

UK tax policies to control CO₂ emissions from motor vehicles – early impacts and lessons for other European countries

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Abstract

Road transport emissions of carbon dioxide represent 22% of total UK emissions and are thus an important focus for policies designed to help meet the UK's climate change commitments.

Vehicle CO₂ emissions are determined by the carbon content of the fuel, vehicle efficiency and miles travelled. Both Europe (through the European association of car manufacturers, ACEA) and Japan have made voluntary commitments to reduce new car fuel consumption by around 25%, and the US government has announced a programme with car makers to develop new technologies to help curb carbon emissions.

In Europe, the UK was the first country to introduce an explicit CO₂ basis for taxation on vehicle ownership. Vehicle excise duty (VED), which is paid by car owners on an annual basis, is now graduated according to vehicles' CO₂ emissions. A revised company car tax (CCT), introduced in 2002, also levies tax based on vehicles' CO₂ emissions (with an adjustment for other pollutants).

The introduction of this new basis for taxation, and the expectation that tax rates between low and high carbon vehicles will get steeper in the future, has led to a spate of advertising – in both the trade and consumer press – focusing on vehicles' carbon dioxide output in preference to speed, comfort or other factors.

This paper is intended to describe how these new taxes work, place them within their national and European contexts and provide early evidence of any observed impacts since their introduction.

Introduction

Until recently, environmental measures targeting the externalities resulting from the increasing use of motor vehicles have focused on controlling local pollutants such as carbon monoxide, nitrogen oxide, lead, particulates and volatile organic compounds. The main tool of policy in Europe has been regulation in the form of increasingly strict minimum standards for emissions of selected local pollutants for all new vehicles sold. (Euro III regulations are now in force with Euro IV due to take effect in 2005.) These regulations have been effective in significantly reducing the local pollution emitted by traffic.

However, of increasing concern to policy makers are the rising emissions of greenhouse gases (GHGs) such as carbon dioxide which are causing climate change. Transport is now the fastest growing source of greenhouse gas emissions and is responsible for around 20% of total worldwide emissions (Menz, 2002). In the UK, road transport alone is responsible for 22% of the UK's GHG emissions, and this share is rising.

If past trends were to continue, carbon dioxide emissions from personal transport in the UK will increase by 70% by 2020. Worldwide, CO₂ emissions from personal transport will quadruple by 2020. Just to stop CO₂ emissions from personal transport in the UK rising would require a doubling in average car fuel economy because of the growth in car ownership and use. Worldwide average fuel economy would

have to rise from 31 to 150 miles per gallon just to keep CO₂ emissions from this sector stable (WWF + Transport 2000, 2001).

Attempts to limit emissions of carbon dioxide from motor vehicles in Europe have, so far, relied heavily on voluntary agreements with European car manufacturers. The European car makers' association, ACEA, has agreed a target of 25% reductions in average new car CO₂ emissions to 140 grams per kilometre (g/km) by 2008. (The Japanese and Korean car makers' associations, JAMA and KAMA, have agreed to similar targets). According to the latest European Commission monitoring report, ACEA members are close to the schedule for reaching the 2008 target (ENDS, 10/1/03) though there are greater doubts about JAMA and KAMA members being able to reach their targets. The agreement is meant to deliver 15% of the EU's entire commitment to cutting greenhouse gas emissions under the Kyoto Protocol.

European governments are, however – both independently and centrally – looking at additional means of controlling carbon dioxide emissions from transport and, increasingly, are considering the option of taxes levied on either fuel or vehicles based on the levels of carbon emissions arising from their use.

The UK Government has been the first in Europe to introduce tax measures explicitly based on vehicles' carbon dioxide emissions and aimed at encouraging the use of more fuel efficient, less carbon-intensive vehicles and technologies. Fiscal measures have been used in the UK, and elsewhere, with the stated intention of reducing carbon emissions and other pollutants, but these have been more general in their intent and less focused in their execution. For example, the fuel duty escalator which raised gasoline and diesel prices annually at a rate above the prevailing inflation rate was introduced in the UK in 1993 and was justified, at least in part, as a means to reduce emissions of pollution and carbon dioxide. Germany also recently introduced an annual car tax (the equivalent of UK's VED) based on a vehicle's cylinder capacity, engine power and emission rates. Electric vehicles are exempt from annual taxes in several countries.

