The Case for Green Fiscal Reform

Final Report of the UK Green Fiscal Commission

The Green Fiscal Commission

The Green Fiscal Commission is an independent body and is not affiliated to any political party or government. Its members come from business, universities, the three main UK political parties, both Houses of Parliament, and consumer and environmental organisations. Members were all appointed in a personal capacity. One of the Commission's major aims was to assess the social, environmental and economic implications of a substantial green tax shift, such that 15-20 per cent of the UK's tax revenues come from environmental taxes by 2020. The Commission's full Terms of Reference and a list of members are given at the end of this report.

The Commission's Secretariat is provided by the Policy Studies Institute (PSI), one of the UK's leading policy-focused research institutes. Its Chairman is Robert Napier, Chairman of the Homes and Communities Agency and the Board of the Met Office, with a distinguished career in business and the environment. Its Director is Professor Paul Ekins, formerly Head of the Environment Group at PSI, but now Professor of Energy and Environment Policy at the UCL Energy Institute, University College London.

'The Case for Green Fiscal Reform - The Final Report of the Green Fiscal Commission'

This report summarises the findings and conclusions of the work of the Green Fiscal Commission and was written on behalf of the Green Fiscal Commission by Professor Paul Ekins with contributions from Dr Simon Dresner (PSI), Professor Stephen Potter (Open University and member of Green Fiscal Commission), Ben Shaw (PSI) and the independent expert on green taxes, Dr Stefan Speck.

A series of briefings that expand upon the content of this report and gives full references to the material cited is available from the Green Fiscal Commission website. A book bringing together the content of this report, the briefings and further material on green fiscal reform will be published in 2010.

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The Case for Green Fiscal Reform

Contents

Chairman's Foreword

There is now global consensus about the reality and threat of climate change. There is less agreement about implementing the mitigating actions that are so urgently required.

I believe from previous work I led at WWF that to hold temperature increases to a level beyond which consequences are potentially really serious for humankind requires that **all** levers for reducing greenhouse gas emissions are used: political leadership, public opinion, effective emissions trading, regulation, innovation **and** green fiscal reform.

The Green Fiscal Commission was established to address how a major tax shift could be achieved, what carbon reductions would result and what the other consequences would be. The conclusions in this Report are clear. A large increase in green taxes will be environmentally very effective and with a largely positive economic outcome.

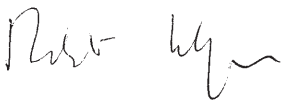
Under the executive leadership of Professor Paul Ekins, we have assembled an outstanding group of Commissioners, including senior representative from the three main political parties, whose experience and wisdom have stimulated a lot of debate and thus informed this Report.

I must emphasize that all Commissioners (including myself) have offered our particular perspectives on green fiscal reform to inform the Report. The Report does not necessarily reflect the views of our employers.

The Commissioners share a belief about the importance of the subject and the need for wide-ranging public debate about it. They welcome this Report, and its contribution to the low-carbon agenda, but they do not necessarily endorse all its detailed arguments. It was never our intention to prescribe specific tax changes but rather to produce a menu of possible and effective fiscal adjustments.

I would like to thank the Commissioners for their input, Paul and his team for all their work and our funders, in particular the Esmée Fairbairn Foundation.

I hope this Report gains immediate political and public attention and traction so that green fiscal reform is indeed implemented following the widespread public discussion which is needed and to which I hope this report will contribute.



Robert Napier

Chairman

Green Fiscal Commission

Executive Summary

Green Fiscal Reform (GFR) – a green tax shift

The concept of a green tax shift is simple: taxes on the things that are valued by society; like jobs, incomes and profits; are reduced and the lost revenue is replaced by taxes on things society does not like, such as pollution and environmental degradation. 'Pay as you burn, not pay as you earn' as one political formulation has put it. This shift not only reduces pollution, but is a more economically efficient way of raising necessary tax revenues. Taxes on labour at their current level, for example, distort the economy and reduce its efficiency and output. The same considerations suggest that, at times when taxes need to be increased to stabilize the public finances, green taxes should play a more than proportionate role in the increase.

The polluter pays

While a green tax shift does not mean the overall rate of tax will change at the national level, it does mean people and business will see the amount of tax they pay change: the polluter pays. Highly polluting households and businesses will see their tax bill increase where low pollution households and businesses will see their tax bill cut below what it would otherwise be.

The need for Green Fiscal Reform

If the UK is to meet its climate change and other environmental targets it will need to apply a wider range of policy measures, and apply them more stringently. Price is a fundamental factor which affects the type of products and services individuals and businesses buy and the level of demand for them. Changing the price of polluting activities relative to clean ones is a vital element in any serious package of measures intended to reduce climate change emissions. Green Fiscal Reform is the best way for a national economy to achieve this shift in prices.

This Report

There have already been relatively modest tax shifts in a number of European countries, including the UK, the results of which have been shown to be generally positive. A major purpose of the Green Fiscal Commission was to explore the economic, social and environmental implications of a major green tax shift for the UK, such that revenues from environmental taxes would more than double their current seven per cent share in overall tax revenues by 2020.

The results suggest that a large-scale green tax shift would be economically sensible and environmentally effective. If implemented with appropriate complementary measures, it could also be socially acceptable, especially as increasing numbers of people come to realise the imperative of reducing carbon emissions and climate change.

Key messages

Environmental taxes work: numerous studies, including those of the Green Fiscal Commission, have shown that green taxes are effective in reducing the environmental impacts on which they are targeted.

Environmental taxes are efficient: there are good reasons why environmental taxes in many situations will achieve environmental improvement at lower cost than other instruments.

Environmental taxes can raise stable revenues: some environmental taxes, like fuel duty, have been raising sizeable revenues for years. Raising them significantly would therefore both achieve environmental improvements and allow other taxes to be lower than they would otherwise need to be.

The public can be won round to green fiscal reform: a number of polls show majority public support for a green tax shift, which increases when people are persuaded that the green taxes really will be instead of other taxes.

The UK's 2020 greenhouse gas targets could be met through green fiscal reform: the economic implications of doing so would be broadly neutral, and the green fiscal reform policy approach would increase employment.

Green fiscal reform would stimulate investment in the low-carbon industries of the future: investing a small proportion of the revenues from green fiscal reform in energy-efficient homes and vehicles, and in renewable energy development, would accelerate the growth of new low-carbon industries with real export potential, as well as increasing the environmental benefit of green fiscal reform.

Green fiscal reform can mitigate the impact of high world energy prices: high world energy prices are bad for the UK economy, which is now a net energy importer. Green fiscal reform can drive energy efficiency and make the UK economy less vulnerable to high world energy prices if they rebound once the global economy recovers.

The impacts of green fiscal reform on competitiveness can be mitigated: relatively few economic sectors would face serious challenges to their competitiveness from green fiscal reform, and there are a number of ways in which these concerns can be addressed.

For green fiscal reform to be fair, low-income households would need to be protected from energy price rises while their homes were being made energy efficient: the UK needs a massive programme of energy efficiency improvement to existing homes for social as well as environmental reasons. While this programme is being carried out, special measures would need to reduce the impacts on low-income households of the energy price rises entailed by green fiscal reform.

Green fiscal reform emerges as a crucial policy to get the UK on a low-carbon trajectory; help develop the new industries that will both keep it there and provide competitive advantage for the UK in the future; and contribute to restoring UK fiscal stability after the recession. It is a key to future environmental sustainability and low-carbon prosperity.

1. Introduction

This is the Final Report of the UK Green Fiscal Commission, an independent body convened in 2007 and consisting of Commissioners drawn from both Houses of Parliament, business, universities and other non-governmental organizations with an interest and expertise in environmental taxation and green fiscal reform (GFR). The Terms of Reference of the Commission is given at Annex 1, and a full list of Commissioners is given at Annex 2. The work of the Green Fiscal Commission was funded by the Esmée Fairbairn Foundation and the Ashden Trust.

GFR has been defined by the European Environment Agency as "a reform of the national tax system where there is a shift of the burden of taxes from conventional taxes such as labour to environmentally damaging activities, such as resource use or pollution". The main purpose of the Green Fiscal Commission was to assemble, present and disseminate the evidence on GFR, including examining the implications of a GFR that would increase the share of environmental tax revenues in overall tax revenues from their current level of around seven per cent to 15-20 per cent by 2020. The rationale for undertaking this work was the perception that a UK GFR could have an important role to play in achieving the substantial reduction in UK CO_2 emissions to which the UK is now statutorily committed.

A number of countries over the last 20 years have organized green fiscal commissions to explore the implications of environmental taxes. A summary of their experience and main lessons and recommendations is given in Annex 3.

The work programme of the UK Green Fiscal Commission produced a number of longer papers which are being assembled into a book to be published by Earthscan in 2010. Some of these long papers were edited down to form shorter Briefing Papers. These are listed in Annex 4 and can be found on the Green Fiscal Commission website.

This Final Report is a further distillation of the Green Fiscal Commission's findings, evidence and conclusions. While some of the analysis and arguments are still necessarily complex, the material has been made accessible to the general reader by removing all the references and using non-technical language wherever possible. Those who wish to see the references and the fuller arguments behind the Report's conclusions should go to the Briefing Papers and, in due course, to the book.

The Green Fiscal Commission work programme also included an investigation of public attitudes to environmental taxes and GFR, through a specially commissioned poll, two Deliberative Days and ongoing monitoring of other polls, publications and published opinions on the issues. Details of this work may be found in the report of the Deliberative Days and in the information on the Green Fiscal Commission blog, a link to which may also be found on the Commission's website.

In addition, workshops were held with more specialist stakeholders on the issues of the possible effects of GFR on low-income households, and on business competitiveness. The latter workshop was organized with the Confederation of British Industry (CBI).

Finally, in July 2009, a major two-day conference was organized at King's College London jointly with the PETRE ('Resource Productivity and Environmental Tax Reform in Europe') project of the Anglo-German Foundation. The conference presentations are available on both the Green Fiscal Commission and PETRE websites, the latter of which (www.petre.org.uk) is a rich information source on the implications of green fiscal reform at the European level.

Green fiscal reform (GFR) is the term used consistently throughout this Report, but GFR is also sometimes called environmental tax reform (ETR) or green tax reform. The name GFR was chosen to reflect the focus of the work of the Commission on environmental taxes large enough to have fiscal implications, i.e. to be significant sources of revenue. There is therefore no discussion in this report of environmental taxes which raise little revenue, either because the tax base is very small to start with, or because they soon induce behaviour change that renders it so.

Section 2 of this Report sets out the basic rationale for GFR 'in a nutshell', touching on most of the issues that are then explored in more detail in subsequent sections. Sections 3, 4, 5 and 6 cover the Commission's work on the effectiveness of GFRs to date, on some little-known experience with them in the UK, on transport taxation and on public attitudes to green taxes.

Section 7 is easily the longest section and reports on the results of a major modelling exercise by Cambridge Econometrics, investigating the possible outcomes and implications of a far more ambitious GFR than has been implemented anywhere to date.

The results of the modelling of this GFR are very positive: the UK meets its greenhouse gas obligations at very little overall cost and with a slight increase in employment. This does not mean that such a GFR will be easy to implement, and Sections 8 and 9 examine the two principal obstacles to GFRs in the past and, probably, in the future: their potential impact on competitiveness and low-income households. Section 10 sets out the conclusions of the report.

This Report therefore covers a lot of ground, but there are inevitably a number of areas that are beyond its scope.

First, it is concerned with GFR at the UK level, and does not examine its implications for the devolved levels of government or the European dimension. With regard to the former, while fiscal policy is almost entirely reserved to the UK Government at present, fiscal politics are more complex. A successful GFR will need to take account of the distinctive features of the UK's devolved regions and administrations, but how this is done will need to be the subject of further work. As for the EU, there is much recent detailed work on GFR at this level, which suggests that GFR would generally be as positive as this Report suggests it would be for the UK. But the politics of taxation at the European level make it most unlikely that a large-scale GFR for the EU will be agreed in the near future. Such a prospect is therefore not considered in this report.

Secondly, the Report is mainly concerned with the practical implications of GFR and not with the theory behind it or with environmental taxation more generally. There are therefore many staple topics in the literature, such as the efficiency characteristics of environmental taxation or the point at which it should be levied, or the existence of a 'double dividend' as labour taxes are reduced as environmental taxes are increased, that are referred to only briefly or not at all.

Similarly the Report does not explore in any detail the relationship or interactions between GFR and other policy instruments, including the EU Emissions Trading Scheme (EU ETS). The revenues from increased auctioning of EU ETS permits are included in the GFR that is modelled in Section 7, and other policy instruments that seem necessary or desirable to complement the GFR are outlined in places, but the detailed design and analysis of any policy package to support the GFR have not been undertaken.

Finally, when the Green Fiscal Commission was being set up in late 2006, the public finances seemed stable, and revenue neutrality of the tax shift seemed the desirable approach to examine its implications without getting into arguments about the desirable level of public expenditure. This indeed has been the basis of the modelling that has been undertaken. Three years on, the recession and associated fiscal stimulus have resulted in a fiscal deficit that most commentators now agree will require increased taxation to address. Under these circumstances the green tax shift can be reconceptualised as an increase in environmental taxation, rather than for example in income tax, National Insurance contributions or VAT, such that the share of environmental tax revenues in overall tax revenues is increased. There seems to be no reason why a GFR of this kind would be economically or environmentally less favourable, compared to the scenario of non-environmental tax increases, than the revenue-neutral kind that is the focus of most of the analysis in this Report.

2. In a Nutshell – The Case for Green Fiscal Reform

The Imperative to Reduce Carbon Emissions

The UK has set legally binding targets to reduce greenhouse gas emissions.

Through the Climate Change Act the UK Government has now legislated into statute the widespread international recognition that industrial countries must reduce their emissions of greenhouse gases (GHGs) by 80 per cent from 1990 levels by 2050 if there is to be any chance of keeping average global temperature increases to 2°C, which is the EU's definition of averting dangerous anthropogenic climate change. This will require comparable reductions in emissions of carbon dioxide, the principal greenhouse gas, which are mainly the result of burning fossil fuels, and it is this necessary reduction in emissions that provides the main motivation for green fiscal reform (GFR).

