files/publications/files/upldbook247pdf.pdf.

Graham, D., Glaister, S. & Quddus, M. (2009). Testing for the distributional effects of national road user charging. *International Journal of Sustainable Transportation*, 3(1): 18–38.

Greene, D. L. (2010). *How Consumers Value Fuel Economy: A Literature Review*. US Environmental Protection Agency. Retrieved 29 February 2012 from www.epa.gov/otaq/climate/regulations/420r10008.pdf.

HMRC (Her Majesty's Revenue and Customs) (2011a). *Measuring Tax Gaps 2011*. Retrieved 29 February 2012 from www.hmrc.gov.uk/stats/mtg-2011.pdf.

HMRC (2011b). *Hydrocarbon Oils Duties*, Statistical Bulletin (October). Retrieved 1 March 2012 from https://www.uktradeinfo.com/index.cfm?task=bulloil.

HMRC (2011c), *Direct Effects of Illustrative Changes*. Retrieved 1 March 2012 from www.hmrc.gov.uk/stats/tax_expenditures/table1-6.pdf.

HM Treasury (2002). *Modernising the Taxation of the Haulage Industry – Progress report one*. Retrieved 6 March 2012 from www.hm-treasury.gov.uk/d/modernising_haulage.pdf.

Jin, M., Joyce, R., Phillips, D. & Sibieta, L. (2011). *Poverty and Inequality in the UK: 2011*. IFS Commentary 118. Retrieved 1 March 2012 from www.ifs.org.uk/comms/comm118.pdf.

Klier, T. & Linn, J. (2011). *Fuel Prices and New Vehicle Fuel Economy in Europe*. RFF Discussion Paper 11-37. Retrieved 1 March 2012 from www.rff.org/RFF/Documents/RFF-DP-11-37.pdf.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics,*112(2): 443–477.

Leicester, A. & Levell, P. (2010). *It's Not Easy Being Green: Raising the Share of Environmental Taxes in Total Receipts*. IFS Observation. Retrieved 1 March 2012 from www.ifs.org.uk/publications/5189.

Leicester, A. & Levell, P. (2011). 'Environmental policy'. In Brewer, M. et al. (eds.), *IFS Green Budget 2011*, IFS Commentary 117. Retrieved 1 March 2012 from www.ifs.org.uk/budgets/gb2011/11chap11.pdf.

Leape, J. (2006). The London Congestion Charge. *Journal of Economic Perspectives*, 20(4): 157–176.

Lucas, K. & Jones, P. (2009). *The Car in British Society*. RAC Foundation. Retrieved 1 March 2012 from www.racfoundation.org/research/mobility/car-in-british-society.

McKinsey & Company (2011). *Keeping Britain Moving: The United Kingdom's Transport Infrastructure Needs*. London: McKinsey & Company.

Mirrlees, J., Adam, S., Besley, T., Blundell, R., Bond, S., Chote, R., Gammie, M., Johnson, P., Myles, G. & Poterba, J. (2011). *Tax by Design: The Mirrlees Review*. Oxford University Press. Retrieved 1 March 2012 from www.ifs.org.uk/MirrleesReview/design.

Nash, C., Mackie, P., Shires, J. & Nellthorp, J. (2004). *The Economic Efficiency Case for Road User Charging*. University of Leeds: Institute for Transport

Studies. Retrieved 1 March 2012 from http://webarchive.nationalarchives.gov.uk/20070305190858/http:/www.dft.gov.uk/pgr/roads/roadpricing/feasibilitystudy/supplementary/economicsofroadpricing.

New Zealand Ministry of Transport (2005). *Surface Transport Costs and Charges Study*. Retrieved 1 March 2012 from www.beehive.govt.nz/Documents/Files/STCCS%20Main%20Report.pdf.

