

briefing notes

IFS

FUEL TAXATION

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Introduction

In the autumn of 2000, increases in the price of petrol led to fuel protests across Britain. It was argued that high levels of indirect taxation on fuel, which had risen rapidly in each year from 1993 to 1999 (the ‘escalator’, which saw duties on fuel increase by 3 percentage points above inflation between 1993 and 1997, and 6 points between 1997 and 1999), had provoked the protests. Since abandoning the escalator in the 1999 Pre-Budget Report, the Chancellor has not increased fuel duties above inflation in any Budget. As has become customary in recent years, it was announced in the 2005 Budget that the planned increase in duties in line with inflation that would normally come in from April 2005 had been postponed until September, when it would be reviewed in the light of oil prices.

Despite the escalator being abandoned, petrol prices have risen once again and the threat of renewed protest has been debated. This Briefing Note updates earlier work (see asterisked footnote below) from the time of the last petrol crisis and considers the extent to which recent increases in prices can be attributed to government policy. It also considers whether there is a case for duties to be changed as a direct result of pump price changes, and examines evidence on the effects of fuel duty changes on different groups of the population.

A definitional note

This paper focuses on the two major road fuels purchased by domestic consumers – Ultra Low Sulphur Petrol (ULSP, or Premium Unleaded) and Ultra Low Sulphur Diesel (ULSD, or DERV). In the last quarter of 2004, these fuels accounted for 95% of petrol and 79% of diesel sales^a and they make up the vast majority of domestic-use sales of vehicle fuel. Less than 0.2% of petrol sales were of lead-replacement petrol and 4% were of Super Premium Unleaded. For expositional ease, we will refer to ‘unleaded’ and ‘diesel’ throughout this note.

Data for most of this analysis come from the DTI.^b Pump prices are collected in the middle of each month from major retailers.

^a Source: http://www.dti.gov.uk/energy/inform/energy_trends/mar_05.pdf.

^b See http://www.dti.gov.uk/energy/inform/energy_prices/tables/table_411.xls.

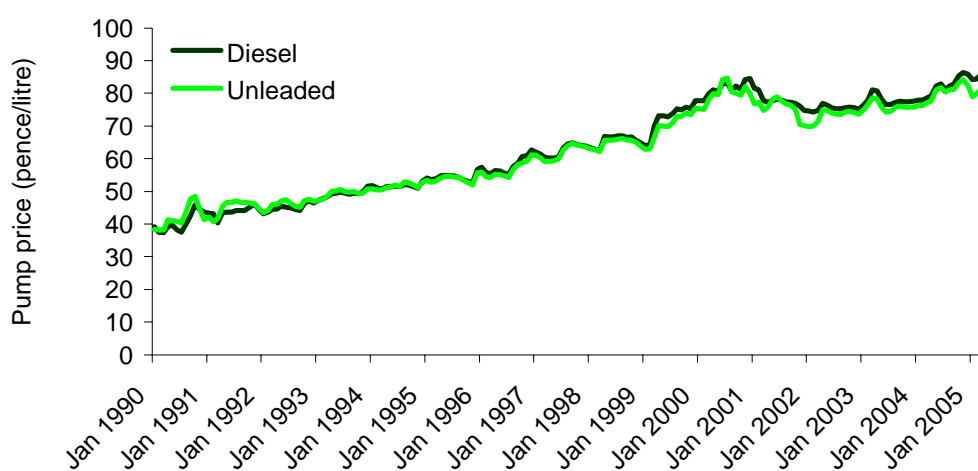
* This Briefing Note substantially updates and revises Z. Smith, *The Petrol Tax Debate*, IFS Briefing Note no. 8, 2000 (<http://www.ifs.org.uk/bns/bn8.pdf>). The author is thankful to Laura Blow for the distributional analysis and comments on earlier drafts. Funding from the ESRC through the Centre for the Microeconomic Analysis of Public Policy at IFS (grant number M535255111) is gratefully acknowledged. All errors remain his own.

Background

In April 2005, both unleaded petrol and diesel were charged excise duty at 47.1 pence per litre.¹ Fuel is also subject to value added tax (VAT). Total taxation represented 69.9% of the pump price for unleaded petrol and 67.3% of the pump price for diesel (in each case, this was broken down into 14.9% accounted for by VAT and the remainder by duty).

Figure 1 shows the monthly retail (pump) prices of unleaded petrol and diesel since 1990. Figure 2 then shows these values as an index (beginning at 100 in January 1990) compared with a general price index for the same period.

Figure 1. Pump prices for diesel and unleaded petrol, January 1990 – April 2005



Notes: Prices are collected on or around the 15th of each month. Data for April 2005 are provisional. Data from supermarkets are included after January 1995; before that, prices came from information from oil marketing companies.