The associated targets for 2020 will need to be met through renewables, energy efficiency and demand reduction.

To get on a trajectory to meet its 80 per cent target, the UK Government has further committed the UK to reducing its GHG emissions by a minimum of 34 per cent from 1990 levels by 2020 (the Scottish Government has adopted a more ambitious 42 per cent reduction from the same baseline). This is too soon for a major part in such emissions reduction to be played by carbon capture and storage (CCS) or new nuclear plants, though these may make a significant contribution thereafter. This means that most of the reductions by 2020 will have to come from the large-scale deployment of new renewables technologies, energy efficiency (the delivery of the same energy services with lower use of energy) in households, transport, business (industry and commerce), power generation and the public sector, and demand reduction (a reduction in consumer demand for energy services).

The rate of emissions reduction is too slow so new polices are needed.

Carbon emissions are not currently reducing anything like fast enough to reach the 2020 target. A new policy approach is likely to be required in order for them to do so. First it is necessary to recognise some inconvenient facts about the use of energy in industrial (and industrialising) societies.

Some Inconvenient Facts About Energy Use

A number of facts about energy use in a society like the UK need to be recognised to increase the chances that any policy to radically reduce carbon emissions will be successful.

Energy use increases with income…

First, other things being equal, energy use increases with income. There is no sustained period of economic growth in the UK or any other industrial or industrialising society for which this has not been the case. Policy to 2020 must therefore recognise that, if the UK is to experience economic growth to 2020, as is widely hoped, the associated underlying trend of energy use will be increasing.

One of the reasons for the close connection between economic growth and energy use is that, consequent to the laws of thermodynamics, energy use is fundamental to all kinds of economic activity (though some activities are obviously more energy-intensive than others). The innovation that drives economic growth is therefore often associated with new products or processes that use energy.

So just improving energy efficiency alone won't be enough to meet the UK's carbon targets.

One consequence of this is that improvements in energy efficiency by themselves are most unlikely to reduce the absolute consumption of energy, because although they will reduce the consumption of energy for the delivery of any given service, they will increase the demand for energy services overall and this, combined with the continual creation of new energy service demands through the innovation process will overwhelm the particular reductions in consumption from the efficiency improvement. Indeed, this must be the lesson of past experience, because industrial societies have seen huge improvements in energy efficiency across practically all uses of energy over the last fifty years, and before, and yet energy consumption has remained obstinately increasing with the size of the economy, as already noted.

Increasing energy prices reduces energy use…

Second, the only change in economic circumstances that has been shown to reduce energy consumption is an increase in energy prices. If energy prices increase in relative terms, compared with other goods and services, this channels innovation into less energy-intensive routes. If they increase in absolute terms, this reduces the demand for energy services (old and new), and encourages investment in energy conservation and efficiency technologies. If the energy price has been increased through the imposition of a price on carbon, for example, through a carbon tax or an emissions trading scheme, then the price increase will also encourage investment in low-carbon energy sources.

And increasing the price of energy appears to be the only policy that contributes to all three ways of meeting the 2020 carbon reduction targets.

It was noted above that it is only through increased energy efficiency, increased investment in renewables and reduced demand for energy services that there is any prospect of meeting the carbon-reduction target for 2020. An increase in energy prices is the only economic change that will directly promote all three of these outcomes. It is difficult to avoid the conclusion that such an increase is a necessary (if perhaps not sufficient) condition for carbon reduction on the scale that is now required.

Ways of Increasing Energy Prices

Energy prices can be increased by governments or the market…

In the past there have been two sources of energy price increases: from markets, as for example the oil price increases in 1973 and 1979, and more recently in 2007-08; and from government policy, mainly from taxation such as fuel duty or the Climate Change Levy in the UK. Both these taxes have reduced fuel use below what they would otherwise have been, although in the case of fuel duty even a relatively high rate of duty has not been enough actually to reduce the use of transport fuels. In Germany however, a 90 per cent

increase in diesel prices and 62 per cent increase in petrol prices over 1997-2006, largely driven by increases in taxation, caused the total consumption of the main road fuels to decrease by 13 per cent.

But price increases by government keep revenues in the country and generate tax receipts which allow other taxes to be reduced…

There is a very important economic difference between market-driven and taxation-driven increases in energy prices. In the case of the former the extra revenues accrue to energy companies and energy-producing countries, at the expense of energy-consuming countries. With the latter the government of the energy-consuming country keeps the revenues from the price increase, which, for a given level of government expenditure, allows it to reduce other taxes, with far reduced negative impacts on its economy.

And market increases in the oil price incentivise the development of high-carbon substitutes.

Another important difference is that market-driven increases in, for example, oil prices will stimulate investment into high-carbon substitutes for crude oil (for example, oil shale and tar sands), as indeed has happened with the relatively high oil prices over 2006-08, as well as into low-carbon energy sources. Government taxation, in contrast, can target carbon emissions through a carbon tax, which would penalise high-carbon oil substitutes, and be far more effective in promoting new investment into low-carbon energy sources.

For both these reasons, if it is necessary for the prices of high-carbon fuels to increase if carbon emissions are to be reduced, as argued above, governments would be well advised to bring about these increases through taxation, rather than leaving the task to unpredictable market forces. Recycling the revenues from the taxation by reducing other taxes (or by increasing them by less than would otherwise be the case), is the essence of green fiscal reform.

Political Difficulties with Environmental Taxes

Green taxes are necessary but problematic…

It is regrettable that green fiscal reform emerges from the above analysis as a necessary condition for significant carbon reduction, because governments, including the UK Government, find green taxes politically problematic. At least four interacting, or mutually reinforcing, factors make this so in the UK context.

Because people do not regard green taxes as a legitimate source of revenues…

First, people tend to regard green taxes as an illegitimate source of general government revenues. There are a number of possible reasons for this: energy taxes affect highly valued forms of consumption (e.g. driving, flying); energy taxes have become regarded as 'stealth' taxes; because energy taxes can be (but do not need to be) regressive, they are regarded as unfair; energy taxes (like other consumption taxes) are not related to ability to pay; some people think that, because environmental taxes are intended to change behaviour and improve the environment, they should not be used to raise revenue – and believe the revenues deriving from them should be used to increase the environmental improvement (a use of the revenues described as 'hypothecation').

And people tend to think green taxes are extra taxes rather than replacements for other taxes…

Second, people do not trust governments to implement green taxes in a fiscally neutral way. The identification of green taxes as 'stealth' taxes exacerbates this lack of trust. It may be noted that the desire for revenue neutrality conflicts with a perceived need for hypothecation (which implies an increase in overall taxation). However, both factors – the lack of trust and the demand for full hypothecation – tend to limit the politically feasible scope for green taxes.

And they are thought to affect business competitiveness negatively…

Third, green taxes on business (like any other taxes on business) can have impacts on competitiveness. It is now apparent that, in the case of energy or carbon taxes, the number of sectors that would be significantly affected by even quite a large green fiscal reform (which was revenue-neutral to business) would be rather small, and the effect on the economy could be positive overall, especially when they incentivise the development of new low-carbon industries, as has already happened in Denmark and Germany. But as ever the losers from such a tax are more politically resonant than the potential winners so that competitiveness arguments continue to act as a brake on the implementation of green fiscal reform.

And they are seen as unfair…

Fourth, energy taxes on households are widely regarded as regressive and unfair. This is a situation rather special to the UK. All five other North European countries that have implemented green fiscal reforms to date (Denmark, Finland, Germany, the Netherlands, Sweden) have included household energy use in the tax base, sometimes on top of very high VAT rates (e.g. 25 per cent in Sweden). Undoubtedly the energy-inefficient nature of much of the British housing stock has resulted in the high political profile of the concept of 'fuel poverty', which has nothing like the same resonance in mainland Europe as it does in the UK, even in those countries which pay more attention to social equity generally.

BUT, despite these negative perceptions, in fact green fiscal reform should lead to widespread economic, environmental and welfare benefits.

All the above factors will need to be addressed to some extent at least if there is to be any chance of green fiscal reform making a substantial contribution to the huge carbon reductions by 2020 to which the UK is committed. As part of this, it should be stressed that implemented gradually, with appropriate complementary policies, green fiscal reform should lead to a number of benefits for the UK apart from its main objective of reduced carbon emissions. These include:

- new low-carbon industries with the possibility of export markets;
- a better-trained construction industry, that is far more expert in energy efficiency and low-carbon household technologies;
- far more energy-efficient homes, with consumers keeping warmer while using less energy, and spending no more on energy than before, because the higher price is balanced by their need to use less to meet their needs;
- greater energy security, the UK being less vulnerable both to disruptions to supplies of fossil fuels (because of a more diverse energy mix) and to energy price rises in oil and gas markets (because of greater energy efficiency).

These benefits make green fiscal reform a policy worth fighting for despite its political challenges.

Implementing Green Fiscal Reform

The need for green fiscal reform must be widely supported before it will be able to be implemented, in terms of understanding both the need for substantial carbon emissions reductions and the fact that energy prices need to be increased steeply to achieve these reductions.

If green fiscal reform is to be implemented the argument must be won that it is necessary. This argument has two parts: first that it is imperative to reduce carbon emissions significantly; and second that green fiscal reform, entailing steep increases in energy prices, is a necessary policy to achieve such reduction.

Neither part of the argument has yet achieved the necessary political traction. Although legally binding carbon targets are now in place, both for 2050 and for five-year budgets up to 2022, the required policies are not yet in place to achieve them, and there is no widespread sense that government is prepared to do what it takes to achieve the targets. The carbon targets for 2010 will be missed, despite having been in two manifestoes of the party that went on to win the associated General Elections. Mechanisms to contribute to the delivery of the targets such as the Renewables Obligation (which intended to impact on electricity suppliers) is not an 'obligation' at all, because it permits a buy-out option that is widely used; and the statutory commitment to end fuel poverty in the next decade has been shown through judicial review to have very little legal force. Such experiences reinforce the general perception, especially when allied to the possibility of buying carbon 'offsets' from abroad to meet the targets, that policy targets that prove too difficult, as carbon reduction is proving, will simply be missed and pushed further into the future, outside the government of the day's term of office.

Political consensus is required on the general need for green fiscal reform.

If there is little general perception that carbon targets must be met, there is even less that green fiscal reform is a necessary condition for meeting them. There is currently no consensus on this between the major UK political parties, while there are many examples at national and local level of parties attacking each others' green tax proposals. It is hoped that this report will help change this situation and make it more likely that a major GFR will win the political support it needs to be implemented.

When implemented the fiscal neutrality of green fiscal reform must be monitored by an independent body…

Once the argument is won in principle that a major green fiscal reform over a number of years is necessary, a number of conditions will need to be met for it to be able to be implemented in practice. One is that the fiscal neutrality of any green fiscal reform will need to be independently monitored to have any credibility. It may be noted in this connection that, in a different context and for a different purpose, the Conservatives have put forward a proposal for an Office for Budget Responsibility. The significance of the proposal in respect of green fiscal reform is that it seems to recognise the need for independent scrutiny of fiscal policy, and this is certainly likely to be necessary if proposals for a revenue-neutral green fiscal reform are to be credible.

And the needs of vulnerable economic sectors and households must be considered…

Another condition to be met is that impacts on the competitiveness of vulnerable economic sectors will need to be taken into account and mitigated to the extent possible, without undermining the objectives of the reform. A third is that the green fiscal reform will have to be acceptable in terms of its distributional impacts on households.

And some green tax revenues will need to be spent on improved environmental measures.

Finally, any green fiscal reform would need to be accompanied by further measures, to respond to people's perceptions (as noted above) that green tax revenues need to be spent in environmentally enhancing ways to make the tax legitimate (even if this means an increase in government spending overall). These measures would also make it easier for people to adjust to the low-carbon world that the reform is seeking to promote, and therefore both make more acceptable and increase the changes in behaviour which it will bring about.

Green Fiscal Reform as Part of a Policy Package

Green fiscal reform, if necessary, is not a sufficient policy response by itself to achieve the UK's carbon reduction targets.

It has been argued above that there are compelling arguments to implement a green fiscal reform to achieve substantial cuts in carbon emissions. It has not been argued that it is sufficient. Systematic moves towards a low-carbon society will require use of the whole policy toolbox – regulation, voluntary agreements, information measures as well as economic instruments, and emissions trading as well as green fiscal reform through the use of taxation.

This is not the place to set out in detail the policy package of which green fiscal reform could be a necessary part. Instead only those complementary policies will be sketched out which could play a role in increasing the public acceptability of the green fiscal reform itself.

First there would need to be policies to mitigate competitiveness and household distributional impacts. These are discussed in Section 8 of this report.

Measures in addition to green fiscal reform include rewarding perceived good behaviour changes…

Second there would be policies to reward perceived good behaviour change. To be revenue neutral these rewards would have to come out of the taxes increased elsewhere. For example, if they included reduced Council Taxes for energy-efficient homes, a measure which has received some public support, this would have to be paid for out of the revenues from taxes on household energy use.

And better means of raising people's awareness of their energy use and its impact…

Third, there would be policies to increase the behavioural impact of the green fiscal reform in other ways, for example policies which make it easier for people to be aware of their energy use (e.g. smart metering, Energy Performance Certificates, improved billing contents and formats). This is an essential part of the process of moving from a wasteful, cheap-energy, high-carbon way of life, to much higher energy awareness where low-carbon energy is valued much more highly and used with far greater awareness, such that its price may be high but is stable.

And addressing infrastructural barriers to behaviour change.

Fourth, there would be policies which tackled some of the infrastructural barriers to behaviour change (e.g. making it easier to connect distributed energy; public transport improvements). Again, to the extent that this involves expenditure (and it could involve a lot of it), this would either undermine the revenue neutrality or would need a funding source separate from the green fiscal reform.

Fifth, there could be regulatory policies that made it easier not to use so much energy (e.g. performance criteria on appliances/vehicles/buildings).