OBR (Office for Budget Responsibility) (2010). *Assessment of the Effect of Oil Price Fluctuations on the Public Finances*. OBR. Retrieved 6 March 2012 from http://budgetresponsibility.independent.gov.uk/wordpress/docs/assessment_oilprice_publicfinances.pdf.

OBR (2011) *Fiscal sustainability report, July 2011.* OBR. Retrieved 5 March 2012 from http://budgetresponsibility.independent.gov.uk/wordpress/docs/FSR2011.pdf.

ONS (Office for National Statistics) (2011). *Family Spending: A Report on the 2010 Living Costs and Food Survey*. ONS. Retrieved 1 March 2012 from www.ons.gov.uk/ons/rel/family-spending/family-spending/family-spending-2011-edition/family-spending-2011-pdf.pdf.

Owen, R., Sweeting, A., Clegg, S., Musselwhite, C. & Lyons, G. (2008). *Public Acceptability of Road Pricing*. Final Report for Department for Transport.

Parry, I. (2009). *How Much Should Highway Fuels be Taxed?* RFF Discussion Paper 09-52. Retrieved 1 March 2012 from www.rff.org/RFF/Documents/RFF-DP-09-52.pdf.

Parry, I. & Small, K. (2005). Does Britain or the United States have the right gasoline tax? *American Economic Review*, 95(4): 1276–1289.

Parry, I., Walls, M. & Harrington, W. (2007). Automobile externalities and policies. *Journal of Economic Literature*, 45(2): 373–399.

Pearce, D. (1991). The role of carbon taxes in adjusting to global warming. *Economic Journal*, 101(407): 938–948.

Pickett, J., Anderson, D., Bowles, D., Bridgwater, T., Jarvis, P., Mortimer, N., Poliakoff, M. & Woods, J. (2008). *Sustainable Biofuels: Prospects and Challenges*. The Royal Society Policy Document 01/08, The Royal Society. Retrieved 1 March 2012 from http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2008/7980.pdf.

Ramsey, F. (1927). A contribution to the theory of taxation. *Economic Journal*, 37(145): 47–61.

Salmons, R. (2011). *Road Transport Fuel Prices, Demand and Tax Revenues: Impact of Fuel Duty Escalator and Price Stabiliser*. Policy Studies Institute. Retrieved 1 March 2012 from www.psi.org.uk/pdf/2011/fuel_duty_psi_green_alliance.pdf.

Sansom, T., Nash, C., Mackie, P., Shires, J. & Watkiss, P. (2001). *Surface Transport Costs and Charges: Great Britain 1998*. Department of the Environment, Transport and the Regions. Retrieved 1 March 2012 from www.its.leeds.ac.uk/projects/stcc/downloads/SurfaceTransportCostsReport.pdf.

Schipper, L., Hand, P. & Gillingham, K. (2010). *The Road from Copenhagen: Fuel Prices and Other Factors Affecting Car Use and CO_2 Emissions in Industrialized Countries*. Retrieved 1 March 2012 from http://intranet.imet.gr/Portals/0/UsefulDocuments/documents/02947.pdf.

Smith, S. (1992). Taxation and the environment: a survey. *Fiscal Studies*, 13(4): 21–57.

SMMT (Society of Motor Manufacturers and Traders) (2011a). *Motor Industry Facts 2011*. Retrieved 1 March 2012 from https://www.smmt.co.uk/shop/motor-industry-facts-2011-2/.

SMMT (2011b). *New Car CO_2 Report 2011*. Retrieved 6 March 2012 from https://www.smmt.co.uk/shop/new-car-co2-report-mar-2011/.

TfL (Transport for London) (2008). *Central London Congestion Charging Impacts Monitoring – Sixth Annual Report, July 2008*. Retrieved 1 March 2012 from www.tfl.gov.uk/assets/downloads/sixth-annual-impacts-monitoring-report-2008-07.pdf.

TfL (2011a), *Annual Report and Statement of Accounts: 2010/11*. Retrieved 1 March 2012 from www.tfl.gov.uk/assets/downloads/corporate/tfl-annual-report-2010-11-final-interactive.pdf.

