A Green Tax Shift is often talked about as something government could perhaps attempt in the future. Yet, a number of green tax shifts have already been implemented in the UK and beyond. This briefing describes and draws lessons from two green tax shifts that have already taken place in the UK in the 1990s, one by a Conservative government and the other by a Labour government. Both shifts were based on a fuel duty escalator increasing the price of road fuels and income tax cuts reducing the cost of labour.

These shifts resulted in benefits that are often overlooked. These include the environmental benefits of reduced fuel use, emissions and travel demand. In economic terms a reduction in taxes on employment is to be expected to have increased both UK employment and economic output. Yet these broader benefits of the tax shift were rarely highlighted and the public unpopularity of the fuel tax escalator eventually resulted in its being abandoned.
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About the Green Fiscal Commission

The Green Fiscal Commission is an independent body and is not affiliated to any political party or government. Its membership includes experts from business, leading academics, senior MPs from all three main UK political parties, three members of the House of Lords, and representatives from consumer and environmental organisations.

The Commission’s aim is to assess the social, environmental and economic implications of a substantial green tax shift, such that 15-20 per cent of tax revenues come from environmental taxes. The Commission is reviewing and collating the existing evidence on the implications of a green tax shift as well as conducting new research. The results from this work will be placed in the public domain to stimulate debate and, we hope action, on this agenda.

This briefing is the second in a series which will summarise the main messages from the work of the Commission. The series of briefings will cover a wide range of issues associated with the implementation of a major green tax shift, problems that it may raise and how these can be overcome. The series will include briefings covering: the impact of green fiscal reform on economic competitiveness, public opinion on green taxes, and distributional issues that a green tax shift may raise. The briefings will be available on the Green Fiscal Commission website as they are published. It is also possible to register on the website to receive email updates on the work of the Commission or subscribe to the Green Fiscal Commission Blog which provides news and expert commentary on this agenda.

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How Effective Are Green Taxes?

Summary

Environmental taxes have been widely introduced across Europe and elsewhere over the last 20 years. Many organisations have advocated a more widespread or radical adoption of green taxes. But what evidence is there that green taxes are actually effective? Indeed, what do we mean by effectiveness, how can it be assessed, and what are the factors that affect it?

This briefing looks at these issues and draws conclusions from the review of evidence that the Green Fiscal Commission has conducted on the practical effectiveness of green taxes, particularly in relation to their reduction of environmental impacts. We conclude that, where environmental taxes have been evaluated, the evidence is overwhelming that they are an effective means of reducing environmental impacts. Some green taxes will also generate tax revenues for government which are stable over time. This briefing also highlights some important factors that contribute to the effectiveness of green taxes.

Effectiveness - What is the purpose of green taxes?

The main purpose of green taxes is to reduce pollution or conserve natural resources. However, many green taxes will also raise substantial tax revenues, and some, like the duty on road fuels, were introduced for this purpose before they were thought of as green taxes. It is important to realise that raising revenue and changing behaviour are not mutually exclusive objectives. Taxes can reliably raise revenue and change behaviour at the same time. For example, the Fuel Duty Escalator, introduced by the UK Government in 1993, was primarily introduced to raise revenue (and did so1), but it also reduced demand for petrol and thereby reduced environmental impacts. The key issue here is the price elasticity of the response: if demand falls by a lower proportion than the price increases, then a tax-induced increase in the price will both increase tax revenues and reduce environmental impacts.

In spite of the long-standing practice of using green taxes both to raise revenues and reduce environmental impacts, there seems to be public resistance to their tax rates being raised, even where this seems necessary for environmental reasons, such as the mitigation of climate change. This issue will be further discussed and explored in a future briefing from the Green Fiscal Commission on green taxes and public opinion.

Evaluating effectiveness

The argument for environmental taxes is that, if a product or activity is made more expensive, people will respectively buy or do less of it. If the activity is associated with excessive environmental damage, this will reduce the environmental damage. It is obviously desirable to evaluate the extent to which this argument holds up in practice - the extent to which environmental taxes really do lead to environmental improvement. Evaluations of green taxes following their implementation are desirable not only to see how effective they have been in environmental terms, but also to learn lessons about how best to introduce them and to communicate their impact and value to policy-makers.