This paper intends to outline the two new tax mechanisms recently introduced in the UK – company car tax (introduced 2002) and vehicle excise duty (2001) – and to comment on their early impacts.

Vehicle Taxes – the European Picture

Taxes on motor vehicles within the European Union can be broken down into three distinct categories:

(i) taxes on purchase; (ii) taxes on ownership; and (iii) taxes on use (fuel taxes, road tolls and congestion charges).

Taxes on motor vehicles are a major source of revenue for European governments. The total revenue gained from vehicle taxation (including the types of taxes detailed above plus driving license fees, insurance taxes, tolls, customs duties and other taxes) is now worth around 334 billion Euro (ACEA, 2002). The total tax take from vehicle-related taxes is highest in Germany (72.5 billion Euro), followed by the UK (65.2), Italy (58.4) and France (53.6).

All countries in the European Union levy taxes on motorising through fuel duties. Duty rates vary from 289 Euro per

1 000 litres for the main unleaded grade fuel (95 RON) in Portugal to 753 Euro/1 000 litres in the UK. (For diesel: from 246 Euro/1 000 litres in Portugal to 753 Euro/1 000 litres in the UK). (ACEA 2002).

The UK is one of a handful of countries in Europe (including Germany, Sweden, Luxembourg and France) that do not levy tax – other than VAT – when a vehicle is purchased. Of the countries that do levy taxes on acquisition, most do so on a scale that rises either against engine size or cost (i.e. richer people or those buying bigger cars pay more). Vehicle purchase tax in Austria comes closest to a carbon tax as here the tax is based on fuel consumption up to a maximum of 16% of the vehicle's cost.

Most countries also levy a registration charge which is usually low, ranging from zero in Ireland and Greece to 453 Euro in Italy (sliding scale from 151 to 453).

Cutting average emissions of CO₂ relies on a complex mix of technical developments, market and government support to stimulate the production and sale of low carbon vehicles. The European car makers association, ACEA, is critical of EU governments for delays in achieving their commitment to introduce clear fuel-economy labelling of new cars even though two years have passed since the legal deadline (ENDS, 10/1/03).

Apart from the UK and Germany, in most other European countries vehicle ownership taxes are based on vehicles' engine sizes for passenger cars and on weight or payload for commercial vehicles.

The European Commission is in favour of ensuring that the system of vehicle taxes across Europe is more clearly geared to meeting the Union's environmental objectives and is consulting on ways to achieve them. Although the Commission isn't currently calling for a full harmonisation of vehicle taxes, it is suggesting that both purchase or registration taxes and annual road taxes be based entirely or partly on CO₂ emissions.

UK Tax Policies for Vehicles

Since the Labour Government came to power in the UK in 1997 there has been a greater emphasis on transport and environmental taxation with the emphasis split between air quality and climate change considerations. Economic and fiscal instruments have been used more proactively to stimulate change.

The annual fuel duty escalator was raised to 6% above the rate of inflation in July 1997 but was scrapped (at least in its automatic form) in 1999 (ironically before the serious fuel price protests by hauliers and farmers of autumn 2000). At its inception, the (then) UK Chancellor had stated that he expected the escalator to provide the necessary transport-related CO₂ reductions to meet the target outlined at the Rio Earth Summit.

Since the collapse of the fuel duty escalator, UK fiscal policy has focused on vehicle ownership taxes as a means of delivering carbon dioxide improvements from the transport sector to help meet the UK's commitments to CO₂ reductions agreed at Kyoto.

From March 2001, VED, an annual tax on car ownership, has been based on CO₂ ratings for all new cars. Company car tax was completely restructured according to vehicles' CO₂

ratings and the new system came into effect in April 2002. The requirement to include vehicles' CO₂ ratings on the Vehicle Registration Document (V5) was introduced in March 2001, to enable the new systems to come into force.