TfL (2011b), *Travel in London: Report 4*. Retrieved 1 March 2012 from www.tfl.gov.uk/assets/downloads/corporate/travel-in-london-report-4.pdf.

Wadsworth, B. (2011). *Moving On: Fairer Motoring Taxes and Investment for Growth and Jobs*. RAC Foundation. Retrieved 1 March 2012 from www.racfoundation.org/assets/rac_foundation/content/downloadables/moving_on-wadsworth-171011.pdf.

Walker, J. (2011). *The Acceptability of Road Pricing*. RAC Foundation. Retrieved 1 March 2012 from www.racfoundation.org/assets/rac_foundation/content/downloadables/acceptability_of_road_pricing-walker-2011.pdf.

Appendix A: Main motoring tax decisions by fiscal event, 1989 to 2011

Fiscal event	Fuel duty	VED	Company car taxes
March 1989 Budget (Lawson)	Petrol duty differentiation favouring unleaded over 2/3 star Diesel duty frozen	Car rates frozen Simplification of system – reduction in the number of rates for coaches, buses and taxis	
March 1990 Budget (Major)	10% increased in duties on most fuels (rising by more than inflation)	HGV rates increased LGV (under 3.5 tonnes) rates decreased	
March 1991 Budget (Lamont)	15% increased in duties on most fuels (rising by more than inflation)	Car rates frozen	
March 1992 Budget (Lamont)	Unleaded and diesel duties up 4.5%, in line with inflation Leaded duty up 7.5%, raising unleaded differential	Car rates increased by £10 (rising by more than inflation)	Car benefit scale charge increased by 4.5%, in line with inflation
March 1993 Budget (Lamont)	10% increase in duties on most fuels (rising by more than inflation) 'Escalator' policy announced: 3% minimum real increase on average in duties in future Budgets	Car rates increased by £15 (rising by more than inflation) Lorry rates frozen	Car benefit scale charge replaced by a charge of 35% of the list price of the cars Discounts for high business mileages and for cars more than four years old Fuel benefit scales increased by 20%, and business mileage discounts scrapped
November 1993 Budget (Clarke)	Main duty rates increased by 3p/litre, representing larger proportional increase for diesel; increase is above the 3% real-terms commitment Escalator increased to 5% in future Budgets	Car rate increased by £5 (rising roughly in line with inflation) Lorry rates frozen	Fuel scales increased by 8%
November 1994 Budget (Clarke)	Duties on leaded and unleaded rise by 2.5p/litre, in line with 5% escalator, representing a larger proportional increase for unleaded Duty on diesel increased by 3.2p/litre, bringing it in line with unleaded	Car rate increased by £5 (rising roughly in line with inflation) Lorry rates frozen	Fuel scales increased by 5% (roughly in line with inflation)

Appendix A: Main motoring tax decisions by fiscal event, 1989 to 2011 cont.