Conclusion

Many of these policies have already been, or will be, introduced in some form, in the UK and elsewhere. What is missing is a strong and consistent signal coming from the price of carbon-based energy that it is expensive, and will get more so at least through to 2020 in order to meet the carbon targets and build the necessary business confidence in the viability of low-carbon investments for companies to start mobilising the necessary investment resources at the required scale. Green fiscal reform could provide such a signal. The reduction in the market price of energy associated with the economic downturn gives government an opportunity to take the steps to introduce green fiscal reform which was not present when prices were at their highs in mid-2008. Everyone in the UK knows that taxes are going to have to increase in 2010 and thereafter in order to reduce the public deficit. The important thing is that green taxes play an important role in this tax increase, with the promise that revenue-neutral green tax increases will be the order of the day once the public finances have stabilised. Carbon prices rising gradually but predictably, and tending to muffle the noise of increasingly volatile energy markets, because market energy prices make up a lower and lower proportion of final energy costs, is a recipe for economic stability and energy security, as well as an ordered transition to a low-carbon way of life.

3. Introduction and Effectiveness of Green Fiscal Reforms to Date

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 is meant by effectiveness, how can it be assessed, and what are the factors that affect it?

This section looks at these issues and draws conclusions from the review of evidence on the practical effectiveness of green taxes, particularly in relation to their reduction of environmental impacts. It concludes 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 section 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 so), 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 is discussed further in the section in this report on green taxes and public opinion.

It is important to realise that raising revenue and changing behaviour are not mutually exclusive objectives.

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 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. 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. Elasticities can vary both over time, and with the relative level of the tax, and can also be altered by other policy interventions which can make it easier or more difficult to respond to the tax. 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 a large-scale green tax shift this will clearly not be the case. The section in this report on modelling a major green fiscal reform (GFR) gives the results of such a modelling exercise.

The evidence on the environmental effectiveness of green taxes and European GFRs

As indicated above, the evaluation of green tax measures or any policy measure raises some significant challenges. Table 3.1 summarises the headline messages on the environmental effectiveness of green taxes, drawn from a much longer review of the literature in this area. 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, however, 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.

Table 3.1: The impact of energy and carbon-based taxes

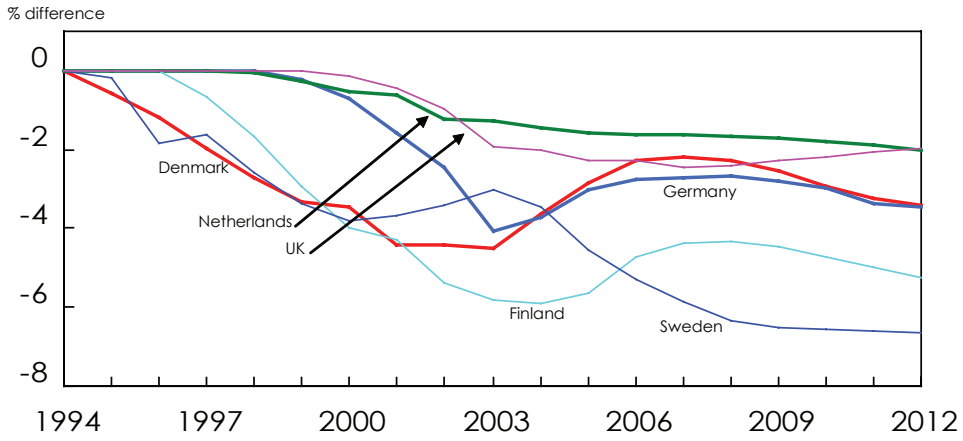
Country and tax	Period evaluated	Impact
Finland – carbon/ energy tax	1990-2005	CO_2 emissions 7 per cent lower than would have otherwise been A shift from carbon tax to output tax on electricity in 1997 may have lessened impact
Norway – carbon dioxide tax	1991-2007	21 per cent reduction in CO_2 from power plants by 1995 14 per cent national reduction in CO_2 in 1990s, 2 per cent attributed to carbon tax 12 per cent reduction in CO_2 emissions per unit of GDP
Denmark – carbon and energy taxes	1992- 1997	CO_2 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 emissions in one year in response to tax increase In 1990s a 23 per cent reduction in CO_2 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
Sweden – energy and 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
The Netherlands – energy tax	1999-2007	Emissions 3.5 per cent lower than would have otherwise been Low tax rates may have limited impact
Germany – green fiscal reform, taxes on transport, other fuels and electricity	1990-2005	CO_2 reduced by 15 per cent between 1990 and 1999 and 1 per cent between 1999 and 2005 CO_2 emissions 2-3 per cent lower by 2005 than they would have been without tax German re-unification an important factor in reductions
UK – industrial energy tax	2001-2010	UK CO_2 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

The most extensive analysis of the effects of GFRs at the European level has been undertaken in the EC-funded research project COMETR. The main focus of the project was to assess the competitiveness effects of GFRs, in particular in those EU member states which launched GFRs during the past two decades (i.e. 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. Figure 3.1 of the model results shows that the GFRs (mainly involving energy/CO2 taxes) are likely to have brought about a reduction in greenhouse gas (GHG) emissions in all the six EU countries that implemented them. Figure 3.1 shows the difference between the actual situation with the GFRs, the base case, and a counterfactual reference case

[1] 'COMETR – Competitiveness effects of environmental tax reforms', (2004-2006), FP6 Proposal 501993 funded by DG Research of the European Commission.

without the introduction of GFRs. 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). Further results from the COMETR project are given in Section 8.

Figure 3.1: The effect of GFR on GHG emissions



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 in Table 3.2 are those with a particularly clear link between tax and impact.

Table 3.2: The impact of transport taxes

Country/region	Period evaluated	Impact
Europe	No date	Taxes mean European vehicle fuel price three times that of US and European emissions half what they would be at US fuel price European vehicle fuel efficiency 25-50 per cent better than US
UK – Fuel Duty Escalator	1993-1999	Increases in fuel duty are estimated to have produced annual carbon savings of between 1 and 2.5 MtC by 2010. Average fuel efficiency of lorries over 33 tonnes increased 13 per cent between 1993 and 1998
Sweden – sulphur content of vehicle fuels	1980-1998 tax introduced in 1991	Sulphur content of fuels fell 80 per cent between 1980 and 1998
Switzerland – commercial vehicles tax – weight and distance based	2001-2002	5 per cent reduction in commercial traffic in first year, compared with 7 per cent increase in previous year
London – congestion charge	2003-2004	Congestion reduced by 30 per cent and vehicle volume by 15 per cent
UK – company car tax	1999-2005	Average CO_2 emissions of new company cars decreased from 196 g/km in 1999 to 182 g/km in 2002 Business mileage reduced by over 300 million miles per year Overall effect has been estimated to have reduced by 2005 the emissions of carbon from the company car fleet by 0.7-1.8 MtCO2, or up to 1.5 per cent of all CO_2 emissions from road transport in 2005 in the UK
Netherlands – graduation of purchase tax by fuel efficiency	Pilot trial, 2002	Compared to 2001, the market share of the most fuel-efficient category of cars in 2002 increased from 0.3 per cent to 3.2 per cent, while that of the second most fuel efficient rose from 9.5 per cent to 16.1 per cent

The impact of waste taxes

The impact of green taxes on waste is summarised in Table 3.3.

Table 3.3: The impact of waste taxes

Country/region	Period evaluated	Impact
Denmark – household waste tax	1987-1996	26 per cent reduction in waste delivered to municipal sites between 1990 and 1996
Finland – waste taxes	1996-2007	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
Sweden – waste taxes	1996-2006	Production and consumption have grown by 7 per cent, waste generation has declined by 0.5 per cent Total waste to landfill has fallen
UK – landfill tax	1996-2006	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

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.

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. 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 well below comparable countries, thereby saving substantial public investment.

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 has already been refuted with the observation that 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, which may be significant and stable, 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, which are essential to much economic activity. 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

These evaluations overwhelmingly suggest that environmental taxes are environmentally effective…

There is now substantial experience with the introduction of both environmental taxes, and of green fiscal reform, 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 the Organisation of Economic Co-operation and Development (OECD), European Environment Agency (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 a green fiscal 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. 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 sections of this report.

4. Lessons from Green Tax Shifts in the UK

Summary

Green Fiscal Reform (GFR) is often talked about as something government could attempt in the future, perhaps when the time is right or when perceived issues associated with it are overcome. Yet, a number of green tax shifts have already been implemented in the UK and elsewhere, with very positive results, as discussed in the previous section.

This section describes and draws lessons from two unannounced green tax shifts that took place in the UK in the 1990s, one by a Conservative government and the other by a Labour government. In both shifts, the Fuel Duty Escalator increased the price of road fuels, whilst simultaneous cuts in income tax increased the effective returns to labour.

These shifts resulted in benefits that are often overlooked. Environmental benefits included reductions in fuel use, emissions and travel demand below what they would otherwise have been. In economic terms a reduction in taxes on labour will have made employment more attractive, and may have increased both UK employment and economic output. Yet these broader benefits of the tax shift went almost entirely unnoticed and uncelebrated, and the public unpopularity of the Fuel Duty Escalator eventually resulted in its being abandoned.

The Fuel Duty Escalator – recognising its benefits

Road fuel duty is a familiar measure that has for long provided a useful and steady income to the UK government and to other national and (in some federal countries) regional governments. The Fuel Duty Escalator (FDE) was introduced by the Conservative government in 1993, and was maintained by Labour until 1999. It entailed an annual increase in fuel duty above the rate of inflation, of 3 per cent in 1993-94, 5 per cent from 1994-95 to 1997-98, and 6 per cent from 1998-99 to 1999-2000.

No measure like the FDE that aims to increase annually the duty on a product at a rate significantly above the rate of inflation is ever going to be popular. Public attention focused almost exclusively on the impact of the escalator on the price of fuel, the consequent impact on consumer and business finances, and the fuel protests of 2000 that followed the increases in the market price of oil the year before, so that the escalator was abandoned.

Yet behind the headlines and the spectacle of fuel protests there is a more positive story to tell. With a broader perspective the FDE can be presented as an eminently desirable public policy measure. For example, it raised significant revenues, allowing other distorting taxes to be reduced, penalised pollution and rewarded labour: all of which are desirable policy outcomes. This more positive view of the benefits of the FDE hardly emerged in the public debate to balance the unpopularity of the measure itself. Yet in the context of these broader benefits and the imperative of addressing climate change it shifts the focus to how to introduce measures that are necessary but politically difficult.

Fuel Duty Escalator revenues balanced by cuts in income tax

Introduced in 1993, as the revenues from the FDE increased the Conservative government simultaneously cut income tax from 25 to 24 per cent in 1995 and to 23 per cent in 1996. The loss in revenue from these cuts in income tax totalled about £4.7 billion in 1997, which was more or less the same as the revenues generated over 1993-97 by the FDE. Without drawing attention to it, the Conservative government had in fact implemented a green tax shift.

In its first term, the Labour government also made a number of changes to income tax, including a cut in the standard rate to 22 per cent, which altogether cost about £2.3 billion. This was more than offset by revenues from the FDE in 1998 and 1999 of at least £2.8 billion. Labour had also introduced an unannounced green tax shift.

Environmental taxes do not need to be spent on environmental measures

It is important to note that the revenues from the FDE were not allocated to environmentally-related spending. It is a widespread view that revenues from environmental taxes should be allocated – or hypothecated – to environmentally-related spending and this view is used by some to define green taxes. Of course, if they are so allocated and other public spending is not to be cut, then increases in green taxation amount to an increase in overall taxation.

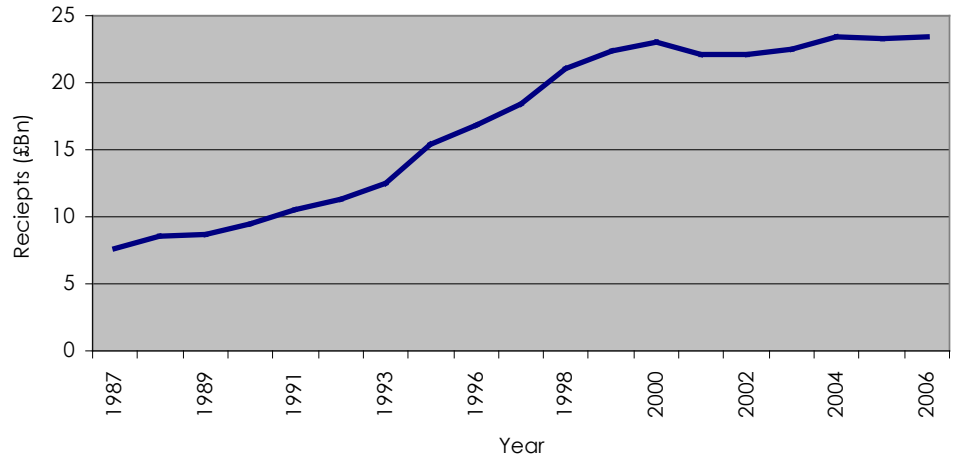
Insisting on an automatic link between the revenues from green taxes and how they are spent is unhelpful. The main benefit of green taxes lies in their encouragement of the more efficient use of resources, and reduced pollution. The case for increased public environmental expenditure does not depend on whether or not revenues from green taxes are available to finance them. Of course, if the case is made, revenues from green taxes may be used for this purpose, and this may increase the public acceptability of the tax, but revenues can also be used to reduce other taxes.

This difference becomes important in the context of a major green tax shift, such that for example 15-20 per cent of tax revenues might come from green taxes (instead of the current seven per cent). It is clear that it would be excessive to insist on the allocation of 20 per cent of tax revenues to environmentally-related spending. The potential impacts of allocating a significant proportion of the revenues from a major GFR to environmentally-related expenditure are explored in Section 7 of this report.