It is only in the fairly recent past that reliable CO₂ statistics for vehicles have been accessible and therefore useable as a tool by policy makers. In 1997 only 80% of newly registered vehicles had fully checked CO₂ data on their registration documents compared with 99.6% by 1999 and virtually 100% today.

The UK Government raises around 65 billion Euro from annual vehicle taxation of which over half comes from fuel excise taxes and nearly a quarter from VAT. There have been a number of attempts by transport ministers to 'hypothecate' taxes i.e. to ensure that tax revenues raised are invested in other parts of the transport system. Vehicle Excise Duty was introduced, for example, with the stated intention that the money would go to maintain roads and other parts of the transport system. However, the Treasury has resisted attempts at hypothecation and money continues to be allocated at that department's discretion.

VEHICLE EXCISE DUTY

Before 2001 the annual rate of road tax, or VED, was levied at the same level for all cars, regardless of size. Differential rates of VED were introduced for smaller-engined (below 1.1 litre) cars in 2001 and were extended to 1.55 litre cars by the summer. For vehicles registered before 1 March 2001 there are two rates of duty – £ 105 a year for smaller vehicles (below 1 549 cc) and £ 160 for larger vehicles. For vehicles registered after this date, a system of graduated taxation based on CO₂ ratings (5 bands) and fuel types (3) has been introduced as shown in Table 1:

Heavy and light goods vehicles, motor cycles, buses and other vehicles have VED levied according to different criteria. A CO₂-based system similar to that for cars above will soon be introduced for light good vehicles. For buses and heavy goods vehicles, tax is levied according to seating capacity (for buses) or weight (for HGVs) with reductions for the least polluting vehicles.

As Table 1 shows, the rates of VED for cars are set mainly to reflect their outputs of CO₂, but there are adjustments to reflect the expected air quality benefits (or disbenefits) relative to petrol to be derived from vehicles operating on the different fuel types (i.e. there is a bonus for vehicles running on gas, and a penalty for those running on diesel to reflect the impact on local air quality).

Company Car Tax

In the UK, historically many employees – particularly those at more senior levels within organisations – have been offered a company car as a benefit of employment. The UK tax authorities treat the provision of a car as a 'benefit in kind' (i.e. a substitute for income) and all employees earning £ 8 500 (13 700 Euro) or more a year have to pay the tax.

Company cars are a very significant segment of the UK new car market. Just over 50% of all new car sales are purchased by companies for business purposes with the remainder being bought by private individuals. In 2001, 41.9% of all vehicles sold were to businesses with fleets of over 25 vehicles and 8.7% were to small businesses with up to

Table 1. UK rates of Vehicle Excise Duty (for new cars registered after 1/3/01).

Bands	CO ₂ Emission figure (g/km)	Diesel Car	Petrol Car	Alternative Fuel Car
Band AA	Up to 120	80.00	70.00	60.00
Band A	121-150	110.00	100.00	90.00
Band B	151-165	130.00	120.00	110.00
Band C	166-185	150.00	140.00	130.00
Band D	Over 185	160.00	155.00	150.00

- UK £ per annum (Source: DVLA website: www.dvla.gov.uk)

24 vehicles (SMMT, 2002a). Consequently the company car sector is an important target for policies designed to influence the nature and characteristics of the UK car fleet.

The maximum car benefit is 35 per cent of the 'price' of the car, but may be lower depending on the amount of business mileage driven in the car and other factors. (The 'price' includes the vehicle's list price, the price of accessories and the total of VAT and other taxes levied). Individuals pay income tax on the calculated 'benefit in kind' (BIK) value of their company car. The rate of income tax will be levied at the individual's marginal rate of income tax (currently 22% up to income of £ 29 400 and 40% above this level).

(A separate tax charge is paid on the benefit of free fuel provided by employers for private motoring in a company car. From April 2003, Company Fuel Benefit charges will also be linked to the CO₂ graduated scale used for CCT).