Fiscal event	Fuel duty	VED	Company car taxes
November 1995 Budget (Clarke)	Duties on leaded, unleaded and diesel rise by 3.5p/litre, in line with 5% escalator, representing a larger proportional increase for unleaded/diesel Duty on super unleaded petrol raised by 7.4p/litre to bring the rate closer to leaded since the emissions advantage of super unleaded is smaller	Car rate increased by £5 (rising roughly in line with inflation) Lorry rates frozen Exemption for vehicles over 25 years old	Fuel scales increased by 5% (roughly in line with inflation)
November 1996 Budget (Clarke)	Duty on most fuels up 3p/litre, in line with 5% escalator, representing a larger proportional increase for unleaded/diesel than leaded Announcement of future 1p/litre cut for ULSD, eventually introduced in August 1997	Car rate increased by £5 (rising roughly in line with inflation) Lorry rates frozen	Fuel scales increased for petrol cars (13%) and for diesel cars (15%), in line with changes in fuel prices
July 1997 Budget (Brown)	Duty on most fuels up 4p/litre, in line with 5% escalator, representing a larger proportional increase for unleaded/diesel than leaded Escalator raised to 6%	Car rate increased by £5 (rising roughly in line with inflation)	
March 1998 Budget (Brown)	9.2% increase in petrol and ULSD duty, in line with escalator Regular diesel and super unleaded duty raised by almost 12%, widening differential between diesel and ULSD to 2p/litre and introducing a 1p/litre differential favouring petrol over regular diesel, reflecting higher carbon content of diesel; plan to raise diesel/ULSD differential to 3p/litre in 1999 and diesel/petrol differential to 2p	Rates for all vehicles frozen Concessions introduced for low-emitting buses and lorries	Fuel scales increased by 20% in real terms Diesel scales further increased to align with petrol cars of equivalent engine size Announcement of intention to increase fuel scales by 20% in real terms in each year until 2002/03

Appendix A: Main motoring tax decisions by fiscal event, 1989 to 2011 cont.

Fiscal event	Fuel duty	VED	Company car taxes
March 1999 Budget (Brown)	7.3% in petrol duty, in line with escalator ULSD duty raised by 9.8%, introducing a 1p differential with unleaded petrol Conventional diesel duty raised 11.6%, introducing differentials with ULSD and unleaded petrol as planned 7.3% rise in super unleaded/ lead-replacement petrol duty, pre-announcement of 6% cut in October 1999 to encourage switching from leaded petrol to lead replacement petrol (LRP)	Car rate increased by £5 (rising roughly in line with inflation) Announcement of new system: From 1 June 1999, a 'small car' reduction of £55 introduced for cars with engines under 1,100cc Announcement of plans for a graduated system for cars, based upon CO_2 emissions, to be introduced in Autumn 2000	Fuel scales increased by 20% in real terms Reduction in business mileage discounts Announcement of reform from April 2002 into system based on a specified percentage of the list price, linked to CO_2 emissions
November 1999 PBR (Brown)	6% escalator abandoned; decisions on duty rates to be taken on a Budget-by-Budget basis; any future real increases in duty to be ring-fenced for public transport and road network investment		
March 2000 Budget (Brown)	Main duty rates increased by 3.4%, in line with inflation 1p differential between unleaded and ULSP announced, came into effect in October 2000	Announcement of a new graduated system to be introduced from March 2001 for cars, setting out the rates and the bands to be used Increased 'small car' threshold to 1,200cc from March 2001 Car rates frozen until March 2001	Details of the CO_2-based system announced for April 2002; 15% of list price for the lowest emitters, increasing to 35% for the highest emitters; an extra 3% is levied upon diesel cars, still capped at 35%
November 2000 PBR (Brown)	Pre-announcement of changes for March 2001 Budget: nominal freeze in main duty rates, 2p/litre cut in ULSP duty rate to increase differential between unleaded and ULSP to 3p/litre, and 3p/litre cut in ULSD duty rate to bring it into line with ULSP	Planned further extension of 'small car' threshold to an engine size of 1,500cc in the 2001 Budget	Discounts introduced for electric and hybrid cars, and also for cars that run on gas

Appendix A: Main motoring tax decisions by fiscal event, 1989 to 2011 cont.