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1 For details of fuel duty revenues see Green Fiscal Commission Briefing Paper No. 1 'Lessons from Two Green 'Tax Shifts in the United Kingdom', March 2009.
and other interested stakeholders such as businesses and members of the public.

The difficulty with evaluating the effectiveness of green taxes is that there are many factors which affect what people buy or do apart from price, and the evaluation must somehow separate out the different effects of these factors, which include market price changes apart from that due to taxes, growth or contraction of the economy and incomes, and the fact that green taxes are often introduced as part of a ‘package’ of several environmental policies. It can be difficult or impossible to isolate the effect of the tax by itself.

This is one of the reasons why policy evaluations, including of green taxes, are conducted relatively rarely. In addition, they are time-consuming, data and resource intensive and can be inconclusive. There are also few incentives for policy makers to conduct them - negative reactions against non-performing policy instruments tend to be stronger than positive reactions when they are delivering as expected.

When evaluations are conducted there are two fundamental questions that must be answered. Firstly, what would have happened had the policy instrument not been introduced? This is often referred to as ‘the baseline’ question. In the context of green taxes, generating a ‘without green tax’ baseline is often far from straightforward, especially when an environmental tax might be expected to have sectoral and macroeconomic impacts, with further knock-on environmental effects, in addition to affecting the particular target of the tax.

Secondly, as noted above, when the policy has been implemented as part of a package of policies, as is increasingly the case, how can the effect of the policy instrument of interest, the green tax, be distinguished from that of each of the other instruments in the package? What would have been the effect of the tax by itself? Or have the other policy instruments actually increased (or diminished) the price effect of the tax (perhaps in addition to having their own effects)?

There are no hard and fast ways of answering these questions, and this should be borne in mind when assessing the results of evaluations. They are, at best, estimates in a context of uncertainty. But it is surely better to have such estimates than no information about whether policy is effective or not.

As noted above, the size of the response to a tax is measured by what is called its price elasticity, which is the proportional change in the demand for a taxed good caused by a change in the price. There are many estimates of price elasticities, and they are widely used to estimate the scale of the behavioural responses to tax-induced price changes (OECD, 2001, 2006). Price changes will generally have impacts not only on the demand for the products directly affected, but throughout the economy. These effects act over different time scales, both short term and long term. An evaluation of these economy-wide effects (economic as well as environmental) can only be undertaken by the use of a macroeconomic model. Many of the evaluations reported below have used such models. Obviously this greatly complicates the analysis, but it is necessary unless it is clear that the direct effects of the tax on the taxed product will have a negligible impact on the economy as a whole. For the scale of green tax shift which is being investigated by the Green Fiscal Commission, this will clearly not be the case. The Commission is therefore using one of these models to estimate the impacts a major green tax shift in the period from now until 2020. This will be reported on in a separate briefing.

The evidence on the environmental effectiveness of green taxes

As indicated above, the evaluation of green tax measures or any policy measure raises some significant challenges. Below we summarise the headline messages on the environmental effectiveness of green taxes, drawn from
a much longer review of the literature in this area, which will be published as one of the major outputs of the Commission’s work. The review makes clear that such headline messages are often subject to caveats or qualifications, which for the sake of brevity have been omitted here, and this should be borne in mind when reading what follows. Overall, we feel that these headline messages give a valid representation of the environmental effects of green taxes, and confirm that they are positive and effective policy instruments for environmental improvement.