From April 2002, company cars in the UK have been taxed on a percentage of their price, adjusted according to vehicles' carbon dioxide emissions (Before 2002, CCT was levied as a proportion of a car's price alone). A minimum CCT liability of 15% of the car's price applies to cars emitting at or below 165g CO₂/km (2002-3 level), rising to 35% if the car emits over 265g/km. The carbon dioxide bands are being progressively tightened in 2003-4 and 2004-5, sending a clear signal that high CO₂-emitting vehicles will become increasingly expensive, relative to more efficient vehicles emitting less CO₂.

In an attempt to reflect the air quality benefits – or disbenefits – of vehicles running on fuels other than petrol, variations to the percentage of tax liability are made. For certain alternative fuel vehicles there are discounts to the level of CCT liability. Battery electric cars enjoy a 6% discount, petrol electric hybrids up to 4%, and 1% for LPG/natural gas. For diesel vehicles, there is a 3% supplement, up to the maximum charge of 35%, to reflect the extra local pollution (mainly in the form of particulates and NOx) emitted by diesel vehicles. This diesel supplement will be waived for vehicles meeting the new Euro IV standard for cleaner cars, due to come into force in 2005. Some new diesel vehicles are already meeting the Euro IV standard and – given diesel's significant CO₂ benefits compared with petrol – the CCT system in UK will give a significant boost to sales of new diesel vehicles.

As Table 2 shows, the new UK CCT gives a very significant financial incentive for company car drivers to purchase vehicles with low CO₂ ratings, and particularly if they operate on fuels which are also deemed to offer a local air quality benefits. Compared with a petrol vehicle in the top CO₂ banding, a driver of the lowest carbon diesel vehicle (of which a good number are available because of the fact that diesel is intrinsically a more carbon-efficient fuel) who is

Table 2. UK Company Car Tax 'benefit in kind' (BIK) liability (for new registrations from April '02-3).

Vehicle Purchase Price £	CO ₂ g/km	Fuel type	BIK %	BIK £	Income Tax 22% taxpayer £	Income Tax 22% taxpayer £	BIK benefit vs highest rated petrol vehicle £/year
15 000	261	Petrol	35	525	1155	2100	0
15 000	160	Diesel	18	2 700	594	1080	+1 020
15 000	160	Petrol	15	2 250	495	900	+1 200
15 000	160	LPG/CNG	14	2 100	462	840	+1 260
15 000	160	Petrol-electric	11	1 650	363	660	+1 440
15 000	160	Electric	9	1 350	297	540	+1 560

also in the highest income tax band can make an annual financial saving of £ 1 020 (1 645 Euro). As the highest carbon vehicles also tend to be larger and more expensive, the potential financial savings are even greater.

The amount saved by a (high rate tax-paying) company car driver of the lowest CO₂-banded LPG vehicle is now £ 1 260 a year compared with a top band petrol vehicle of similar purchase price.

Hybrid vehicles offer even bigger tax savings for UK company car drivers although the Toyota Prius and the newly introduced Honda Civic are currently the only petrol-electric hybrid vehicles available on the UK market.

Battery electric vehicle options are currently very limited in the UK and, in any case, only a realistic option for operators with specific, short-range driving requirements.

Other UK vehicle taxes and incentives

VED and CCT are the only UK vehicle taxes that are explicitly focused on reducing carbon emissions.

Unlike most European countries, the UK levies no specific taxes on vehicle acquisition, other than VAT which is charged at the rate for all non-exempt products of 17.5%.

Fuel taxes in the UK are the highest in Europe. Excise duties on unleaded petrol and diesel are levied at around 750 Euro/1 000 litres and comprise over 60% of the retail prices of these products. While fuel taxes have only occasionally been portrayed by government officials as taxes to encourage carbon reductions, these levies clearly favour the most fuel efficient, and thus lowest CO₂-emitting vehicles. Drivers of the most fuel efficient vehicles will save over £ 500 per annum in fuel taxes compared with drivers of the least efficient vehicles (based on average mileage: 12 000 per year).