Fiscal event	Fuel duty	VED	Company car taxes
March 2001 Budget (Brown)	Implementation of pre-announced changes from November PBR and cut in duty on unleaded petrol of 2p/litre (announced the month before the Budget) Higher duty on LRP over unleaded abolished, following a consultation announced at the PBR Pre-announcement of 20p/litre duty advantage for biodiesel over ULSD for the 2002 Budget	Graduated system implemented Car rates frozen 'Small car' threshold increased to 1,549cc from 1 July 2001 New system of VED for lorries introduced, with reduced rates available for lorries meeting the new Euro 4 standard	
April 2002 Budget (Brown)	Main duty rates frozen in cash terms Introduction of planned 20p biodiesel differential Pre-announcement of intention to introduce duty differential in favour of sulphur-free fuels in 2003	Car rates frozen New low-carbon band for cars emitting less than 121 gCO_2/km Lorry rates frozen, with plans announced to introduce lorry road user charging in 2005/06	Implementation of pre-announced changes Announcement of intentions to restructure fuel scale charge from 2003/04, to align them with the company car tax system
November 2002 PBR (Brown)	Pre-announcement of intention to introduce 20p differential for bioethanol but without firm timetable		
April 2003 Budget (Brown)	Inflation uprating of main duty rates frozen until October 2003 (this uprating then occurred as planned) Announcement of intention to introduce 0.5p differential favouring sulphur-free petrol and diesel from September 2004 20p differential for bioethanol announced for January 2005	Car rates increased (roughly in line with inflation) Introduction of a new low carbon band for cars emitting less than 101 gCO_2/km Lorry rates frozen	Lowering of the emissions level that was necessary to qualify for the minimum charge, for 2005/06 Fuel scale charge linked to CO_2 emissions levels
December 2003 PBR (Brown)			Announce review of company car tax system

Appendix A: Main motoring tax decisions by fiscal event, 1989 to 2011 cont.

Fiscal event	Fuel duty	VED	Company car taxes
March 2004 Budget (Brown)	Duty on ULSP and ULSD to be increased by 0.5p above inflation from September 2004, to generate the planned differential Biofuel differentials guaranteed until 2007	Car and lorry rates frozen	Minimum charge qualifying emissions level for 2006/07 frozen Fuel charge fixed figure set at £14,400
December 2004 PBR (Brown)	Planned uprating of duties (and real increase in ULSP/ULSD) for September scrapped: this meant the 0.5p differential in favour of sulphur-free fuels was not introduced		Alignment of VAT fuel scale increases with the company car benefit charge Announcement of intentions to simplify alternative fuel discounts for company cars at the 2005 Budget
March 2005 Budget (Brown)	Inflation uprating of main duty rates deferred until September 2005	Rates frozen for the four lowest-polluting bands, whilst rates for the highest two bands are increased by £5 Rates for cars registered before 1 March 2001 increased by £5	Minimum charge qualifying emissions level for 2007/08 frozen Fuel charge fixed figure frozen Simplification of alternative fuel discounts
December 2005 PBR (Brown)	Deferred uprating of duties scrapped altogether Introduction of Renewable Transport Fuel Obligations (RTFO) from April 2008		Announcement of the introduction of a new system of VAT fuel scale charges in May 2007
March 2006 Budget (Brown)	Inflation uprating of main duty rates deferred until September 2006 RTFO level set at 2.5% in 2008/9 and 3.75% in 2009/10, with a target of 5% in 2010/11 Biofuels duty differential extended until 2008	Introduction of a new higher band for cars emitting more than 225 gCO_2/km (cars emitting over above this level, but registered before March 2006, are not affected) Lowest emissions band reduced to £0, with increased differentials for other bands Pre-2001 'small car' rate frozen, whilst 'large car' rate increased by £5	Reduction of minimum charge qualifying emissions level for 2007/08 by 5 gCO_2/km Fuel charge fixed figure frozen

Appendix A: Main motoring tax decisions by fiscal event, 1989 to 2011 cont.