The impact of energy and carbon-based taxes

<table>
<thead>
<tr>
<th>Country and tax description</th>
<th>Period evaluated</th>
<th>Impact</th>
<th>Source</th>
</tr>
</thead>
</table>
| Finland – energy & carbon tax | 1990-2005 | • CO2 emissions 7 per cent lower than would have otherwise been  
• A shift from carbon tax to output tax on electricity in 1997 may have lessened impact. | Nordic Council 2006, Nordic Council 1999 |
| Norway – carbon & sulphur dioxide taxes | 1991-2007 | • 21 per cent reduction in CO2 from power plants by 1995  
• 14 per cent national reduction in CO2 in 1990s, 2 per cent attributed to carbon tax  
• 12 per cent reduction in CO2 emissions per unit of GDP | OECD 2001, OECD 2006, Nordic Council 2006 |
| Denmark – energy & carbon tax | 1992 | • CO2 emissions in affected sectors down by 6 per cent and economic growth up by 20 per cent between 1988 and 1997 and a 5 per cent reduction in emission one year in response to tax increase  
• In 1990s a 23 per cent reduction in CO2 from business as usual trend and energy efficiency increased by 26 per cent  
• Subsidy to renewables may have accounted for greater proportion of emissions reductions than tax | OECD 2006, Nordic Council 2006 |
| Sweden – energy & carbon taxes | 1990-2007 | • Emissions reductions of 0.5 million tonnes per annum  
• Emissions would have been 20 per cent higher than 1990 levels without tax | Nordic Council 2006, Swedish Ministry of Finance 2004 |
| The Netherlands – energy tax | 1999-2007 | • Emissions 3.5 per cent lower than would have otherwise been  
• Low tax rates may have limited impact | Finance ministry, the Netherlands 2007 |
| Germany – environmental tax reform, taxes on transport, fuels & electricity | 1999-2005 | • CO2 reduced by 15 per cent between 1990 and 1999 and 1 per cent between 1999 and 2005  
• CO2 emissions 2-3 per cent lower by 2005 than they would have been without tax  
• German re-unification an important factor in reductions | EEA 2007, OECD 2006 |
| UK – industrial energy tax | 2001-2010 | • UK CO2 emissions reduced by 2 per cent in 2002 and 2.25 per cent in 2003 and cumulative savings of 16.5 million tonnes of carbon up to 2005  
• Reduction in UK energy demand of 2.9 per cent estimated by 2010 | Cambridge Econometrics 2005, HMT 2006 |

Impacts of European ETRs

The most extensive analysis of the effects of environmental tax reforms (ETRs) at the European level has been undertaken in the EC-funded research project COMETR (2007). The main focus of the project was to assess the competitiveness effects of ETRs, in particular in those EU member states which launched ETRs during the past two decades (ie Denmark, Finland, Germany, the Netherlands, Sweden and the UK). Apart from analysing the economic implications, environmental considerations were also studied using a macro-econometric European model called E3ME (CE, 2006). Figure 1 of the model results shows that the ETRs (mainly involving energy/CO2 taxes) are likely to have brought about a
reduction in GHG emissions in all the six EU countries that implemented them. Figure 1 shows the difference between the actual situation with the ETRs, the base case, and a counterfactual reference case without the introduction of ETRs. The chart combines an ex-post evaluation (development between 1995 and 2005, using historical data and econometric estimation) and an ex-ante assessment (development after 2005, using exogenous assumptions and econometric estimation).

**Figure 1: The effect of ETR on GHG emissions**

![Graph showing the effect of ETR on GHG emissions](image)

**Note(s)**: % difference is the difference between the base case and the counterfactual reference case.

**Source(s)**: CE.

*The impact of transport taxes*

There is a large amount of information at the European and member state level on fuel price and consumption, vehicle taxes and vehicle mileages and how these have changed over time. But analysing this highlights the difficulties of evaluating the effectiveness of environmental taxes (or other policy instruments) referred to above. Apart from the price development, a number of non-price variables can influence the demand for a specific product. The changes in these other variables can add to or offset the estimated effects of the price change, obscuring the price response. Therefore, even in the absence of a fall in demand, it cannot be concluded that the price / tax increase was environmentally ineffective - what has to be compared is the actual situation (with the tax change) and an estimated outcome without the tax change (the baseline). The evaluations summarised below are ones with a particularly clear link between tax and impact. Again, the longer paper this briefing is based on, (and of course the sources themselves), make clear the assumptions and methods that have produced these results, and the issues that should be borne in mind when interpreting them.
## The impact of water related taxes

Results from the wastewater tax in Denmark provide clear evidence of the environmental effectiveness of the instrument. The wastewater tax mainly affects municipal sewage plants, as many industries are exempt from it. During the period 1996 to 1998 the discharges of BOD, phosphorous and nitrogen - the three taxable pollutants - from sewage plants declined by 20-25 per cent, while those from industries with direct discharges increased (EC, 2001). The Dutch wastewater effluent charge reduced water pollution from the 14 companies responsible for 90 per cent of the pollution by 90 per cent over 1969-75, and by a further 20 per cent by 1980. Half of this reduction was said to be due to the charge and accompanying measures (EEA, 2005a). The European Environment Agency concluded that the Dutch tax not only provided a clear incentive for industry to reduce discharges at source, but as a result it also reduced the need for the construction of large new public wastewater treatment plants to a level