The government-funded PowerShift programme, run by the Energy Saving Trust, offers financial incentives to offset the cost of purchase or conversion of vehicles to run on cleaner fuels (including LPG, natural gas, and electrics/hybrids). Grants are worth up to 70% of the extra cost (highest grant value for a car is around £ 1 200). Vehicles funded must offer verifiable emissions benefits for local pollutants as well as CO₂ gains. The PowerShift scheme represents a further financial incentive for (mainly business) drivers to switch to cleaner, low carbon fuels.

Impacts of Carbon-based Vehicle Taxes in the UK

Of the two new CO₂-based taxes, the new CCT regime has been expected to have the most significant effects on the UK vehicle market. With cars for business uses representing over half the sales of new cars in the UK, a significant shift in the annual tax burden associated with operating different

types of vehicle, clearly has the potential for promoting major changes in purchase behaviour. The changes in VED, by contrast, represent a relatively small inducement to purchase one vehicle over another, though the effect could be more pronounced in the more second-hand vehicle market where an annual road tax difference of up to £ 100 is a more significant proportion of a vehicle's purchase price.

In a meeting with environmental groups on budget tax changes in early 2003 the Treasury minister responsible for environment taxes, John Healey, stated that the CCT changes were focused mainly on influencing the vehicle purchase decision while VED changes were not expected to have such a marked effect in the short-term.

Government projections for CCT anticipated that the changed regime would promote a reduction of up to 1 million tonnes of carbon 'in the long run' (UK Treasury, 2001). They projected an increase of 200 000 more smaller and cleaner company cars by 2005/6 than would have been purchased without the change (SMMT 2002).

The early indications in terms of overall new car CO₂ emissions are moderately encouraging, though there are difficulties in drawing conclusions about the efficacy of the new taxes in producing this result. Average CO₂ emissions for new cars fell 2.2% in 2002 compared with the previous year. However, this reduction represents a continuation of a longer-term downward trend in average emissions resulting from improved fuel efficiency, better aerodynamics and the use of lightweight materials. Average CO₂ emissions from new vehicles have fallen in every year since the SMMT began monitoring the data in 1997.

For comparison, average CO₂ emissions from all new cars sold in Europe fell 10% between 1995 and 2001. (EC, 2002) Across the Union, CO₂ emissions from diesel cars have fallen significantly faster (12.7%) compared with gasoline (8.3%).

According to a recent report from the UK Society of Motor Manufacturers and Traders, it is difficult to disentangle the effects of the VED changes from other effects going on in the vehicle market (falling vehicle purchase prices and static or falling fuel prices) (SMMT, 2002c). It should be noted that while the average vehicle's contribution to carbon dioxide output has fallen, the last two years have seen record increases in car sales. Total CO₂ emissions from all new vehicles registered in the UK in 2001 exceeded by around 6% the total emissions from all vehicles registered in 1997 (SMMT, 2000b).

CHANGES IN VEHICLE TYPES PURCHASED AND FUELS USED

The UK market has also seen a significant shift in recent years towards smaller vehicles. Demand for 'superminis' such as the Renault Clio and the Smart have been the cor-

nerstone of overall market growth. There was an increase in the share of the market for cars with emissions below 150g/km to 24% in 2001 from 19% in 2000. The market share increase of superminis has been the most notable change in the segmented market share statistics. From 1997 to 2001, sales of superminis rose from 26.5% of the overall market to 31.5% in 2001. The growth in the supermini segment has come mainly at the expense of the Upper Medium, Executive and Luxury Saloon segments. There has also been a growth in the MPV segment (from 2.05% in 1997 to 3.3% in 2001) but this coincides with a period in which MPVs also reported the largest reductions in CO₂ emissions as more, smaller models appear on the market.

The greater market share taken by cars fuelled by diesel has also been a major influence in the reduction in average CO₂ emissions. Diesel car sales represented a record 22% of the UK market in 2002, compared with 15.6% in 2001 (which had already shown a large increase on 2000 diesel sales). According to Fleet News (2 Jan 2003) it is conceivable that by the end of 2003, one in three new cars in the UK will be fuelled by diesel. It seems clear that the introduction of the CCT has further encouraged buyers to choose diesel rather than petrol models. This has occurred in spite of the 3% (local air quality) penalty which is applied to pre-Euro IV diesels under the tax as this is more than offset by the benefits from the vehicles' low carbon ratings for power output. However, it's likely that the growth in diesel sales may also be partly ascribed to the improvement in range and performance of models available with a diesel option which followed a period in which fuel prices have remained high in the UK, thus providing a greater incentive for buyers to purchase these more efficient vehicles.