Fiscal event	Fuel duty	VED	Company car taxes
December 2006 PBR (Brown)	Deferral of inflation uprating implemented in December 2006		
March 2007 Budget (Brown)	Setting out of three-year plan for inflation-adjustments to fuel duty, with main rates increasing by 2p/litre in October 2007 (deferring uprating by 6 months, though it was then implemented), then 2p/litre in April 2008 (ultimately implemented in December 2008) and 1.84p/litre in April 2009 (implemented as planned) Biofuel differential extended until 2009	Current and future car rates announced, including reduction for lowest emissions bands and widening of differentials Alignment of VED rates for petrol and diesel cars Lorry rates frozen	Fuel charge fixed figure frozen
March 2008 Budget (Darling)	Planned 2p/litre increase postponed from April to October 2008 0.5p/litre above-inflation increase pre-announced for April 2010 20p biofuel differential abolished from 2010	Announcement of reforms to VED system in 2009/10 and 2010/11: six new bands in 2009/10 with increased differentials; to apply to all cars registered since 2001 introduction of 'first-year' rate on new cars from 2010/11, charging high-emitting cars much higher rates provision of a discount for all alternatively fuelled cars in 2009/10 and 2010/11, whilst aligning the VED rates for standard and alternative fuelled cars in 2011 onwards	Increase of car rates on all but the cleanest cars (those emitting less than 135 gCO_2/km) in 2010/11
November 2008 PBR (Darling)	Planned 2p/litre increase implemented from December 2008 Confirmation of change in RTFO to achieve 5% target by 2013/14 rather than 2010/11	Increases to car rates delayed until 2010 Announcement that changes will not be introduced retrospectively on cars registered before March 2006	

Appendix A: Main motoring tax decisions by fiscal event, 1989 to 2011 cont.

Fiscal event	Fuel duty	VED	Company car taxes
March 2009 Budget (Darling)	Planned inflation uprating implemented Additional increase in main duty rates of 2p/litre in September Planned real rise for 2010 increased to 1p, and additional 1p real increases pre-announced for 2011, 2012 and 2013	Implementation of announced changes	Fuel charge increased to £16,900 Minimum charge qualifying emissions level reduced by 5 gCO_2/km Abolition of the existing cap on car list prices used to calculate the taxable benefit arising from company cars Abolition of discounts for high-emitting hybrid and alternative fuel cars
December 2009 PBR (Darling)			10% rate applied only for cars emitting less than 100 gCO_2/km Introduction of a five-year exemption for zero-carbon vehicles Increased fuel charge fixed figure to £18,000
March 2010 Budget (Darling)	Planned 1p real increase for April 2010 split into three staged rises in April 2010, October 2010 and January 2011 Extension of 1p real increase commitment to April 2014	Introduction of first-year rates as planned HGV rates frozen Creation of 'Reduced Pollution Certification', providing a discount to eligible lorries	Zero-carbon exemption extended to low-carbon vehicles (those which emit between 0 gCO_2/km and 75 gCO_2/km)
March 2011 Budget (Osborne)	Main duty rates cut by 1p/litre Planned 1p real increases to April 2014 abandoned Inflation uprating for April 2011 delayed until January 2012; inflation uprating for April 2012 delayed until August 2012; 1p real increases re-introduced if oil prices fall below $75/barrel on a 'sustained basis'	Car rates increased (in line with inflation)	Increased fuel charge fixed figure to £18,800 Car rates frozen for those emitting below 95 gCO_2/km Car rates increased by 1% for vehicles emitting between 95g and 219 gCO_2/km from April 2013
November 2011 Autumn Statement (Osborne)	Planned 3p inflation uprating, already delayed from April 2011 to January 2012, further delayed until August 2012 Planned inflation uprating, already delayed from April 2012 until August 2012, finally cancelled		

The Royal Automobile Club Foundation for Motoring is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users. The Foundation publishes independent and authoritative research with which it promotes informed debate and advocates policy in the interest of the responsible motorist.

RAC Foundation
89–91 Pall Mall
London
SW1Y 5HS

Tel no: 020 7747 3445
www.racfoundation.org

Designed and printed by
The Javelin Partnership Ltd
Tel: 0118 907 3494

Produced on paper from a managed
sustainable source, using pulp that is ECF,
also FSC certified as containing 50% recycled
waste. Printed using vegetable soya based inks.