Impact of the Fuel Duty Escalator on tax revenues

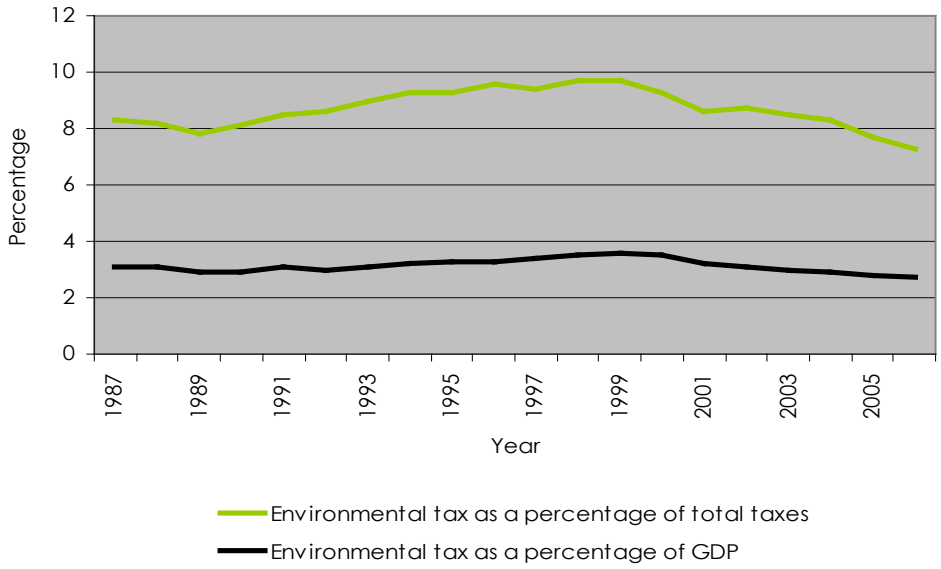
Following the implementation of the FDE in 1993, there was an increased and continued upward trend in revenues from fuel duty as Figure 4.1 shows. In 1987 receipts from fuel duty were £7.6 billion. In 1993 receipts totalled £12.5 billion, but had almost doubled in value by 2000 when receipts peaked at £23 billion. The effect of abandoning the FDE in 1999 can be clearly seen in Figure 4.1, as the upward trend was not only halted, but receipts fell, taking around four years to regain their 2000 levels.

Figure 4.1: UK revenue from hydrocarbon oil duty (nominal)



However, the post-2000 plateau in receipts only tells part of the FDE story, since the data in Figure 4.1 do not take inflation into account. There was, in real terms, a reduction in the per litre level of fuel duty taxation following the abandonment of the FDE. Between 1999 and 2006 there were only three rises in fuel duty, each time only in line with inflation. The Institute for Fiscal Studies has calculated that following the abandonment of the FDE, real fuel duty per litre fell by 16.9 per cent and real fuel duty revenue fell by almost £3 billion between 1999 and 2005.

Figure 4.2: UK Environmental Taxes as a percentage of total tax revenue and GDP



Further, due to the relative size of fuel duty revenues, the abandonment of the FDE has had a wider impact on receipts from all environmental taxes in the UK. Receipts from all green taxes have fallen from 3.4 per cent of national income in 1997 to 2.7 per cent in 2006, having peaked at 3.6 per cent in 1999, and from 9.4 per cent of total government receipts to 7.3 per cent over the same period. In real terms, they now make up a smaller share of total revenue and national income than at any time since 1987 (see Figure 4.2).

The two unannounced green tax shifts described above were in fact in addition to two explicit green tax shifts that were implemented over this period by successive Conservative and Labour governments: the Tories' introduction of landfill tax in 1996, accompanied by a cut in the rate of employers' National Insurance contributions (NICs); and Labour's introduction of the Climate Change Levy in 2001, also accompanied by a cut in employers' NICs.

It is not clear why the two governments did not make an explicit connection between the FDE and the cuts in income tax which it enabled. Whether an explicit environmental and economic justification from government for the FDE would have prevented its being publicly discredited is debatable. What is clear is that failing to defend it as a desirable public policy measure has caused problems for the subsequent debate on green fiscal reform. In reality, both these tax shifts clearly illustrate the benefit of a green tax shift as a policy: environmental improvement (acknowledged and quantified in the Government's Climate Change programme in 2006), and a reduction in taxes on 'goods' (in this case employment), which may be expected to have a positive effect on the labour market. What is more, the revenues from the FDE proved to be stable so that the green tax shift they made possible was also sustainable in public finance terms.

…governments need to be explicit about their implementation of green tax shifts and highlight the taxes that are to be cut as well as those that are to be increased.

There seems little reason why a green tax shift of this kind should not be made explicit and celebrated as a policy that makes both economic and environmental sense.

Conclusions

The conclusions from this analysis are that price is a powerful mechanism but this also makes it controversial. Therefore governments need to be explicit about their implementation of green tax shifts and highlight the taxes that are to be cut as well as those that are to be increased. The broader environmental and economic benefits of the shift also need to be clearly communicated to make it clear that people and businesses that pollute will pay more taxes and those who do not will pay less.

The experience with fuel duty has shown that green taxes can generate significant revenues, particularly if escalators are used, allowing other taxes on households and business to be cut. They can therefore be used simultaneously to raise revenue, change behaviour, reduce resource use and pollution (through behavioural change and stimulation of new technologies) and shift the basis on which tax revenues are raised (that is to say *reduce* other taxes below what they would otherwise be). The revenues from green taxes do not need to be spent on environmental measures – if they are it is no longer a green tax shift but an increase in government spending which implies higher taxes or a cut in other government services.

5. Reducing Carbon Emissions Through Transport Taxation

Summary

Road transport and aviation are or are becoming major sources of carbon emissions which will need to be reduced if the UK's carbon dioxide (CO_2) reduction targets are to be met. However, since 1980 the real costs of motoring have fallen, while those of other transport modes have risen, and rising incomes have also increased transport demand, offsetting efficiency increases. Increased road transport taxation, which could be introduced as part of a green fiscal reform, will be essential if demand is to be managed and carbon emissions from road transport reduced.

Taxes on vehicle purchase, ownership and use have different effects, and can be used to pursue different policy goals. For example, taxes on purchase and ownership can incentivise manufacturers to develop low carbon vehicles and people to buy them. Tax measures on use are needed to reduce congestion and overall energy use.

Increasing fuel duty is progressive overall because most low-income households do not have a car…

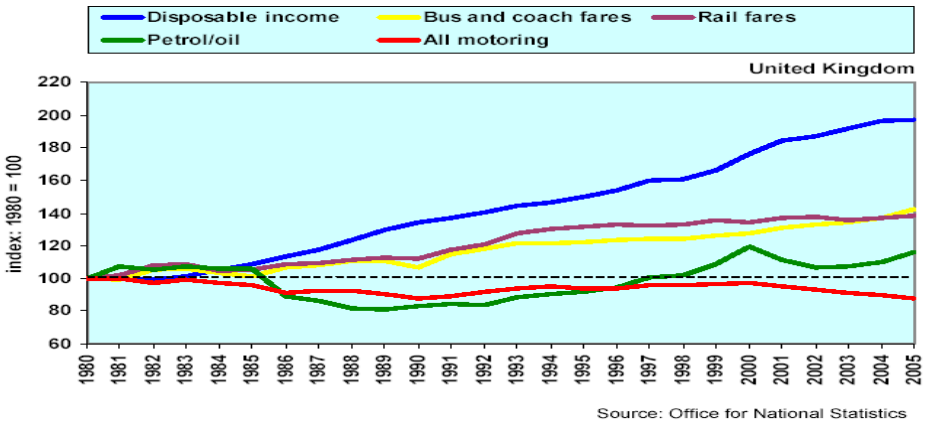
This section discusses experience with road transport and aviation taxes in the UK and other European countries, and considers how they might develop to take account of increasingly stringent CO_2 reduction targets and other issues such as the increasing diversity of road fuels, and the need to maintain government income. In particular, any shift to electric vehicles may require a parallel shift to road user charging if revenues from transport taxes, and incentives to reduce the damaging effects of road transport apart from emissions, are to be maintained.

All taxes affect some people more than others. Increasing fuel duty is progressive overall because most low-income households do not have a car, but there are concerns about the impact on low-income motorists, particularly in rural areas, which can be at least partially addressed if the revenues are recycled in a progressive manner. Increasing taxation on air travel is even more progressive, because most leisure flying is by the wealthiest 20 per cent of the population and those on low incomes fly very little.

Transport Costs and Carbon Emissions

Transport accounted for 28 per cent of UK carbon dioxide emissions from energy use in 2007 (excluding international aviation), and these had risen 9 per cent since 1990, and are still rising. This is partly because, as shown in Figure 5.1, the price of motoring has fallen; motoring costs in 2005 were 10 per cent less in real terms than in 1980, while disposable income had risen by 90 per cent. In real terms over the same period, fares for public transport had risen significantly, with a 42 per cent rise for bus and coach and 39 per cent for rail.

Figure 5.1: Changes in Wealth and Private Costs of Transport 1980-2005



The transport sector is therefore a major challenge if carbon emissions overall are to be reduced by 29 per cent by 2020, and by 80 per cent by 2050, as required by the 2008 Climate Change Act.

90 per cent of transport emissions come from road transport, which is also responsible for substantial economic and other costs from congestion, local air pollution and traffic accidents. There are therefore a number of economic and social reasons apart from CO_2 reduction why it is desirable to manage transport demand.

Road Transport Taxation in Relation to Transport Demand

Transport taxes may be placed at various points of the transport system, depending on whether the purpose is to manage vehicle choice or travel behaviour, although of course both these purposes may contribute to a wider policy objective such as the reduction of carbon emissions from transport.

There are three crucial taxation points which relate to user decisions:

- Tax on the initial purchase of a vehicle,
- 'Circulation' Tax on the ownership of vehicles (annual registration tax and company car taxation), and
- Tax on the use of vehicles (fuel, tolls, road space and parking).

Purchase taxes will have a strong influence on the choice of vehicle and, depending on their design, also on the choice of technology associated with the fuel it uses. Circulation taxes, although distanced from the point of purchase, also largely have an impact upon vehicle choice rather than use. Taxes on various aspects of the use of vehicles (fuel, road user charges and parking) have the strongest impact upon decisions to use a vehicle once purchased. The latter are therefore the main taxes related to managing transport demand.

Transport demand depends on a number of factors which together determine the total volume of travel. These include total number of trips, trip length, mode used and vehicle occupancy. Policies for reducing congestion, as well as considering the total volume of travel also require a consideration of the location and time of trips.

During the last decade, the UK and many other developed nations have reformed existing forms of road transport taxation to address a number of transport policy goals. This has involved modifying the design of purchase, circulation and fuel taxation to promote:

- More fuel efficient vehicles,
- Alternative fuel vehicles,
- Cleaner fuels (lower carbon and/or other emissions),
- Modal shift and traffic volume,
- Congestion reduction.

Overall, when looking at the role of taxation in transport policy it should be recognised both that some important tax measures are primarily to influence vehicle technology, the type of fuel used and vehicle fuel economy, and that if it is desired to manage transport demand, a comprehensive approach is needed covering all its component aspects.

Purchase and 'Circulation' Taxation Measures

Purchase Taxation Measures

Many countries, and most European Union states, have a specific car purchase tax, in addition to VAT, although the UK and Germany are notable exceptions. The UK did have a 10 per cent Car Purchase Tax, but in 1992 it was replaced by the policy of raising fuel duty. In a number of EU countries, existing car purchase taxes have been reformed to promote cleaner and low-carbon vehicle technologies.

VAT is also a purchase tax, and a variable rate of VAT could be levied. Italy does this; as well as a registration tax, Italians pay two rates of VAT on car purchases.

'Circulation' Tax Measures

Most developed countries have an annual registration (or 'circulation') tax entitling owners to use the public highway. In many countries this circulation tax is varied by the engine size or power of a car, but some nations have implemented reforms to address fuel efficiency or environmental policy objectives.

Britain has had a CO_2 emission-based circulation tax (Vehicle Excise Duty) for cars since 2001. Initially the range of charges was small, but this has gradually been widened. In May 2009, VED in the UK was restructured into 13 narrower CO_2 bands with a significant differential based on CO_2 emissions, out by 2011 to make the whole system based on CO_2 emissions ranging from nothing for the least polluting, to £400 per year for the most polluting cars.

Company car taxation is a sector-specific circulation tax. In the UK, around half of new cars are purchased by commercial organisations for their employees for both business and private use. A major reform in UK company car taxation took effect from 2002, from which point the tax charge was related to a car's CO_2 emissions, on a sliding scale, up to a maximum charge of 35 per cent of a car's purchase price. Moreover, in 2002 discounts for high business mileage were abolished, together with most age-related discounts, which had provided an incentive to drive further and to use older, more polluting cars.

The size of the tax is important. This is illustrated by UK evidence on the strong impact of the relatively large reform to company car taxation compared with little discernable effect of the initially much smaller VED reforms, although the recent rises in VED rates and differentials now appear to be influencing vehicle choice.

As an annual charge on ownership, circulation tax has a less direct impact on the type of vehicle purchased than a purchase tax. It can, however, be a useful complementary measure to car purchase tax, and for countries such as the UK and Germany that have no purchase tax, this indirect alternative may be the only tax available to influence purchase behaviour.

…tax systems in Italy and Denmark help explain why their car fleets have a 20 per cent better fuel economy than the UK.

Overall, experience indicates that complementary purchase and circulation tax measures can have a significant policy impact on the type of cars purchased. For example, the combined effect of well-established highly graded purchase and circulation tax systems in Italy and Denmark help explain why their car fleets have a 20 per cent better fuel economy than the UK. Such tax systems can play an important role in the uptake of cleaner vehicle technologies and low-carbon fuels.

Purchase and Circulation Taxes in Transport Demand Management

As noted above, well-designed purchase and circulation taxes can stimulate cleaner car technologies and fuels. Their position within the tax system means that they have little direct influence on transport demand, but they can affect it indirectly. The economics of low-carbon vehicles are currently such that they have high capital costs and lower running costs. The net impact of strong purchase and circulation tax incentives to reduce relative purchase costs, and parallel fuel tax concessions on cleaner fuels, is to stimulate the take up of fuel-efficient low-carbon cars with very low running costs. However, extending the use of lower-cost, fuel-efficient vehicles will cut the cost of motoring and so will produce pressures to increase car use.