Vehicle manufacturers have been much more successful in reducing average CO₂ emissions figures for diesel vehicles, which have fallen by nearly 13% (1997-2001) compared with just over 5% for petrol vehicles in the same period. Highly energy efficient petrol-electric hybrid vehicles have also made an appearance on the UK market since 2000, apparently stimulated by the drive for lower CO₂ emissions. Of the top ten car models with the lowest CO₂ in 2001, seven were fuelled by diesel, two were petrol-electric hybrids and just one (the Smart) was a petrol vehicle.

The introduction of the radical changes to CCT were accompanied by widespread (especially trade) media coverage of the new regime's financial impacts. Early advertising by the car manufacturers, in many cases highlighted, or focused entirely on, the CO₂ emissions/tax implications of new vehicle purchase. More recent advertising, while focusing less sharply on CO₂ tax implications, continues to promote the CO₂ message. It is quite clear that the introduction of the new CCT has made much more explicit the link between climate change and the action of driving a motor vehicle.

There are varying opinions on what effect the CCT changes will have on the willingness of business to provide company cars for their employees. The Lex Fleet Report (2000) anticipated that more companies will offer non-essential users company cars as a 'perk' as there is no longer a penalty for low-mileage users as under the former regime. Accountants Pricewaterhouse-Coopers forecast that there could be a move to new forms of car ownership where companies offer personal leasing schemes for employees, allow-

Table 3. Average new car CO₂ emissions in the UK (1997-2002).

Year	Avg CO ₂ – g/km	y/y % change	% change on 1997
1997	189.8	-	-
1998	188.4	-0.7	-0.7
1999	185.0	-1.8	-2.5
2000	181.0	-2.2	-4.6
2001	177.7	-1.8	-6.4
2002	173.8	-2.2	-8.4

Source: SMMT (2002c)

ing them to avoid CCT liability. The Inland Revenue reckon that there will be a net increase of 200 000 in the numbers of company car drivers as a result of the factor highlighted by Lex.

The tightening of the new CCT bands in 2003-4 and 2004-5 provide an ongoing incentive for company car buyers to purchase increasingly low CO₂ emission cars. The tax structure allows for further tightening to be applied relatively easily in subsequent years.

Lessons for other European policy makers from the UK experience

The European Commission views vehicle taxation as an important complementary instrument to support the realisation of the EU-target of 120g CO₂/km for new cars by 2005 (or 2010 at the latest). According to the EC's Expert Group on Fiscal Framework Measures, vehicle taxation "needs to establish a more direct relation between the tax level and the CO₂ performance of each new passenger car. Vehicle tax differentiation has been identified as an important parameter for improving the overall fuel efficiency of passenger cars. Existing vehicle taxes should be replaced by taxes fully based on CO₂ emissions, or, alternatively a CO₂-sensitive element should be added to them" (EC 2002).

The UK's experience of early adoption of CO₂-based taxes for vehicles is clearly of significance to policy makers responsible for their likely introduction elsewhere in the Union.

Both the new VED and CCT regime changes were announced by the UK Government well ahead of their effective introduction. There was a three year process from the time of the initial government announcement to the date of implementation. In the case of VED, a formal public consultation document was issued and for CCT a series of articles were published, presentations were given and meetings held with key stakeholders and audiences. This would seem to have eased the difficulties associated with the introduction of both new regimes as the philosophy behind them and the mechanics of the changes were given time to gain acceptance and understanding. The fact that the tax changes were broadly revenue neutral (i.e. they did not represent an increase, rather a shift in the overall tax burden) also helped.