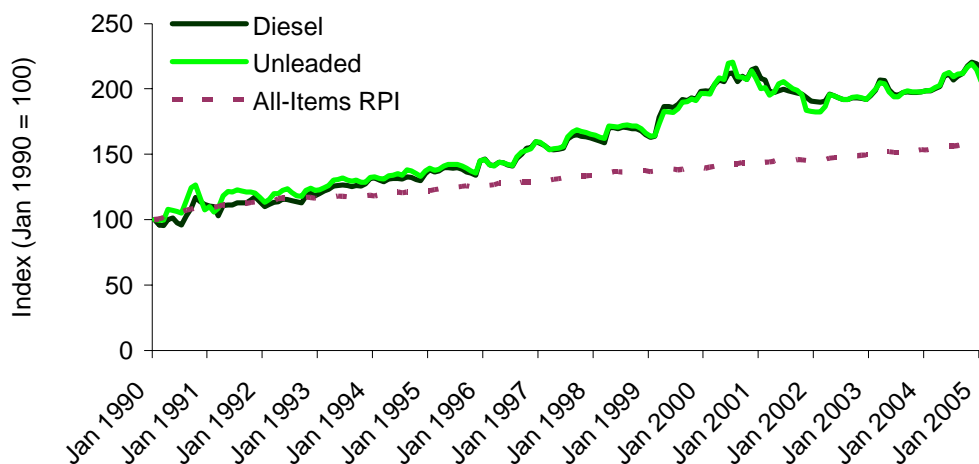
Source: DTI Energy Statistics.

From just under 40p/litre at the start of 1990, petrol prices rose steadily to around 70p/litre in early 1999. There was then a rapid acceleration in price to a peak of 84.7p/litre for unleaded in July 2000 and 84.6p/litre for diesel in December 2000, which sparked the fuel protests around that time. Prices then fell away and hit a trough in 2002, with a low of 69.9p/litre for unleaded and 74.4p/litre for diesel. This trend reversed in late 2002 and fuel prices increased again, to a new peak for diesel of 86.4p/litre in November 2004 and to 84.2p/litre for unleaded, just below its previous peak. Since the turn of the century, therefore, petrol prices have been more volatile than was the case

¹ Different rates still apply for Super Premium Unleaded (50.19p/litre) and conventional (i.e. non-ultra-low-sulphur) diesel (53.27p/litre). Different rates also apply for some alternative fuels. A full list can be found at http://customs.hmrc.gov.uk/channelsPortalWebApp/downloadFile?contentID=HMCE_PROD_011604.

throughout the 1990s when the price rose continually. This is because of the abandonment of the fuel price escalator and greater volatility in crude oil prices.

Figure 2. Index of petrol prices compared with a general price measure, January 1990 – April 2005



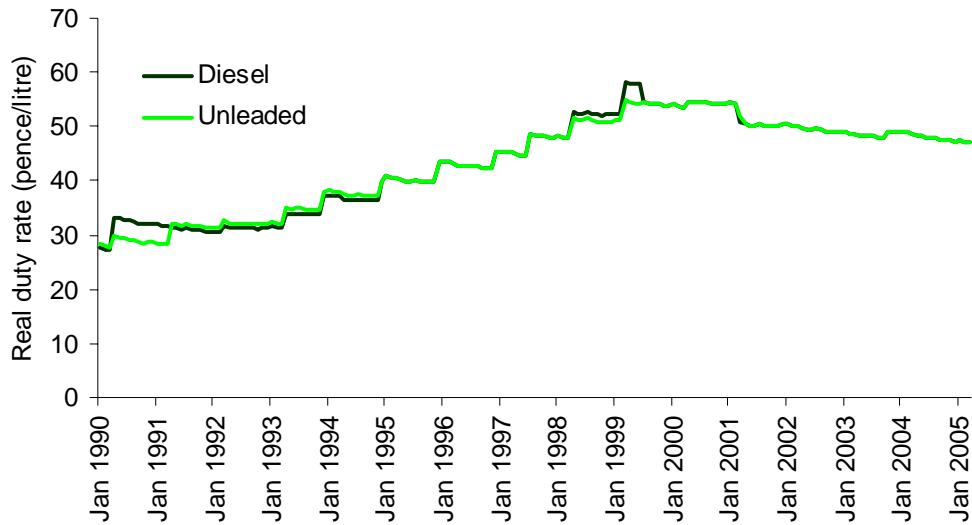
Sources: DTI Energy Statistics; ONS.

Figure 2 demonstrates the impact of the price escalator in place from 1993 – up to this point, fuel prices tended to rise in line with overall prices. Yet at their peak in Autumn 2000, petrol prices had risen about three times more rapidly than prices in general since January 1990. Once the escalator was abandoned, relative fuel prices actually fell, and by late 2002 fuel prices had risen only twice as much as prices in general. Fuel prices since late 2002 have tended to rise at about the same rate as prices in general, with slightly stronger increases in late 2004 and early 2005.

Prices are clearly influenced by two key factors: taxation and oil prices. Figure 3 shows the real (i.e. inflation-adjusted) rates of duty on unleaded petrol and diesel since 1990.

The impact of the escalator is again evident – real duties remained roughly constant at around 30p/litre until 1993, when they began to rise rapidly. Real duties peaked at around 55p/litre for unleaded and 58p/litre for diesel in 1999 (diesel duties fell back from July 1999 owing to the introduction of ULSD, which had a lower duty rate). There followed a period of around two years in which real duties were roughly constant. Since 2001, they have been gently declining. The duty rate of 47.1p/litre in March 2005 was the lowest, in real terms, since June 1997 for both petrol and diesel.