Fuel price elasticity studies indicate a short term elasticity of -0.4 (i.e. a 10 per cent drop in price would increase car use by 4 per cent), so a 33 per cent drop in effective fuel cost (about the amount resulting from policy objectives for low-carbon cars) might be expected to increase the volume of car travel by about 13 per cent. Cutting transport's environmental impacts will require low-carbon vehicles, but if the tax system only increases the use of these vehicles, then it will raise transport demand, counteracting savings in CO_2 emissions from the low-carbon vehicles. For improvements in fuel efficiency to be translated into reduced overall emissions, tax (and other policy measures) are needed to impact upon both vehicle design *and* vehicle use.

Managing Transport Demand Through Road Fuel Taxation

Taxation measures to influence transport demand need to be positioned to influence not only the type of vehicles purchased, but decisions about the amount of travel and mode used. Transport demand management measures include charges on using road space include bridge/tunnel tolls, road tolls, and cordon/congestion charging in city centres. Parking charges are a further significant cost that can be influenced by policy, but are not generally viewed as tax. In the UK, and many other developed nations, the main tax on the use of vehicles is on fuel.

Experience with Road Fuel Duty

In the UK the road fuel excise duty rates (as at December 2008) were around 52p per litre for the main road fuels, unleaded petrol and diesel. Fuel duty rates vary considerably between countries, affecting the overall retail price. Table 5.1 shows this information for the EU-15 states in 2008. It may be seen that while the UK has the highest share of tax in the retail price, it does not have the highest retail price of unleaded petrol.

Table 5.1: Tax and retail price of premium unleaded petrol, October 2008

	Tax as per cent of retail price	Retail price (Euros per litre)		Tax as per cent of retail price	Retail price (Euros per litre)
Netherlands	64	1.63	United Kingdom	67	1.36
Denmark	62	1.58	Finland	64	1.33
Belgium	61	1.55	Austria	56	1.27
Germany	65	1.47	Luxembourg	54	1.27
Portugal	60	1.46	Irish Republic	57	1.23
France	64	1.45	Spain	53	1.23
Italy	61	1.45	Greece	47	1.20
Sweden	63	1.45			

Note: This data covers all tax on petrol (including VAT).

Fuel duty was not originally intended to be a transport policy measure. It emerged through the 20th century to become a steady source of government revenue that fulfilled a series of important principles of taxation. Firstly, it raises large amounts of predictable and reliable income. Secondly, and unusually for an indirect tax measure, fuel tax has some progressive characteristics, with the top income quintile paying nearly five times more fuel duty than the bottom income quintile, as shown in Table 5.2.

Table 5.2: Car Driver Distance Travelled per Year and Fuel Duty Paid by Income Quintile, 2005

	Lowest income quintile	Second quintile	Third quintile	Fourth quintile	Highest income quintile	Average
Car driver mileage	1,370	2,324	3,405	4,793	6,574	3,684
Fuel duty paid*	£93	£158	£232	£326	£447	£250

*Fuel duty paid estimated at 6.8 pence a mile from the 2005 fuel duty rate of 47 pence per litre and an average UK fuel consumption of 9 litres per 100km.

Finally, fuel tax is administratively simple and cheap to gather, it is easily enforced and evasion is difficult. With most petrol and diesel sold for road transport use, the default position is that it is taxed, with rebates provided for clearly defined other purposes (e.g. exemptions may apply for agricultural uses, rail and buses).

In the last 20 years, as well as providing a reliable and equitable source of government income and helping to manage transport demand, fuel duties have been adapted to address a number of transport policy objectives, such as the promotion of fuel efficiency and the use of cleaner and low-carbon fuels. In this respect, fuel taxation is used for exactly the same purpose as purchase and circulation taxes. The key way to do this is to have differential rates of fuel duty to promote fuel switching or low-carbon vehicles. For example, a differential duty rate on unleaded petrol was used successfully in several countries in the 1980s to promote unleaded petrol and more recently to speed up the transition to low-sulphur road fuels.

The level of fuel duty will affect all components of transport demand. In addition high fuel duties will also automatically favour cars with a better fuel economy - so fuel duties will have an impact on the type of vehicle purchased as well as the amount of use.

The effectiveness of the imposition of fuel duty as a general pricing mechanism will depend on the context in which it is applied. In the UK, the general context has been one where, compared to other European countries, both fuel duties (though not necessarily retail prices, as shown in Table 5.1) and public transport fares are high. The modal shift impact of high fuel duties will therefore be muted, but other price-related impacts on transport demand (on the amount of travel, journey length, trip linking and vehicle occupancy) might be expected to be stronger. An examination of changes in traffic growth before and after the introduction of the Fuel Duty Escalator (FDE) policy indicates that this policy did have a general impact. In the six years from 1987 to 1993 (before the FDE) UK road traffic grew by 18 per cent, but the rate of growth dropped to 13 per cent in the six years between 1993 and 1999 when the FDE was in operation. Of course, many factors affect traffic growth, particularly the strength of the economy. However detailed fuel demand elasticity studies suggest that the tax increases resulted in 10 per cent less demand for fuel in 2000 than if the duty rates had only increased at the same rate as inflation. The UK Government estimated that the FDE annually saved between 1 and 2.5 million tonnes of carbon emissions.

The UK FDE was abandoned in 1999. As noted in Section 4, from 2000-2007, following the fuel duty protests in 2000, there were only three inflation-rate rises in UK fuel duty, meaning that the real level of fuel duty fell.

The Future of Road Fuel Duty

Over the next decade the road transport taxation landscape is possibly set to change in a dramatic manner. Road user charges could become a major part of the taxation system, both in the UK and a number of other countries. There are a number of reasons for road user charges rising up the political agenda, among which is the fact that, unlike fuel duty, road user charges can be targeted on the places and times when congestion, which is an important economic cost of traffic, occurs. An additional point is that the increasing diversity of transport fuels, including a possible major future shift to electric vehicles, would obviously raise fundamental questions about the stability of revenues from fuel duties. A shift to road pricing might be necessary if tax revenues from road transport are to be maintained.

Leaving this point aside, there are two key considerations as to whether any new road user charges should replace or be in addition to fuel duties and other taxes. Firstly, fuel and vehicle duties serve important transport and environmental policy objectives that are not addressed by road pricing. If fuel and vehicle excise duties were entirely removed then this would sweep away the existing incentives for fuel efficiency and the promotion of low-carbon fuels. Secondly, studies modelling the impacts of a national road user charge in the UK have suggested that replacing fuel duties with road user charging in a revenue neutral package could actually increase traffic (and emissions) because it would result in motoring costs falling in less congested areas where traffic growth is already rising rapidly (e.g. rural areas and city fringes).

The continuing growth of traffic will greatly multiply the costs of congestion as well as making carbon emission reduction targets more difficult to meet. A green fiscal reform involving a fuel duty escalator-type arrangement with a transparent reduction of other taxes would contribute to the reduction of both congestion and emissions. Such a reform could provide a foundation upon which other, more targeted measures to manage transport demand could be placed - be they fiscal, regulatory, organisational or to provide infrastructure. However, fuel tax policies need to be applied consistently and with political sensitivity. Their effects build up slowly and their effectiveness will also depend on the pricing context - particularly the relative costs of public transport and other travel alternatives. If consistently applied over time, high fuel taxes become part of the everyday transport landscape, to which people adjust long term-behaviour and expectations.

Taxation of Aviation

Air transport is a relatively small, but fast growing source of CO_2 emissions. The Committee on Climate Change has noted that, even if aviation emissions continued at current levels it would require CO_2 emissions from all other sectors to be cut by 90 per cent to achieve the UK's target of an overall 80 per cent cut. If aviation emissions grow, then the legally binding 2050 target is unattainable.

Aviation currently benefits from a number of tax advantages:

- Aviation fuel is exempt from fuel duty,
- There is no VAT on air tickets. Air Passenger Duty (APD) is generally less than what VAT would be,
- Tax-free shopping at airports is a significant benefit which allows higher rents and subsidises airport charges.

Using taxation measures in aviation is complicated by international treaties that effectively eliminate the possibility of a fuel duty on international flights. Hence a number of proxy or second-best taxation measures have been used of which airport departure tax is the most widespread. In the UK this is Air Passenger Duty (APD), the rates of which for 2009-2010 are shown in Table 5.3.

Table 5.3: Air Passenger Duty Rates

Band and approximate distance in miles from the UK	In the lowest class of travel (reduced rate) from:		In other than the lowest class of travel (standard rate) from:	
	1 November 2009	1 November 2010	1 November 2009	1 November 2010
Band A (0-2000)	£11	£12	£22	£24
Band B (2001-4000)	£45	£60	£90	£120
Band C (4001-6000)	£50	£75	£100	£150
Band D (over 6000)	£55	£85	£110	£170

*If only one class of travel is available and that class provides for seating in excess of 40" then the standard (rather than the reduced) rate of APD applies.

International treaties permit the charging of fuel tax on domestic air flights. Domestic air travel is responsible for 5 per cent of the UK contribution to climate change and is 36 per cent of all UK air traffic movements. Fuel used on domestic air flights is taxed in some other countries, including the USA and Germany. A domestic fuel tax would need to be based on fuel usage rather than fuel taken on board, to account properly for journeys only partly within the UK, irrespective of where refuelling took place.

Other possibilities for aviation taxation are an emissions charge on airlines, or the levying of VAT on airline tickets. However, given the institutional barriers to taxation at the European level and to international aviation taxation, the main policy measure that has been adopted at the European level is to incorporate aviation within the EU emissions trading scheme from 2012, with a cap on emissions at the average level for the aviation sector from 2004-2006. Those airlines that exceed this level will have to purchase carbon permits from sectors with a surplus.

Distributional Effects of Transport Taxes

With regard to taxes on motoring, wealthier people are more likely to own a car, tend to drive it further (see Table 5.2)and tend to have a bigger car. The majority of the poorest households do not have access to a car at all. For these reasons the taxation of motoring is progressive, not regressive.

In respect of graduated VED and car purchase tax, the effect on low-income households is small because they are less likely to own cars with high fuel consumption and rarely buy brand-new cars. In respect of fuel duty, distributional concern is focused on low-income households with cars and in particular those in rural areas, who are felt to have a greater need for a car than people in urban areas. Most low-income losers from increases in fuel duty could be compensated if the revenues were recycled in the form of an income tax reduction, tax credit or benefits increase of the same amount for each household based on the number of adults and children living in it.

With regard to aviation, the majority of air travel by people from the UK (including most travel on low-cost airlines) is by people in the richest 20 per cent of the population. Because people on low incomes fly very little there are no serious distributional concerns about ending aviation's tax privileges. Because with a GFR additional taxes on aviation would be offset by tax reductions and tax credits elsewhere, a person who flew once a year on a short-haul flight as far afield as Spain or Italy would roughly break even. It would be those who flew more often or further than that who would lose, while those who do not fly at all would gain.

Conclusions

For road transport, purchase, circulation and fuel taxation can be used to promote a variety of transport and environmental policy goals. In exploring the use of these tax measures it is important to distinguish between policy measures to influence vehicle characteristics (technology, the type of fuel used and fuel economy) as distinct from vehicle use. Well designed purchase and circulation taxes can stimulate cleaner car technologies and fuels, but their incidence on car ownership rather than use means that they are not an appropriate means of reducing traffic. Indeed, if successful, of themselves they could increase road traffic, if they reduce the cost of motoring.

Road fuel duties can be used to reduce traffic, as well as pursue other environmental policy goals related to transport. The most serious distributional issues which arise from transport taxation are the impacts on low-income rural motorists of increasing road fuel duties. However, these can be largely addressed through appropriate re-distribution of the revenues.

…it is also hard to see a solution to excessive traffic that does not involve a green fiscal reform…

Evidence is mounting that, to manage transport demand and transport emissions, any shift to road pricing needs to be in addition to rather than replacing fuel and vehicle excise duties. This produces a dilemma. In recent years the UK Government has retreated for political reasons from pricing measures on road transport to manage demand, while at the same time there is an acceptance that transport demand management is imperative and that simply tweaking existing tax measures will not be sufficient. It is not yet clear how and when this dilemma will be resolved, but it is also hard to see a solution to excessive traffic that does not involve a green fiscal reform in which a systematic annual increase in fuel duties is compensated by an equivalent reduction in business and personal taxation.

6. Public Opinion on a Green Tax Shift

Summary

What does the public think about a green tax shift? Most recent opinion polling about green taxes has presented the taxes as additional, rather than part of a shift with green taxes offset by lowering other taxes, and found majorities of people opposed. A recent poll, commissioned by the Green Fiscal Commission, specifically on public attitudes to a green tax shift found that there were large majorities in favour of such a shift and majorities in favour of shifts of taxes to aviation, motoring and household energy offset with reductions in other taxes.

Two deliberative events were held by the Green Fiscal Commission to explore the issues with members of the public in much greater detail. These suggested that there was conditional public support for green fiscal reform (GFR). On the one hand, there was approval for the principles of green taxation and recognition that fiscal mechanisms were effective at changing behaviour. On the other, when specific interventions were explored in depth, participants became concerned about the fairness of environmental taxes in certain instances.

If a programme of GFR is to be taken forward there is therefore a need to motivate people about the importance of climate change, to overcome scepticism that other taxes would be reduced, to effectively communicate the financial implications for households, and for institutions – possibly new ones – to facilitate the transition to low carbon lifestyles.

What do Previous Polls Say About Public Opinion on Green Taxes?

There have been over a dozen polls about public attitudes to green taxation published in the last three years. The polls did not have entirely consistent findings, but a number of messages can be drawn from them. Most of the polls asked about public attitudes to green taxes without any suggestion of cutting taxes elsewhere or hypothecating revenues, implying that they would be additional taxes. Only three of the polls asked about attitudes to green taxes offset by tax reductions elsewhere, but they gave contradictory findings.