According to Hoy (2002), the learning points for other UK experience for other European policy makers include the need to not only allow a long timescale before introducing such significant tax changes, but also to communicate them to the right stakeholders well in advance, and to be flexible about the timescale for introduction. The original VED timescale of less than two years was, he says, too short.

It is also important in terms of gaining of public acceptance that new environmental taxes aimed at reducing car-

bon dioxide are revenue neutral. There were no 'losers', for example, under the new VED regime but benefits for those moving to lower emission cars. CCT provoked a more hostile response because there were quite significant 'losers' at the top end of the spectrum of liability.

In addition to being revenue neutral (or better) from the taxpayers' perspective the introduction of VED was also probably more easily accepted because it was fairly modest in its initial structure. The difference between the top and bottom tax bands was relatively small but leaves room to steepen the structure and thus improve the incentives for low carbon vehicles over time. It is much easier to increase rates of an existing tax than to introduce a new tax regime at the same time as higher rates.

It is also important to minimise the administrative burden of any new tax regime and be certain that it is manageable and free from loopholes for avoidance. According to Hoy, the new version CCT reduced the burden on administrators because business and private car mileage no longer needs reporting unlike under the preceding system.

There was, however, opposition to the introduction of the more radical CCT, reflected in a concerted campaign in certain areas of the trade press and surfacing occasionally in the national media shortly before its introduction in April 2002. Drivers of larger, more powerful and – judged by conventional criteria – more desirable company cars would find themselves penalised through a significant increase in tax. Opposition to CCT, at least as reflected in the media, subsided after its introduction, though it could resurface when most company car drivers begin to complete tax forms and pay income taxes for the financial year 2002-3 later in 2003. Any difficulties in administering and enforcing the tax may also come to light at this point.

It needs to be borne in mind, of course, that the total output of carbon dioxide from the transport sector is determined not just by vehicles' technical efficiencies but by the number of vehicles on the roads, and the amount they are used. Improved fuel efficiency with stable fuel prices equals a reduction in the cost of using a vehicle and, thus, an inevitable increase in demand and resulting emissions. While the short-term impact of fuel price changes on driving behaviour is not high (the elasticity has been reported as 0.2-0.3 by most studies), the long-term impact is much more significant. Most academic studies have consistently shown that the long term impact of a 10% change in fuel prices will be a 7% change in the level of consumption (i.e. an elasticity of 0.7). (WEC, 2001).

Policy makers need to consider this effect when designing a coherent long-term policy framework for the reduction of CO₂. Fuel price mechanisms – such as the 'fuel duty escalator' which provoked such opposition in the UK – or road use taxes are also likely to be a necessary part of an effective policy mix.

Conclusions

Although it is early to judge the full effects of the move to the CO₂-based taxation for vehicles in the UK some clear patterns are emerging. The directly quantifiable effects include increases in sales of 'superminis' and other small cars and of vehicles fuelled by diesel. A less easily quantified but potentially highly significant factor is the effect that the new

tax regimes are having on UK consumer and European producer awareness of the importance of carbon dioxide emissions in the vehicle purchase decision. While vehicles are, in most cases, manufactured for the European rather than individual national markets the experience of the relatively smooth (so far) introduction of the new tax regimes in UK and the stated intention of the EC to adopt similar regimes across the Union sends a clear signal to the car makers that buyers in Europe will be demanding increasingly fuel efficient, climate-friendly cars.

Fiscal measures such as these are clearly an important measure in support of the voluntary ACEA (JAMA+ KAMA) agreements to reduce carbon dioxide emissions from vehicles across the EU, and are complemented by the introduction of customer-friendly CO₂ labelling of vehicles. Barring a major technological breakthrough, however, as car ownership and increasing use will offset vehicle efficiency gains across Europe, these alone will not deliver the CO₂ reductions in the transport sector sufficient to meet carbon reduction targets for 2010 and beyond.

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Glossary

- ACEA – European Association of Car manufacturers
- JAMA – Japanese Automakers' Association
- KAMA – Korean Automakers' Association
- VED – Vehicle Excise Duty
- CCT – Company Car Tax
- VAT – Value Added Tax
- LPG – liquefied petroleum gas
- CNG – compressed natural gas