Figure 3. Duty on unleaded petrol and diesel, January 1990 – March 2005 (March 2005 prices)

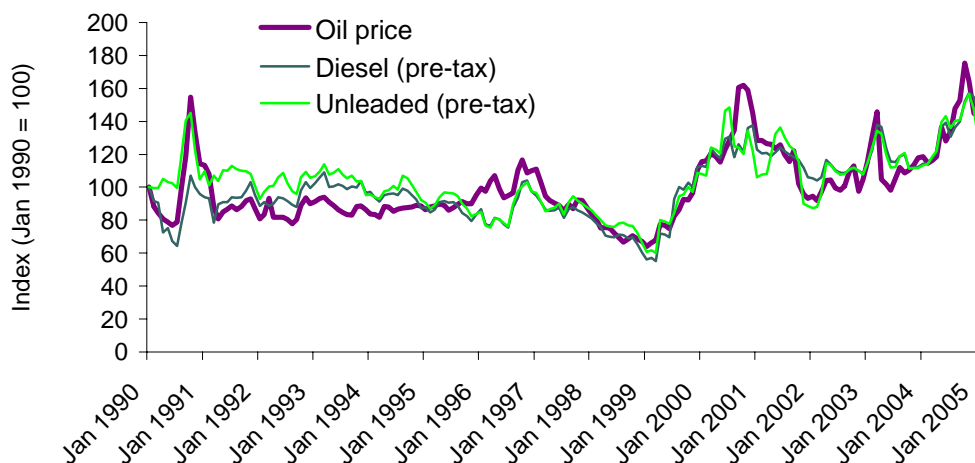


Source: Author's calculations from DTI data.

VAT is also charged on road fuel. The VAT rate increased from 15% to 17.5% in April 1991. VAT is charged on the pre-tax plus duty price (thus for April 2005 the VAT per litre of unleaded of 12.75p is 17.5% of 25.78p (the pre-tax price per litre) plus 47.10p (the duty per litre)).

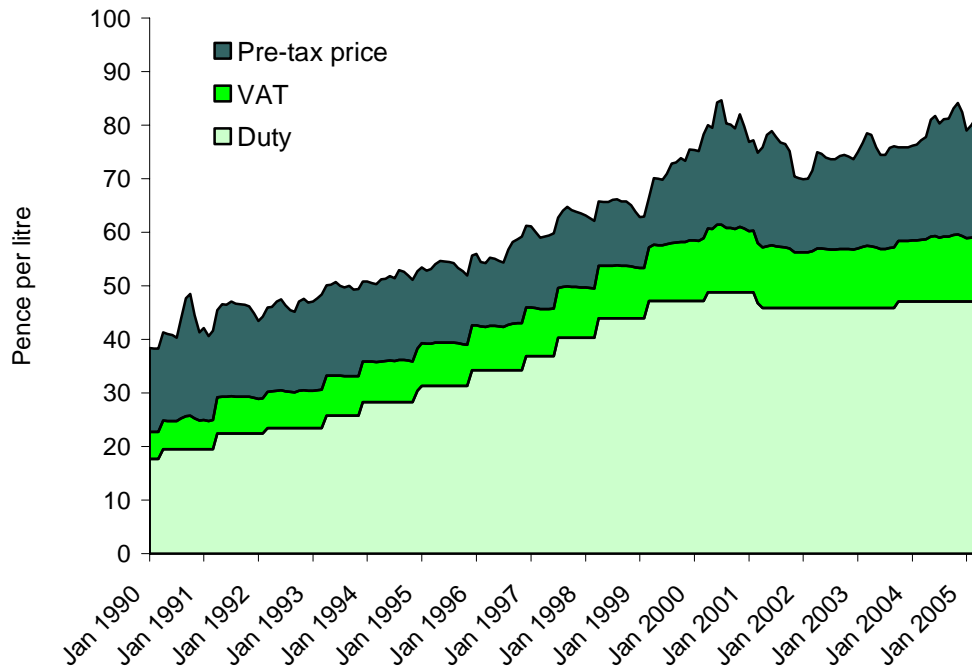
Figure 4 shows an index of oil prices and pre-tax fuel prices since 1990. The oil price here is the price of 'standard grade burning oil' as estimated in the DTI data.

Figure 4. Oil price and pre-tax fuel price indices, January 1990 – March 2005



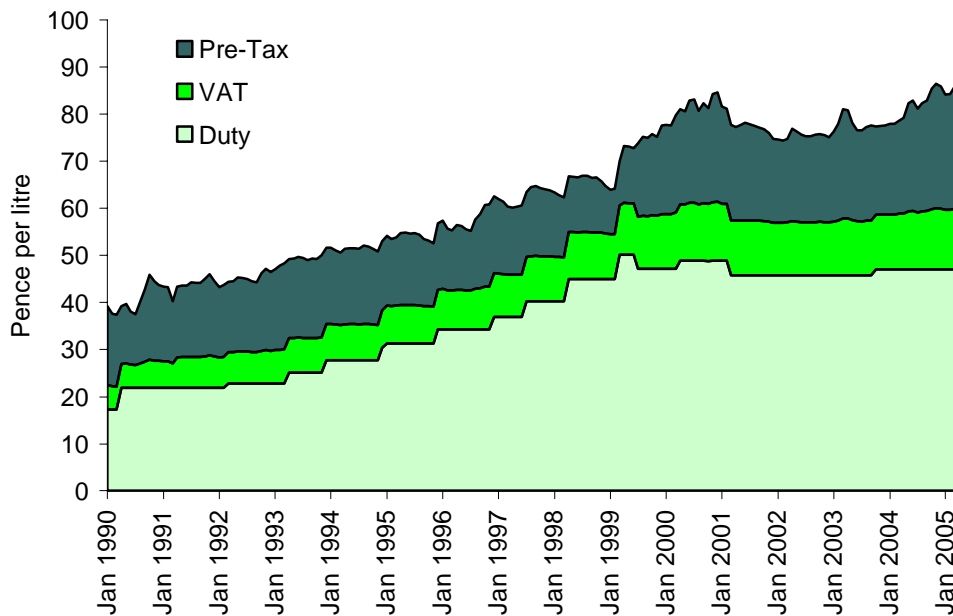
Source: Author's calculations from DTI data.