A YouGov poll in 2006 found that only 22 per cent of respondents were prepared to pay substantially more in motoring and energy taxes in exchange for lower income tax, with 65 per cent saying no. However, a poll by Communicate Research at the same time found that 55 per cent would support an increase in energy taxes if it was offset by a cut in income tax. In a September 2007 YouGov poll for the TaxPayers' Alliance, 61 per cent thought that if extra green taxes were raised then the extra money should be used to reduce other taxes. Approval of extra green charges on motoring and air travel was split in the TaxPayers' Alliance poll, with 45 per cent supporting them and 46 per cent opposing them.

Most of the other polls asked about taxing aviation, some asked about additional taxes on motoring and a few asked about taxes on energy or carbon emissions in general. Support for higher taxes on aviation was about 60 per cent in two polls in 2005 and 2006, about 40 per cent in two polls in March 2007 and around 20 per cent in two polls in summer 2007, revealing an apparent trend of declining support.

Views on taxes on motoring were more constant. Two polls found 65 per cent (YouGov, November 2006) and 69 per cent (MacIntyre Hudson, August 2007) were opposed to higher fuel duty. Even if increased taxes on motoring were used to reduce public transport fares, 63 per cent were opposed (YouGov, March 2007). However, there was 72 per cent support for an extra tax on large executive cars and 4x4s (YouGov, November 2006) and 64 per cent support for a tax on fuel-inefficient vehicles (Ipsos Mori, October 2007).

The only poll that asked about increasing tax on domestic energy found 86 per cent opposed (MacIntyre Hudson, August 2007), compared to 69 per cent opposition to an increase in fuel duty and 60 per cent opposed to an increase in air passenger duty in the same poll.

Public opinion polling about a green tax shift for the Green Fiscal Commission

The Green Fiscal Commission commissioned a poll to look at public attitudes to a green tax shift. BMRB conducted a national opinion poll with face-to-face interviews between 30 August and 5 September 2007. There were 1,010 respondents.

There was substantial support in principle for green taxes – 51 per cent support versus 32 per cent opposition.

There was a significant increase in support if revenue was to be hypothecated to be spent on projects to directly reduce carbon dioxide emissions. Support rose to 73 per cent and opposition fell to 17 per cent.

Support for green taxes rose even higher if other taxes were to be reduced at the same time. Support was 77 versus 9 per cent opposition.

Favoured taxes to be reduced were council tax 32 per cent, income tax 31 per cent and VAT 11 per cent. No other named tax polled more than 3 per cent in support.

There were quite high levels of support for taxes on environmentally harmful activities:

- 60 per cent versus 20 per cent for taxes on air travel,
- 48 per cent versus 35 per cent for taxes on petrol,
- 48 per cent versus 35 per cent for taxes on home energy use.

These levels of support were significantly higher than those in polls where no offsetting tax reductions were mentioned, but similar to those in two of the other polls that had done so.

Respondents in households owning a car were not significantly less likely than those in households without a car to support additional taxes on petrol.

Respondents were asked about their support for the principle of taxes on activities that damage the environment, such as driving, flying or not recycling. Support was 57 versus 24 per cent opposition. This compares to levels of support for redistributive taxes (69 versus 19 per cent) and taxes on unhealthy behaviours (66 versus 18 per cent) which were somewhat higher than for green taxes.

Deliberative workshops – exploring attitudes to a green tax shift in depth

The poll was followed up with deliberative events with members of the public in November 2008. Deliberative events are used to explore how people's views change (or don't change) when they are presented with information on a particular topic and allowed to discuss it in groups and with experts over a period that can be a day or longer. Two day-long deliberative workshops were held, one in Birmingham and one in Norwich. Each workshop comprised 50 members of the public recruited to reflect the socio-economic profile of each area. Participants were also selected to have views on green taxes indicative of national trends. However, the groups were too small to be truly representative of the population at large, so the polling results at the workshops should be regarded as indicative only.

The workshops specifically explored public views on climate change, the polluter pays principle and which taxes to decrease if green taxes are increased. They also included a detailed examination of green tax interventions on personal transport and domestic energy use.

While 90 per cent of participants stated they were concerned about climate change, only 57 per cent believed it would make an impact on them personally. This lack of belief concerning the personal impact of climate change was one of the key factors shaping negative views towards green taxes. When concerns about climate change were discussed participants generally focused on systemic social and environmental issues, such as population migration or water shortages, rather than day-to-day personal impacts.

The responsibility for tackling climate change was perceived to rest predominately with government and business. Any calls for the public to make lifestyle changes needed to be matched by efforts from institutions to facilitate the transition to low carbon living. Efforts to cut energy use in the UK were perceived as neither fair nor effective if other countries such as the US and China do not do the same.

Overall, there was conditional support for green fiscal reform. On the one hand, there was approval for the principles of green taxation and recognition that fiscal mechanisms were effective at changing behaviour. On the other, when specific interventions were explored in depth, participants became concerned around the fairness of environmental taxes in certain instances. Importantly, participants generally perceived themselves to be worse off under any given scenario. There was a tendency for participants to have greater concern with progressive taxation rather than GFR per se.

Where tax reductions were concerned, council tax was originally favoured at the beginning of the days. However, after discussion income tax was preferred as the main means of offsetting rises in green taxes – due to the ability to tackle distributional issues through tax credits. However, there was a lack of trust that a green tax shift would be revenue neutral – with certain groups equating green taxes to stealth taxes. Transparency in implementing a green tax shift was seen as highly important.

Table 6.1 shows the total support for particular tax interventions after debate in the deliberative workshops, and the net support (the difference between those in favour of and those against an intervention) before and after debate, indicating how the debate changed people's minds. Table 6.1 shows that after debate all of the tax rises were supported by more than 50 per cent of participants (provided they were introduced on a revenue-neutral basis), though net support varied from 6 to 68 per cent. With the exception of fuel duty, support for all the measures was higher after debate than it had been beforehand. Of

the three main energy-using behaviours examined, aviation was the most supported area for tax rises; increases in fuel duty and a tax on energy in the home were more controversial and also viewed as potentially regressive.

Increasing fuel duty was supported by 49 per cent of respondents, falling to 43 per cent after the discussion. The primary concern was that duty on fuel was already high and people already had cut journeys significantly, in the wake of the price rises in 2008. There was particular concern from rural communities that without an adequate and affordable public transport system in place, such a tax would be unfair and regressive. While an increase in fuel duty was the least supported intervention, the potential to increase Vehicle Excise Duty and introduce a car purchase tax were supported by approximately three-quarters of participants.

Table 6.1: Support for Different Tax Interventions Before and After Debate

Intervention	Total support after debate	Net support after debate	Net support before debate (where polled)
Road transport			
Increase in fuel duty	43	+6	+ 10
Increase in Vehicle Excise Duty	80	+68	-
Introduction of car purchase tax	71	+54	-
Aviation			
Introduction of green tax on flying	69	+55	+35
Introduction of VAT on airline tickets	50	+18	-
Abolition of tax-free airport shopping	67	+52	-
Energy use in the home			
Green tax on energy use in the home	55	+27	-4

A green tax on flying was supported by 69 per cent of respondents, due to the relative affluence of airline passengers and concerns at the levels of subsidies the airline industry enjoyed. Frequent flyers, rather than those taking an annual holiday, were a particular concern and it was suggested that the tax should escalate based on the number of flights taken in any given year. The introduction of VAT on tickets and the abolition of tax-free shopping at airports were supported by 50 and 67 per cent of participants respectively. A tax on airline emissions was viewed as an effective means to promote greater efficiency in engine design and encourage airlines to fly fuller planes.

Views in relation to household energy were the most volatile of the days, with support rising from 43 to 55 per cent after debate. Concerns included that prices for domestic gas and electricity are high and that demand for energy is inelastic. Increasing tax on home energy use was viewed as potentially regressive, and there were significant concerns around growing fuel poverty. Support for a tax on energy in the home increased providing there were appropriate safeguards in place to protect the elderly, the poor and the vulnerable - in particular reductions in council tax and stamp duty in order to encourage the adoption of energy efficiency measures.

Conclusions

Four key conclusions have emerged from this and other work on public attitudes to green fiscal reform. It will be important to address these if a major programme of green fiscal reform is to be successfully taken forward. They are:

Motivators for behaviour change

Although climate change was a concern for participants, it was not a leading issue for them. In particular, the lack of belief that climate change would make an impact on people personally was one of the key factors shaping individual views on taxes in subsequent group discussion: making them much more likely to oppose the more contentious reforms such as fuel duty and a carbon tax. Conversely, those who believed that climate change will have an impact on them were most likely to support the adoption of such measures.

This highlights a need to tackle the deeper levels of awareness and understanding to convince individuals of the urgency and importance of the issue and to understand the relationship between their consumption behaviour and the process of climate change. It is important that individuals believe that the issue is 'real' and that their own behaviour is relevant to it and can make a material (rather than simply symbolic) difference, which requires that they see other people and organisations acting too, as mentioned below.

Scepticism around a tax shift and its impact

Whilst in abstract the principle of a green tax shift – and of the polluter pays principle more generally – were supported, there was a tension between people's general views on environmental pollution and their reaction to particular measures to address it.

The factors affecting this difference in attitude between the general and the particular were not just latent, i.e. only coming into play when considering trade-offs around specific tax interventions. Rather, they were also shaped by three key perceptions that people had in relation to a green tax shift.

…the idea that the GFR would be revenue neutral was generally not believed by participants. This issue was fundamentally related to lack of trust in government…

First, the idea that the GFR would be revenue neutral was generally not believed by participants. This issue was fundamentally related to lack of trust in government, and a perceived view that after a decade of increased public expenditure, any change to the tax system would be to raise government revenue. The potential use of environmental taxes as 'stealth taxes' was a particular concern.

The fiscal situation has now changed significantly from that when the deliberative events were held, such that tax increases are now widely perceived to be necessary to reduce public deficits. In this context, the insights from the deliberative events suggest that it will be essential to get across the idea that any increases in green taxes are *instead of* increases in other taxes (such as income tax or National Insurance), i.e. if it were not for the green tax increases, other taxes would have to be raised more than will anyway have to be the case. Conversely, the more revenue that can be raised by green taxes, the lower other taxes can be. When fiscal stability has been restored, strict revenue-neutrality can be reinstated as a guiding principle of a green tax shift, with the tax rebate clearly identified and easy to understand, and the tax shift perceived to be fair. The rebate must also be communicated and enacted at the time of any tax shift.

Second, a key finding was that, although the revenue neutrality of the green tax shift means that on average people would be neither worse nor better off, the vast majority of participants *believed* they were likely to be worse off under green fiscal reform. This was an ingrained and instinctive position, which was also tied to a perception that certain green taxes were likely to hit lower income groups disproportionately. There was a great deal of concern about the wider economic impact of taxes on energy and fuel – for instance raising the costs of goods and services more generally. Moreover, given the great differences in the energy consumption of households with similar incomes, people were uncertain exactly how green tax changes may affect them.

…fairness emerged as a key principle underpinning acceptability of tax reform…

Finally, fairness emerged as a key principle underpinning acceptability of tax reform, both in respect of affordability of the tax increases and as needing to be proportionate in the sense that the good or service is not already subject to high taxes and that easily substituted alternatives are available to the polluting behaviour. Others, particularly government and business, need to be seen to be doing their bit too.

Factors affecting green tax support

Increasing fuel duty and placing a carbon tax on energy use in the home were among the most controversial of all the suggested tax rises and provoked the most polarised views.

With regard to fuel duty, concerns fell into three areas. First, it was felt that people in the UK already paid a very large amount of duty on fuel, so when the market cost of crude oil increased, as had happened in 2008, participants were concerned that prices would become exorbitantly high. Second, demand in relation to fuel was seen as inelastic – particularly in rural areas as there was a very limited public transport infrastructure in place. Participants were therefore more supportive of tax initiatives which would shape purchasing intent rather than day-to-day driving behaviour: such as an increase in VED and, to a lesser extent, car purchase tax. As already noted, opposition to fuel duty actually increased over the course of the workshops' discussions.

To address these issues, the financial impact of tax reductions to offset the rise in fuel duty needs to be underscored. For example, at what mileage car use would be revenue neutral is fundamental to how fair it is perceived to be. It should affect excessive car users – modest use and essential purposes should not be penalised.

A tax on home energy use was the most volatile of all the interventions – and the only one to have negative net support prior to debate in the groups. Concerns were very similar to that described for fuel duty, in that domestic energy costs were perceived to be very high, demand was relatively inelastic and the tax could be regressive – with particular concerns around the proportion of households in the UK already in fuel poverty. This issue was further complicated as heating was viewed as a basic right and utility companies were seen as making huge profits at the expense of individuals. Again, any fluctuation in the basic price of energy in combination with an additional tax was a major concern for people.

However, and unlike fuel duty, views on energy use in the home became markedly more positive over the course of the day. This was mainly due to the potential for tax incentives –

council tax breaks in particular – to enable people to undertake expensive energy saving measures which would overall reduce their demand for heat. Policy carrots were perceived to be needed if the 'stick' of a carbon tax were to be introduced.

Finally, a green tax on flying was the most supported of all the main interventions. As noted, this was in part due to the heavy subsidies that aviation receives relative to other forms of transport due to tax exemptions the sector enjoys. It was also due to the relative affluence of flyers and the general support for progressive taxation measures. There was seen to be a need to focus on frequent flyers. Again, at what level flying behaviour becomes revenue neutral when offset against tax cuts will be important in this regard.

Leadership and environmental behaviours

Although participants generally acknowledged their own contribution to climate change, and their responsibility for mitigating it, they generally placed the main burden of response on national and global institutions. Even the majority of those already making changes believed their own efforts were likely to make little difference without broader government and business leadership in this area.

Making sure that everyone is doing their bit is perhaps the most significant barrier to support for green taxes. This goes beyond the environmental performance and sincerity of government and business, important though these issues are. It is also about facilitating conditional and situational factors that will help shape the environment in which choices are made: the provision of effective public transport systems; the availability of environmentally superior products and so on.

Overall people accepted the principle of a green tax shift. All the proposed tax interventions were supported by significantly more participants than those opposed to them: the key issue will be to apply the tax shift fairly and honestly, with complementary policies to facilitate behaviour change.