<table>
<thead>
<tr>
<th>Country/ region</th>
<th>Period evaluated</th>
<th>Impact</th>
<th>Source</th>
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<tbody>
<tr>
<td>Denmark - household waste tax</td>
<td>1987-1996</td>
<td>• 26 per cent reduction in waste delivered to municipal sites between 1990 and 1996</td>
<td>MEE-DEPA 2007</td>
</tr>
<tr>
<td>Finland - waste taxes</td>
<td>1996-2007</td>
<td>• Reduced waste by 15 per cent compared to a business-as-usual scenario. Packaging tax is said to have led to almost complete recycling rates for soft-drink packaging</td>
<td>Nordic Council 2006</td>
</tr>
<tr>
<td>Sweden - waste taxes</td>
<td>1996-2006</td>
<td>• Production and consumption have grown by 7 per cent, waste generation has declined by 0.5 per cent</td>
<td>Nordic Council 2006</td>
</tr>
<tr>
<td>UK - landfill taxes</td>
<td>1996-2006</td>
<td>• Active waste disposed of to landfill fell by 14 per cent between 1997-98 and 2005-06, while overall landfilled waste fell by 25 per cent</td>
<td></td>
</tr>
</tbody>
</table>
well below comparable countries, thereby saving substantial public investment (EEA, 2005b).

Revenue and revenue stability

It is sometimes argued that, because one of the objectives of green taxes is to change behaviour (to improve the environment), they will not be substantial or reliable sources of public tax revenues. This argument was refuted earlier in this briefing: where an environmental tax reduces rather than eliminates an activity or use of a product, it will continue to raise revenues, and these revenues may be substantial and sustained. There are many examples of environmental taxes like this, including taxes on road fuels, other uses of energy, other basic resources (such as aggregates) and landfilled waste. The behavioural response to a tax will depend on the elasticity of demand, and where this is not too high, the tax may result in both some revenues and some reduction in demand.

Comparison with non-environmental taxes illustrates the case further. Cigarettes and alcohol are both highly taxed and have been for a considerable period. As a result people smoke and drink less than they would otherwise do, but they do not give up completely, and the taxes yield substantial tax revenues. Some people might wish that people would stop smoking completely, but this cannot be true of the use of environmental goods and services, or the economy would grind to a halt. Environmental taxes have been an important source of tax revenues in the past and will continue to be so in the future.

Conclusions and factors affecting effectiveness

There is now substantial experience with the introduction of both environmental taxes, and of environmental tax reform (ETR), in many countries and in relation to many environmental issues. There have been a number of attempts, despite the difficulties, to evaluate the effectiveness of these instruments by such bodies as such as the OECD, EEA, the European Commission and the Nordic Council.

These evaluations overwhelmingly suggest that environmental taxes are environmentally effective, i.e. they contribute to the achievement of the environmental objectives for which they have been designed. The design of the instrument is crucial. The tax must be set at the right level to achieve the objectives, and must be directed at the source of the environmental burden which it is sought to reduce. When implemented in this way, it is clear there are numerous examples of environmentally-successful green taxes, among which may be mentioned the Danish energy/carbon taxes, the Swedish NOx tax, the German energy and transport taxes, the UK climate change levy and fuel duty escalator, the Finnish, Swedish and UK waste taxes, the London congestion charge and the Dutch wastewater effluent charge.

Many of these taxes have also generated substantial revenues on a stable and predictable basis, which makes them suitable taxes for consideration for an environmental tax reform.

One regular finding of the evaluations is that environmental taxes would have been more effective if tax rates had been higher, and if major industries or
other sectors of the economy had not been exempted either by paying reduced tax rates or by being fully exempt from the tax (Nordic Council, 2006 and COMETR, 2007). In environmental terms, this conclusion is hardly surprising. The reasons for the low rates and the exemptions are familiar concerns about competitiveness and the potential distributional effects of environmental taxes, which are discussed in other Green Fiscal Commission papers.

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