Figure 5. Components of the pump price of unleaded petrol, January 1990 – April 2005



Source: Author's calculations from DTI data.

Figure 6. Components of the pump price of diesel, January 1990 – April 2005

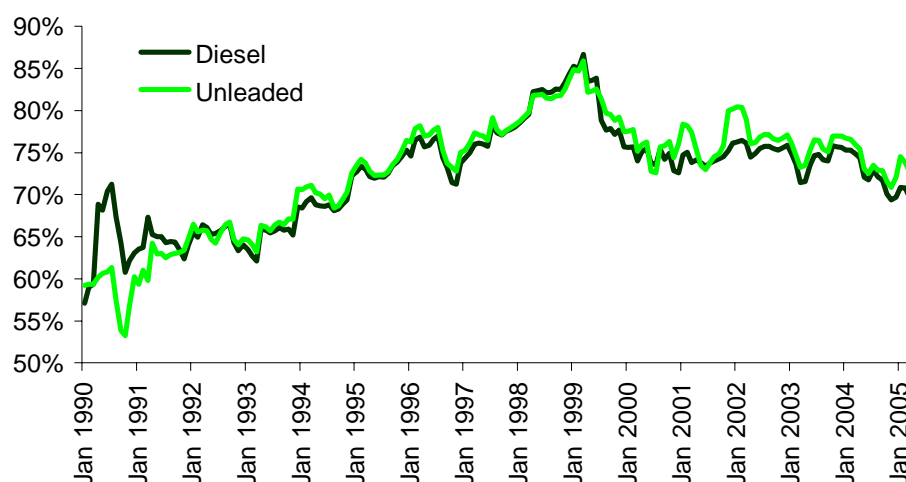


Source: Author's calculations from DTI data.

Clearly, pre-tax petrol prices closely track the oil price, and this helps explain why pump prices fell in the early 2000s and have recently risen again despite, as we saw above, small declines in real duties.

Putting all this information together, how important has taxation been in explaining the pump price over the previous 15 years? Figures 5 and 6 show, for unleaded and diesel respectively, the three key components of the pump price over time – duty, VAT and the pre-tax price. Figure 7 then shows the proportion of the pump price accounted for by taxation over time.

Figure 7. Total tax (duty + VAT) as a share of pump price, January 1990 – April 2005

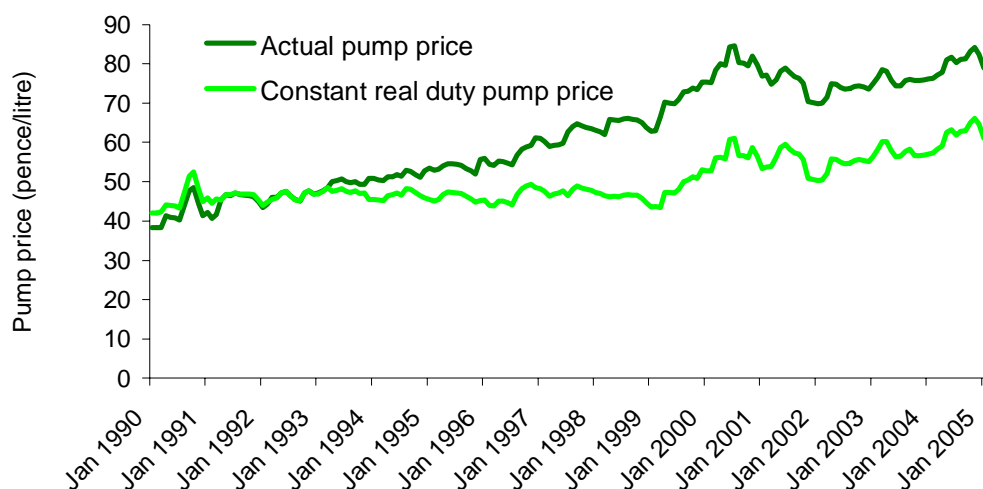


Source: Author's calculations from DTI data.

Not surprisingly, the fraction of the pump price accounted for by taxation rose rapidly in the 1990s – the result of a relatively low, and even falling, pre-tax price coupled with the duty escalator. From just over half of the total price in 1990, tax accounted for over 85% of the price at its peak. In 2000 and 2001, rising oil and pre-tax prices coupled with the ending of the escalator saw the tax share of the pump price fall back to below 75%. Its share stabilised during 2002 and 2003; more recently, as oil prices have increased again, the tax share has fallen to around 70% owing to higher pre-tax prices. The 69.4% and 70.9% tax shares for diesel and unleaded respectively recorded in November 2004 were the lowest tax shares since November 1994, exactly 10 years before, though clearly at that time the pump price was considerably lower.