7. Modelling a Major Green Tax Shift for the UK

Summary

This section reports the results of a major modelling exercise to gain insights into the possible economic and environmental effects of a large-scale green fiscal reform (GFR) in the UK. As already noted, GFR involves a shift in the target of taxation away from labour or firms towards pollution or the use of natural resources, in such a way that overall tax revenues are unchanged. It is hoped that such a tax shift will deliver environmental improvements while having a neutral or positive effect on the economy. The modelling was set up to explore the extent to which this would be the case.

Such modelling projects different scenarios into the future and compares their outcomes. The scenarios in this case had medium, low and high world market fossil fuel prices without a tax shift (the 'baseline' scenario, S1 and S2); medium and low world market fossil fuel prices with a tax shift (the GFR scenarios); and the same prices with a tax shift but with 10 per cent of the extra tax revenues spent on environmental investments (the 'eco-innovation' or scenario, E1 and E2).

The headline environmental result from the GFR scenarios is that the UK meets its greenhouse gas emissions reduction targets for 2020…

The baseline with a high oil price reduces UK carbon emissions, although not enough to meet the 2020 target, but also reduces 2020 GDP by 6.3 per cent compared with the medium-price scenario.

The headline environmental result from modelling the GFR scenarios is that the UK meets its greenhouse gas (GHG) emissions reduction targets for 2020, whereas the baselines miss them by a large margin. On the economy, the baseline GDPs are reduced in the GFR scenarios by 0.6-0.7 per cent by 2020, a reduction in the economic growth rate of around 0.07 percentage points (i.e. from around 2.6 to 2.53 per cent per year). The reduced cost of labour in the GFR scenarios results in about 455,000 extra jobs by 2020.

In the E scenarios 10 per cent of the environmental tax revenues are invested in making homes more energy efficient, in fuel-efficient cars and in offshore wind electricity. This increases the generation of electricity from renewables to 26-29 per cent by 2020 (up to double the share in the baselines); the more efficient cars reduce carbon emissions from road transport by around 5 per cent; and the greater efficiency of homes reduces their carbon emissions by around 9 per cent. Overall, the E1 and E2 scenarios reduce carbon emissions a further 3.5 per cent and 7.3 per cent below the already low levels in S1 and S2 respectively, indicating the environmental effectiveness of such investment.

GFR emerges from this modelling exercise as a policy instrument that can reduce GHG emissions enough to meet the stretching government targets for 2020, with practically no cost to the economy overall, and with an increase in employment. There is no other single policy that can achieve this.

Introduction

This section of the report presents the results of a modelling exercise to generate insights into the economic and environmental implications of a large GFR in the UK. GFR involves shifting the target of taxation away from labour (income taxes, or National Insurance contributions) or business enterprise (taxes on profits) towards taxes on pollution or the use of natural resources. It is hoped that such a tax shift will reduce pollution and increase resource efficiency, and, by reducing disincentives to use labour or make profits, have a broadly positive effect on the economy.

Those GFRs that have been introduced to date have been quite small, usually involving the shift of only a few per cent of tax revenues. However, even these have been estimated to have had significant positive environmental and economic effects, increasing energy efficiency and reducing emissions, and increasing employment. This provided the rationale for seeking to understand the wider implications of a much larger GFR.

This report provides only a brief description of the results of the modelling, full details of which, with accompanying explanations, are given in the Green Fiscal Commission Briefing Paper on this topic, and in the full report of the modelling work.

Evaluating a Green Fiscal Reform

To generate any kind of detailed insights into the effects of a GFR requires the use of an economic model that simulates the many interactions between different sectors in the economy. The Green Fiscal Commission commissioned Cambridge Econometrics (CE) to undertake this work, using its model of the UK economy called MDM-E3 (multi-sectoral dynamic model of the economy, energy and the environment). This model has been developed and improved over many years, and has often been used in simulations of this kind.

MDM-E3 is an econometric model in which the key relationships in the economy are estimated on the basis of past data, and scenarios are projected into the future on the basis of these relationships and a number of assumptions about key variables such as economic growth, energy prices and government policies. The total model consists of the main economic model, and sub-models of the energy system and, within it, the electricity system. In addition to its results for the economy and energy demand, the model estimates air emissions from the use of energy and industrial processes, of which the most important are the six greenhouse gases covered by the Kyoto Protocol, the main one of which is carbon dioxide (CO_2) emissions resulting from the combustion of fossil fuels.

The basic modelling approach to generating insights into the impacts of a GFR is, first, to generate one or more projections of the future that show how the economy, energy demand and emissions might develop in the absence of a GFR. These are called the Baseline projections. The various elements of the GFR are then imposed, singly or together, and the results of the projections with the GFR are compared to the results of the Baseline(s). These various projections are called scenarios.

Scenarios

GFR works by using taxes to raise the prices of energy and other resources, or taxing pollution, and reducing other taxes. However, energy prices often change without GFR through the operation of world energy markets. A major purpose of this modelling was to generate insights into any differences between the impacts of energy price increases due to world markets, and those due to GFR. This entailed the modelling of three Baselines, with different assumed fossil fuel prices – medium (B1), low (B2) and high (B3). The GFR scenarios (S1, S2) were compared against these Baselines. In a variant of the GFR scenarios, not all the revenues from the environmental taxes were used to reduce other taxes. 10 per cent of these revenues were instead used to boost the environmental effects of the taxes, by investing in household energy efficiency, fuel-efficient cars and renewable energy sources. Because other taxes had not been reduced by the full amount of the environmental tax increases, this means that in these 'environmental' (E1, E2) scenarios overall tax revenues, and public spending, were higher than in the other scenarios.

Main Assumptions for Baseline B1

The Baseline scenario (B1) for this study was the August 2008 projection from CE's UK Energy and the Environment report. This baseline economic forecast builds on and is consistent with the industrial and regional economic forecasts published by CE in its regular forecast publications *Industry and the British Economy* and *Regional Economic Prospects*, respectively. The baseline forecast provides a disaggregated projection of economic, energy and environmental developments to 2020.

In respect of energy prices, it will be remembered that in July 2008 oil prices reached highs of over $145 per barrel. In the period to 2010 it was assumed in Baseline B1 that oil prices would decline moderately from the highs of 2008, but would remain high at over $110 per barrel in nominal terms. Over 2010-20, real oil prices were then assumed to rise at a long-term trend of 2 per cent per annum, reaching $170 per barrel in nominal terms in 2020, as global dependence on OPEC supplies increases and non-OPEC production falls, and the demand for oil is led by developing countries, China and India in particular. Gas prices, while lower, rise from 2010 with oil prices. Coal prices stay broadly constant in real terms to 2020.

The Baseline B1 only includes 'firm' government policies up to June 2008; that is, policies that were already in operation or those that had been planned and definitely confirmed. The UK environmental policies modelled in the B1 scenario include the Renewables Obligation (RO), the Renewable Transport Fuel Obligation (RTFO), the Climate Change Levy (CCL), and the UK's membership of the EU Emissions Trading Scheme (EU ETS). It is also assumed that the Carbon Reduction Commitment and the Carbon Emission Reduction Target will dampen fuel demand from commercial and household users respectively. The EU ETS has an impact on fuel prices as it is assumed that the cost of emissions allowances is passed through to fuel users. In the Baseline B1, the EU ETS price is assumed to be €25/tCO_2 in 2008, the first year of Phase 2, and thereafter to grow between 2 and 2.5 per cent per annum, reaching €32/tCO_2 in 2020. This means that the emissions reductions induced by the EU ETS at this level are already in the Baseline B1.

Baselines B2 and B3

The Baselines B2 and B3 have the same assumptions as B1, except for the oil and other fossil fuel prices. B2 is a low oil price baseline to simulate technical progress in fossil-fuel production from unconventional sources and/or reductions in demand from carbon emissions reductions – the oil price is the same as in B1 until 2010, when it falls smoothly to $70 per barrel (in nominal terms) by 2020. B3, in contrast, is a high oil price baseline to simulate an unstable world economy/energy market – the oil price is the same as in B1 until 2010, after which wholesale oil and gas prices were increased above B1 to leave end user gas and petrol prices equal to those in the central green fiscal reform scenario (S1, described below). This leads to an oil price in 2020 of around $500 per barrel in nominal terms. In each case the prices of other fossil fuels (coal and gas) were adjusted so as to be consistent with the oil prices used.

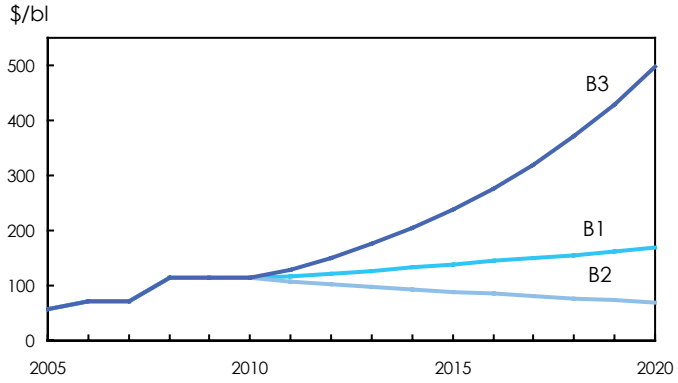


Chart 7.1: Oil Price Assumptions in the Baselines

Chart 7.1 shows the oil prices over the projection period for the different Baselines.

Source(s) : BERR, Cambridge Econometrics.

The GFR Scenarios, S1 and S2

Two green fiscal reform scenarios were modelled, S1 starting from the Baseline B1, and S2 starting from the Baseline B2, but with the same target end fuel user prices as S1. Because the market prices of fossil fuels were lower in B2/S2, the GFR had to be larger (i.e. the taxes had to be higher) in order to reach the same end fuel user prices, generating more revenue that could then be used to lower other taxes.

The green taxes for S1 were specified as follows:

- a substantial increase in CCL rates, by 25 per cent per annum, beginning in 2010,
- a household energy tax at the level of the aforementioned increased CCL rates over the period 2010-20,
- a Fuel Duty Escalator of 10 per cent per annum during the 2010-20 period,
- auctioning of EU ETS permits: 100 per cent auctioning for power generation during 2013-20 and 20 per cent of all other permits in 2013 increasing linearly to 100 per cent in 2020. (While this raises revenue, it does not reduce emissions from the EU ETS sectors, because these depend only on the number of allowances issued, which is the same as in the baseline.)
- the inclusion of aviation in the EU ETS beginning in 2013,
- a purchase tax on new vehicle purchases averaging £300 in 2010 and rising by £300 each year, reaching £3,300 in 2020,

- a tax on the business use of water, beginning in 2010 at 10 per cent of the average water price in that year and increasing by 10 per cent per annum to 2020,
- an aggregates levy escalator of 10 per cent per annum beginning in 2010.

In both S1 and S2 environmental tax revenues from industry are recycled through a reduction in employers' National Insurance Contributions (NICs) while revenues raised from households are returned via lower income taxes.

The Eco-innovation Scenarios, E1 and E2

Two 'eco-innovation' scenarios were modelled, E1 and E2, allocating 10 per cent of the green-tax revenues levied in S1 and S2 respectively to the three following measures in roughly equal amounts (instead of using this money to reduce other taxes, as in S1 and S2):

- offshore wind: funds were allocated to subsidise this technology, making it competitive with respect to gas-fired new build; this was converted to an annual increase in capacity,
- hybrid vehicles: subsidies (of £3,000 per vehicle) were provided covering the additional production cost of a full hybrid vehicle, thus increasing the number of hybrid vehicles manufactured and bought in the UK,
- retrofitting of the UK housing stock: this portion of the revenues was given to households to pay for the installation of insulation measures in houses currently lacking them; loft insulation is installed first and once all houses have this, houses are then retrofitted with cavity wall insulation. Once all houses have this too, remaining funds are allocated to the offshore wind and hybrid vehicle investment streams.

These measures should not be taken to be prescriptive in any way; they were selected to give an idea of the carbon reduction potential of green investment.

Because S2 has higher green taxes, as explained above, the scenario E2 has a much larger amount of investment into these eco-innovation measures, because the scale of the S2 green fiscal reform is greater.

Results of the Baselines

Effects on tax rates and prices

Table 7.1 shows the effect on end-user energy prices of the different baseline assumptions about market energy prices shown in Chart 7.1. By 2020, the real domestic gas price in B3 is 5.64 pence/kWh compared with 3.23 pence/kWh in B1 and just 2.30 pence/kWh in B2. Even clearer is the impact of high oil prices on petrol prices: in B3, for example, petrol prices reach 190 pence/litre in real terms compared to 110 pence/litre in B1, while they fall to 79 pence/litre in B2. Domestic electricity prices also increase significantly in the high fossil fuel price scenario, with real domestic electricity prices reaching 41 pence/kWh in 2020 in the B3 scenario.

Table 7.1: Final User Energy Prices and Fuel Duty for Different Baselines

	2007	2020		
2003 prices		**B1**	**B2**	**B3**
Domestic Gas (p/kWh)	3.17	3.23	2.30	5.64
Domestic Electricity (p/kWh)	10.37	17.50	12.81	40.85
Petrol (p/l)	84.6	109.9	79.3	190.1
Diesel (p/l)	91.4	121.6	83.9	221.1
Nominal prices				
Fuel duty (p/l / % annual growth)	50.4	78.3 / 3.6	75.8 / 3.3	91.2 /5.2

Source(s): CE, DUKES and DECC.

In all the baselines and scenarios, the fuel duty is 50.4 pence/litre in 2007 (accounting for more than half the final price faced by consumers). Differences in the paths of the tax in the three baselines can be explained entirely by the different paths of inflation, as the Fuel Duty Escalator is index-linked; the tax is highest in 2020 in B3, having grown by some 5.2 per cent per annum over 2010-20, to more than 91.2 pence/litre. Lower inflation in other baselines is reflected in lower growth in fuel duty. In B1 it reaches 78.3 pence/litre in nominal terms, in B2 75.8 pence/litre, by 2020. In interpreting all price increases in this report, special attention should be paid as to whether the quoted prices are adjusted for inflation ('real' prices, in this case expressed in 2003 prices) or not ('nominal' prices).