Figure 8 shows how changes in duty have impacted on the pump price by comparing the actual pump price for unleaded petrol and the pump price that would have been paid had real duties been kept at the March 1993 value of 23.42p/litre, the level before the escalator began.

Figure 8. Counterfactual pump prices for constant real unleaded duty at March 1993 level, January 1990 – April 2005



Source: Author's calculations from DTI data.

We can see that up until 1999, pump price increases were entirely driven by duty increases. Had duties remained unchanged in real terms, the pump price in January 1999 would have been 43.5p/litre, only 1.5p/litre more than the January 1990 level and 19.4p/litre less than the actual pump price of 62.9p/litre. During 1999 and 2000, a combination of pre-tax and duty increases saw pump prices rise further – in January 2000, had real duties not changed since 1993, the pump price would have been 52.8p/litre. This increase of 9.3p/litre in the counterfactual price since January 1999 reflects increases in pre-tax prices, but the actual price of 75.4p/litre was 12.5p/litre higher than the previous year, the faster increase reflecting the final year of the duty escalator. Since 2000, changes in pump prices have been almost entirely driven by pre-tax price changes. The gap between the actual and counterfactual pump price fell from a peak of 23.7p/litre in August 2000 to 17.7p/litre by March 2005. Even if duty rates had not been subject to the escalator, the pump price for unleaded petrol would have hit new heights in the latter half of 2004 and early 2005.

How does the position in the UK compare with that in the rest of Europe? Table 1 shows the pre- and post-tax prices for a litre of unleaded petrol across the EU in December 2004, and how the levels of taxation compare with that in the UK. There is relatively little pre-tax variation in the price – with only a few exceptions, prices tend to be around 20–25p/litre. The UK had the 14th-highest pre-tax price amongst the whole EU (the 8th-highest amongst the 15 pre-May-2004 Member States), ranking firmly in the middle of the European league table. However, the UK has the highest total tax of all the EU countries, fractionally higher than the Netherlands. Thus the UK has the 2nd-highest post-tax price of all EU countries. The new EU Member States typically have lower

Table 1. European unleaded fuel duty rates, December 2004 (pence per litre)

	<i>Pre-tax price</i>	<i>Tax (duty + VAT)</i>	<i>Post-tax price</i>	<i>Tax as % of post-tax price</i>	<i>Tax (UK = 100)</i>
Austria	24.65	40.21	64.86	62.0	67.7
Belgium	23.02	52.09	75.11	69.4	87.7
Cyprus	25.95	27.94	53.89	51.8	47.0
Czech Republic	22.83	36.20	59.03	61.3	60.9
Denmark	21.71	52.82	74.53	70.9	88.9
Estonia	22.27	27.50	49.77	55.3	46.3
Finland	22.12	55.31	77.43	71.4	93.1
France	19.30	52.56	71.86	73.1	88.5
Germany	18.68	55.55	74.23	74.8	93.5
Greece	23.88	28.94	52.82	54.8	48.7
Hungary	23.73	43.23	66.96	64.6	72.8
Ireland	27.08	42.77	69.85	61.2	72.0
Italy	26.09	51.62	77.71	66.4	86.9
Latvia	24.23	25.05	49.28	50.8	42.2
Lithuania	23.22	27.72	50.94	54.4	46.7
Luxembourg	22.18	36.94	59.12	62.5	62.2
Malta	31.38	30.81	62.19	49.5	51.9
Netherlands	24.09	59.33	83.42	71.1	99.9
Poland	25.53	36.63	62.16	58.9	61.7
Portugal	25.17	47.83	73.00	65.5	80.5
Slovakia	23.58	37.26	60.84	61.2	62.7
Slovenia	22.30	36.93	59.23	62.4	62.2
Spain	23.94	36.17	60.11	60.2	60.9
Sweden	21.01	51.48	72.49	71.0	86.6
UK	23.31	59.42	82.73	71.8	100.0

Note: Prices converted to sterling using mid-month exchange rates.

Source: DTI (http://www.dti.gov.uk/energy/inform/energy_prices/tables/table_511.xls).

taxation than the older states – Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands and Sweden also have tax rates of more than 50p/litre, and in all those countries tax makes up over two-thirds of the total pump price.

The economics of fuel taxation

Fuel duty has two key purposes. First is an attempt to change behaviour and reduce the extent to which people use their cars. Second is to raise revenue.

On the second issue, fuel taxation is an important component of UK government revenue: for 2004–05, it is estimated that fuel duties raised around £23.5 billion, or 5.2% of total revenue. Only income tax, National Insurance, VAT and corporation tax raised bigger shares of the total. The Treasury estimates that increasing duty on petrol and diesel by around 7.3p/litre would

raise roughly the same amount (£3 billion) as a one penny increase in the basic rate of income tax.² Increases in duty will raise revenue for the government (assuming the increases do not reduce the demand for petrol too much), but revenue also comes from increases in pump prices (since additional VAT is then paid as well) owing to, for example, crude oil price increases.

Of course, if the purpose of fuel duty is really to change consumer behaviour, then increases in duty that caused people to drive less, switch to public transport and increase use of public transport could commensurately reduce revenues. In practice, the elasticity of demand for petrol – that is, the extent to which people reduce their consumption of petrol in response to a higher price – is sufficiently low that increases in duty will not lead to revenues falling. That is not to say there is no behavioural effect at all.³ Indeed, if it takes a very large price increase to generate the desired reduction in car use, it may justify high rates of duty. The fact that real duties have not increased since the escalator ended in 1999 suggests that, whether economically or politically, there is little scope for using fuel duty merely as a revenue-raising tool in the future.

Why, in theory, should a government be concerned to change consumer behaviour through the use of fuel duty? The argument is that the costs of motoring exceed the private costs faced by an individual motorist. There are environmental costs, noise costs, road-damage costs and congestion costs which people may not factor into their decision about whether and how much to drive. This means that the costs to society of motoring exceed the costs to the individual, which will lead to a level of motoring that is both inefficiently high and inefficiently cheap from a social perspective. The duty is therefore a way of forcing the private motorist to take account of these social costs.

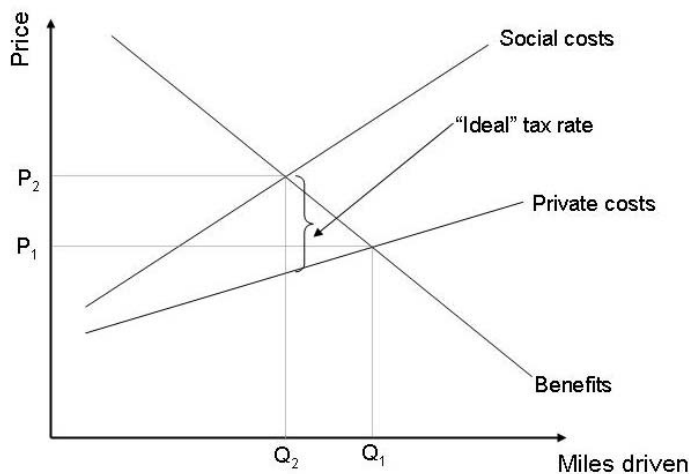
Figure 9 illustrates this argument. Along the horizontal axis are the total number of miles driven by motorists. Along the vertical axis is the price per mile of driving. The downward-sloping curve represents the additional benefit to motorists of driving each extra mile. Generally speaking, we assume that each additional mile brings less benefit than the one before it. The lower upward-sloping curve represents the additional cost to motorists of each extra mile driven – we think this might slope upwards because the costs of, say, wear and tear on vehicles increase more rapidly the more miles are driven. The upper curve represents the total cost to *society* of the extra miles driven. We think this is higher than the private costs because of the external costs we noted above. Thus the gap between the two curves represents the ‘externalities’ of motoring. Therefore an optimal fuel tax would ‘internalise’ these externalities by shifting

² Source: HM Treasury, *Tax Ready Reckoner and Tax Reliefs, December 2004* (http://www.hm-treasury.gov.uk/media/8F5/9F/pbr04tax_ready_182.pdf).

³ L. Blow and I. Crawford, *The Distributional Effects of Taxes on Private Motoring*, Commentary no. 65, IFS, London, 1997, found that a 1% increase in the cost of driving per mile reduces miles driven by less than ½%.

the private cost curve up to the point at which the social costs equate to the benefits. If we impose such a tax, the price of motoring rises from P_1 per mile to P_2 , and the amount of motoring undertaken falls from Q_1 miles to Q_2 miles (assuming the market for motoring is sufficiently able to ensure that the marginal costs and benefits are equalised).

Figure 9. Illustrative example of the external costs of motoring

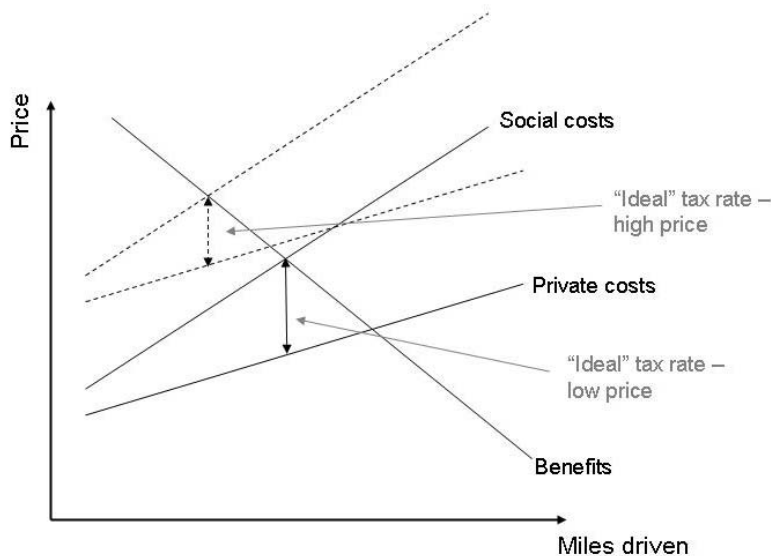


Note that as shown in Figure 9, the size of the externality increases as the total number of miles driven rises. This may not be a bad assumption – some emissions may have environmental impacts only beyond some critical level, for example – but it is not necessarily as straightforward as depicted in this simple example.

In a practical sense, it is not really possible to measure the discrepancy between the private and the social costs in order to be able to determine the ‘ideal’ level of tax, nor can we really know whether or not current tax rates are ‘too high’ or ‘too low’ to achieve the aim of balancing social and private costs. Congestion costs vary across both time and location, so the externality will differ in a way that makes a single national fuel duty unlikely to be optimal. Carbon dioxide emissions are closely related to fuel consumption, and the global warming effects of carbon dioxide depend linearly on emissions, so a fuel tax may well be a good way of targeting that particular social cost; but this is not more generally true. More effective for congestion might be a system of road pricing where the charge varies across the day and for specific roads (such that it would cost more to drive in a city centre at rush hour than on a country road in the middle of the night), but until the technological barriers to such a system are overcome, it is likely that fuel taxation will remain the major form of ‘green tax’ on motorists.

One issue is whether there is a case for reducing the level of duty charged when the pre-tax price of petrol increases so that the post-tax price remains constant. Suppose that the market for motoring looked like that represented in Figure 9. Variations in the pre-tax price of petrol would come through as a shift upwards or downwards in the cost curves (since social costs are the sum of private and external costs, both curves would shift in the same way). Figure 10 illustrates the impact of an increase in fuel prices resulting from an increase in oil prices, say.

Figure 10. Impact of a rise in fuel prices on the ‘ideal’ tax rate



We can see that in this example, the ‘ideal’ tax rate does indeed fall as fuel prices rise (or, conversely, the ideal tax rate rises as fuel prices fall). However, there are a number of objections to this simple case. First and foremost, as suggested already, there would be considerable uncertainty over the extent to which fuel duty captured the external costs of motoring. Setting some arbitrary ‘target price’ for the pump price of fuel – at least on these grounds – would therefore be difficult. Second, there may be a concern about implementation lags even if it were desirable. The price of oil and the pre-tax price of fuel change on a daily basis. It may therefore be that by the time a change in the duty rate were implemented, the pre-tax price would have changed in a way to nullify or exaggerate its effect. There would also be revenue concerns – frequent changes in duty would raise or lower income from petrol taxation leading to more public finance uncertainties. There could be a danger of a ‘ratchet’ effect whereby it was easy for duties to be lowered in the face of high pre-tax prices but much harder for duties to be increased in the face of low pre-tax prices, at least from a political perspective. Finally, as already suggested, this simple model of the external costs of motoring in which the externality increases with total miles driven need not be the true model. If external costs fall as the miles increase, then the optimal tax rate would *rise* as prices rose. If

external costs were constant as the miles increased, the optimal tax rate would not change. If, as seems likely, the relationship between external cost and miles driven is very much more complicated than any of these examples, then calculating a new ideal tax rate would require full knowledge of the costs (private and social) and benefits, which is hugely implausible. All these factors suggest that the most practicable thing to do is not to adjust the rate of duty in the face of fluctuating oil prices. However, it should be noted that in recent Budgets, the Chancellor has postponed and then cancelled planned ‘inflation-only’ adjustments in duty in the face of high oil prices, such that real rates of duty have declined.

Distributional impact of road fuel tax

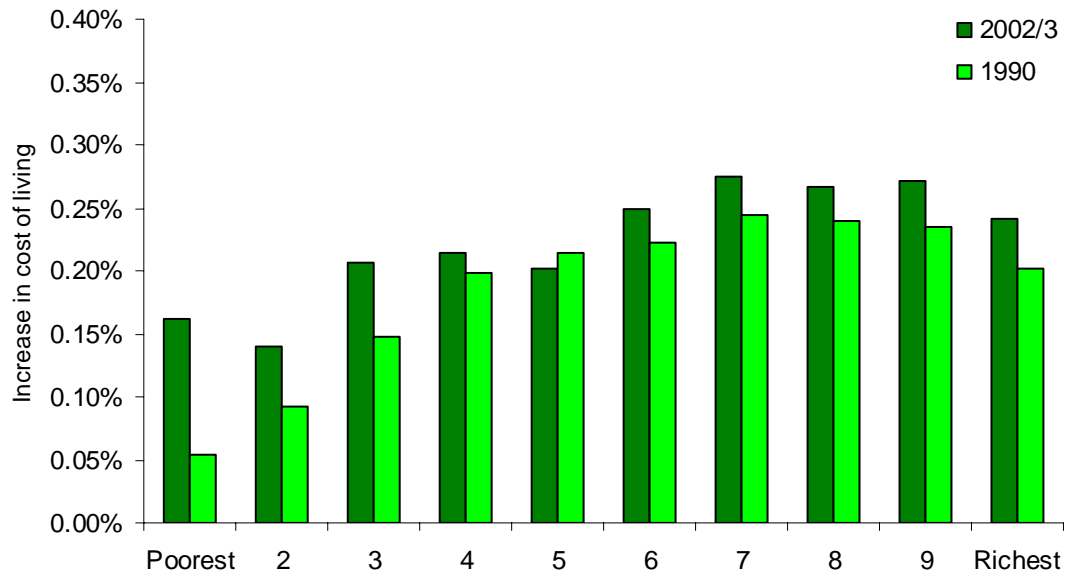
It could be argued that taxes on fuel are ‘unfair’ because they impact more strongly on the poor than on the rich. This section examines this claim using data from the most recent Expenditure and Food Survey, for 2002–03. This gives us information on the income and expenditure of around 7,000 households across the UK. Using these data, we simulate the impact of a 5% increase in petrol prices on the cost of living of different households.⁴ We assume that households would not change their total consumption of petrol in the face of higher prices, so that the total spending on petrol by each household in the data increases by 5%. We then calculate how much more households would have to pay to consume the same amount of petrol as before as a proportion of the total amount they spent before the price increase. Figure 11 shows the increase in the cost of living across the income distribution. We show the poorest 10% of households on the left of the graph and the richest 10% of households on the right. We also present results for data from 1990 for comparison.

We can see that for 2002–03, increases in fuel duty would be likely to impact more strongly on the upper half of the income distribution. The poorest 20% of households would see their cost of living rise by around 0.15%, the next poorest 30% by around 0.2% and the upper half of the distribution by around 0.25–0.3%. It is also clear that the cost of living increase has risen since 1990 for almost all income groups. In particular, there has been a substantial increase for the poorest households, from a 0.05% increase in the cost of living to a 0.15% increase. This is because fuel prices are higher than in 1990, so that a 5% increase represents a higher absolute cost. It also reflects an increase in car-ownership rates at the bottom of the overall income distribution. The fact that very poor households appear to be slightly less affected by a fuel price increase is, in part, driven by the fact that car-ownership rates are lower at the bottom of the income distribution, so that a fuel price increase has no direct impact on their cost of living. We can repeat the analysis in Figure 11 *just* for those

⁴ Since we are simulating the effect of an increase in petrol prices, we do not distinguish whether this is due to taxation or other factors.

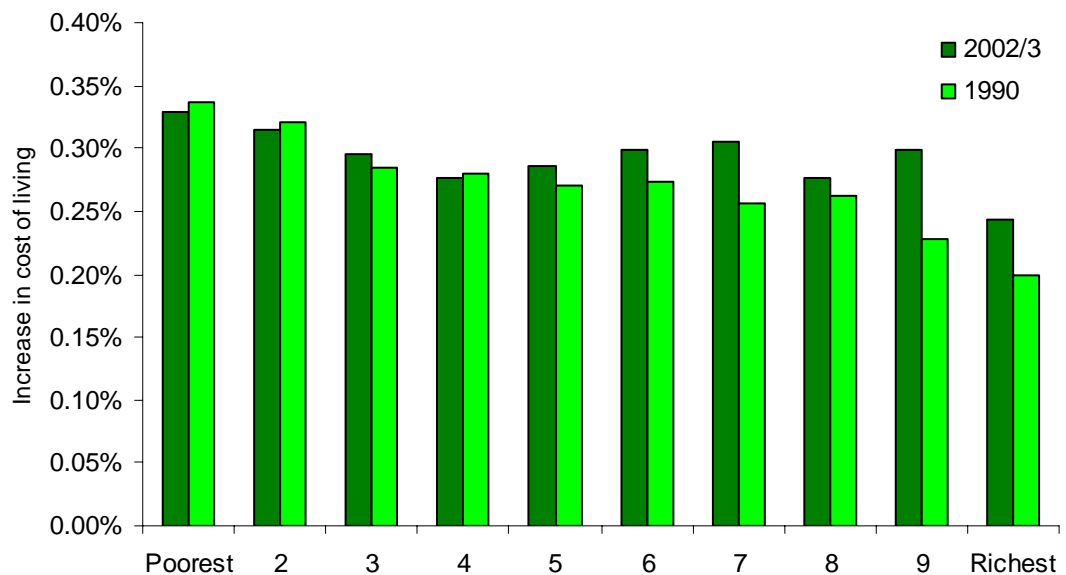
households that own at least one car (thus taking the poorest 10% of car-owners, the next poorest 10% of car-owners and so on along the horizontal axis). The result is shown in Figure 12.

Figure 11. Effect of a 5% increase in road fuel prices on cost of living, by income decile



Source: Calculations from Family Expenditure Survey, 1990 and Expenditure and Food Survey, 2002–03.

Figure 12. Effect of a 5% increase in road fuel prices on cost of living, by income decile (car-owning households only)



Source: Calculations from Family Expenditure Survey, 1990 and Expenditure and Food Survey, 2002–03.

We can see that the picture reverses – poorer car-owning households are hit harder by a fuel price increase than richer car-owning households, though the differences are quite small and the pattern is not uniform. The poorest 10% of car-owners see a cost-of-living increase of around $\frac{1}{3}\%$; the increase declines to the fourth decile then rises again in the upper half of the income distribution. Only the very richest households are affected by an obviously lesser amount.

Conclusions

Petrol prices are now at their highest level since the fuel price protests of late 2000. However, the real duty rates on diesel and unleaded petrol have not risen since then; in real terms, duty rates are at their lowest levels for seven years and look set to continue falling, at least whilst oil prices remain high. Instead, the high prices have been largely driven by increases in the pre-tax price owing to the price of oil. Thus, whilst at the time of the previous high prices around 80–85% of the pump price was accounted for by VAT and petrol duty, only around 70% of the current high prices is down to taxation. Nevertheless, the UK still has the highest combined tax rate on unleaded fuel of any EU Member State.

The poorest households are not disproportionately affected by increases in the cost of fuel; instead, it is those households in the upper half of the income distribution that face the largest increase in their cost of living resulting from price increases. However, the impact on the poorest households has grown over the past 15 years, and the result is largely driven by the fact that many poor households do not consume petrol at all. Amongst only those households that own cars, poorer households are indeed hit slightly harder.