Effects on GDP

Higher world market prices for energy reduce UK GDP. Chart 7.2 shows GDP by component under the three baselines.

It can be seen that the various fossil fuel price assumptions have a strong impact on the economy. The considerably higher fossil fuel prices in B3 cause a substantial fall in GDP of 6.3 per cent by 2020 compared to B1. The average growth rate for GDP in the period 2010 to 2020 is 2.6 per cent per annum in B1 compared to 1.9 per cent per annum in B3. In other words, the high fossil fuel prices modelled in B3 lead to average GDP growth to be 0.7 percentage points lower over the period 2010 to 2020. Conversely, in B2 fossil fuel prices are slightly lower than in B1 and so GDP in B2 is 1.8 per cent higher than in B1 by 2020, equivalent to 2.8 per cent per annum growth in B2, compared to 2.6 per cent per annum in B1, in the period 2010 to 2020.

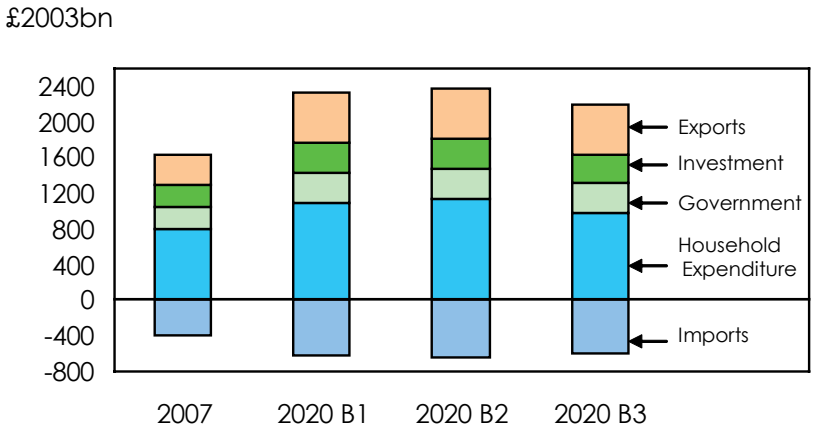


Chart 7.2: GDP by Component in 2020 in the Baselines

Source(s) : ONS, Cambridge Econometrics.

The impact of the higher energy prices differs across sectors. Those sectors facing the highest energy costs are more affected by the impact of the higher fossil fuel prices; typically manufacturing is more affected than services. Energy suppliers are also similarly affected. As industrial output is reduced as a result of the higher fossil fuel prices in B3 there is also a reduction in employment. In B3, higher fossil fuel prices cause some 82,000 job losses by 2020, again quite different to the impact of the green fiscal reform.

Final energy demand is considerably reduced in B3 compared with B1 and B2.

The reduction in energy demand translates into a fall in CO_2 emissions, as shown in Chart 7.3. In 2020 total carbon emissions in B1 are forecast to be around 500 $mtCO_2$, 15.7 per cent below the level in 1990, compared to the target adopted by the Government in April 2009 of a 29 per cent reduction in carbon emissions by that date. However, even the high fossil fuel prices in B3 are insufficient to push GHG emissions down to the 34 per cent reduction goal by 2020, as shown in Chart 7.4.

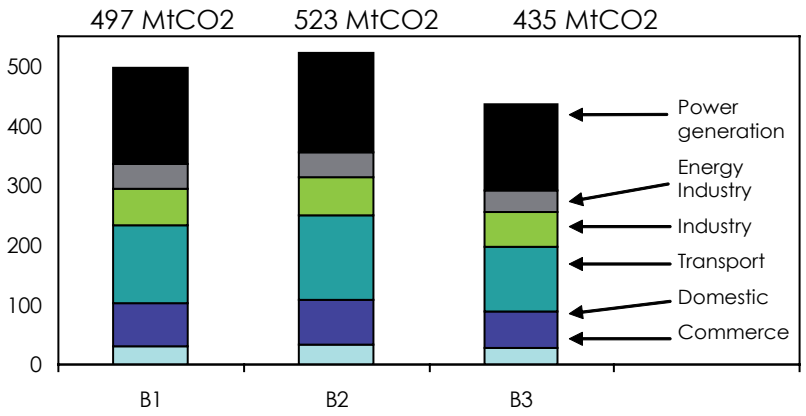


Chart 7.3: CO_2 (IPCC) Emissions in 2020 in the Baselines

Note(s) : Total CO2 emissions, by the IPCC definition, are reported above each column.

Source(s) : NAEI and Cambridge Econometrics.

It is important to distinguish in this context between UK territorial emissions, i.e. those actually emitted due to activities in the UK, calculated on an IPCC basis ('IPCC emissions') and those which are counted towards UK commitments under the Kyoto Protocol ('Kyoto emissions') and other targets. Kyoto emissions take account of emissions permit trades through the EU ETS, and may be more or less than UK territorial (IPCC) emissions, depending on whether the UK is a seller or buyer of EU ETS permits. In this report, CO_2 emissions are normally reported on a territorial (IPCC) basis, to relate them to the economic activities by which they are produced. GHG emissions are calculated as Kyoto emissions to take account of the permit trades that are relevant to whether of not the UK achieves its emissions targets. The total number of permits within the EU ETS is unchanged by world market energy prices, and is the same in all the baselines and scenarios. In baseline B1 it contributes to the 21.5 per cent GHG reduction on the 1990 level by 2020. In B2 the lower fossil fuel prices reduce this to a 19.1 per cent reduction. In baseline B3 the high fossil fuel prices impact heavily on power generation. Although actual UK territorial GHG emissions are reduced by over 30 per cent, in baseline B3 the UK becomes a net exporter of EU ETS permits to other European countries and so the reduction in 'Kyoto GHG emissions' is only 26.7 per cent (see Chart 7.4). Table 7.3 at the end of this section gives a full comparison of both CO_2 and GHG emissions, calculated on both a territorial (IPCC) and Kyoto basis.

The main conclusion of the comparison between the baselines is that higher world market fossil fuel prices reduce UK economic growth as well as carbon emissions. It will be seen that green fiscal reform can deliver a greater reduction in GHG emissions without damaging the economy.

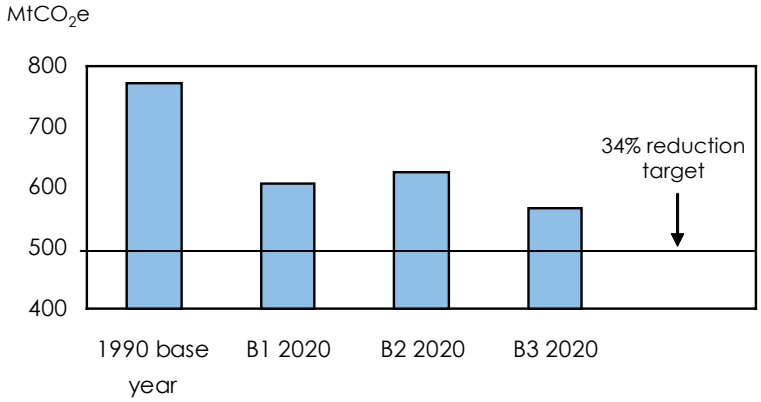


Chart 7.4: GHG (Kyoto) Emissions in 2020 in the Baselines

Source(s) : NAEI and Cambridge Econometrics.

Results of the GFR Scenarios

Here the GFR scenarios S1 and S2 are compared with their respective baselines B1 and B2, with the results for B3 (which was constructed to have the same end-user fuel prices as S1 and S2) also included for comparison.

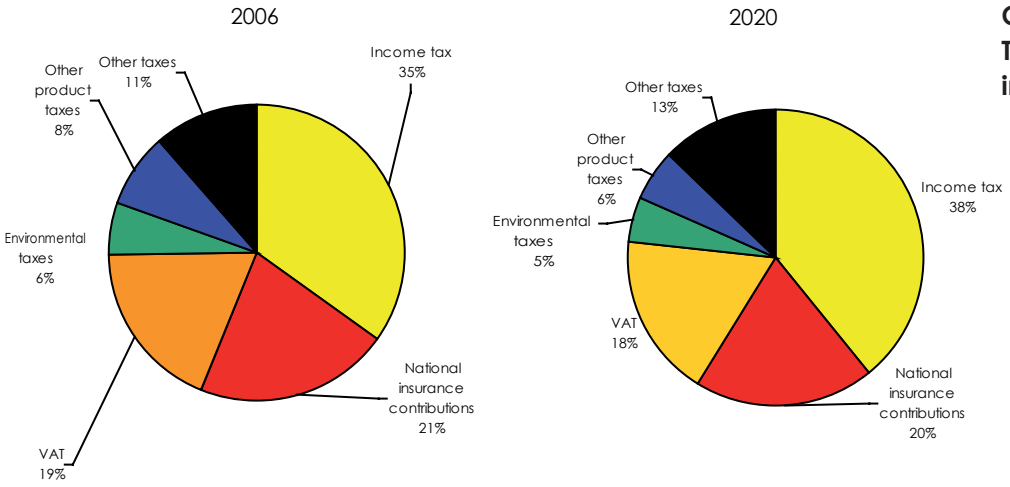
Fuel Prices and Tax Rates and Revenues

…the tax base arising from GFR over the projection period is stable.

Charts 7.5 and 7.6 show the scale of the GFR S1 in terms of the shift in the source of tax revenues. In the B1 baseline, tax revenues rise to £875 billion in 2020. Almost five per cent of these revenues are accounted for by environmental taxes (£43 billion). Chart 7.5 shows that the composition of the sources of tax revenues does not change substantially over the course of this particular scenario.

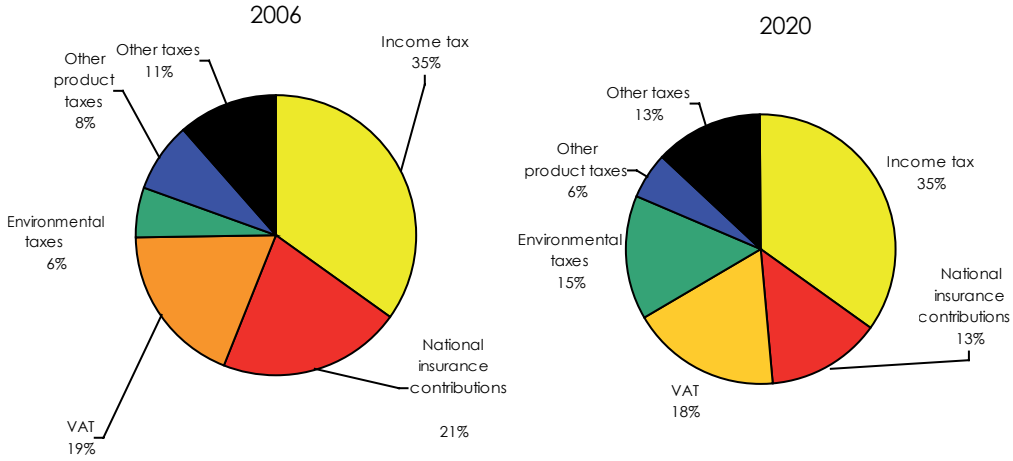
As a result of the GFR, the share of environmental taxes in the tax revenues of S1 is higher by design than in B1, at almost 15 per cent (£132 billion). Chart 7.6 shows that the increase in the share of environmental taxes leads to a corresponding decrease (compared to B1) in the share of National Insurance contributions and income tax. This is, of course, to be expected given the specification of the GFR scenarios.

Chart 7.5: Composition of Tax Revenues in B1



Source(s) : ONS and Cambridge Econometrics.

Chart 7.6: Composition of Tax Revenues in S1



Source(s) : ONS and Cambridge Econometrics.

In S2 (not shown) the share of environmental taxes in all tax revenues in 2020 reaches 17.6 per cent (£155.8 billion). The amount of revenue raised does not differ much between B1 and S1, and B2 and S2, indicating that the tax base arising from GFR over the projection period is stable.

Table 7.2 shows final user energy prices and fuel duty for the GFR scenarios and the baselines.

The rate of increase in road fuel taxes is markedly higher in both S1 and S2. In S1 the fuel duty increases by just over 13 per cent per annum over 2010-20, reaching around 205 pence/litre in 2020 in nominal terms. In order for the fuel prices in S2, based on the low fossil fuel price in B2, to match those in S1, fuel duties must be raised more aggressively. Fuel duty growth in S2 therefore averages 14.5 per cent per annum over 2010-20. The tax in 2020 is thus higher in this scenario, reaching approximately 236 pence/litre in nominal terms.

Table 7.2: Final User Energy Prices and Fuel Duty in the GFR Scenarios

	2007	2020				
		B1	**B2**	**B3**	**S1**	**S2**
2003 prices						
Domestic Gas (p/kWh)	3.17	3.23	2.30	5.64	6.54	6.76
Domestic Electricity (p/kWh)	10.37	17.50	12.81	40.85	23.40	20.55
Petrol (p/l)	84.6	109.9	79.3	190.1	220.6	228.0
Diesel (p/l)	91.4	121.6	83.9	221.1	230.6	230.4
Nominal prices						
Fuel duty (p/l / % annual growth)	50.4	78.3 / 3.6	75.8 / 3.3	91.2 /5.2	205 / 13	236 / 14.5

Note(s): Final user prices for domestic gas and petrol have been equalized in nominal terms but inflation differs across scenarios, so that the real prices vary.

Source(s): CE, DUKES and DECC

An energy tax was raised on households in S1 that was in line with the substantial increase in CCL rates also modelled as part of the GFR. The tax on gas faced by households starts at 0.22 pence/kWh in 2010, accounting for 4.7 per cent of the final price, and rises to 2.53 pence/kWh in 2020,almost 25 per cent of the final nominal price of 10.3 pence/kWh [6.54 pence/kWh in real terms]). In order for the domestic gas prices to be the same in S2 as in S1, it was necessary to raise this domestic energy tax at a higher rate over 2010-20. In S2, the tax on gas rises to 3.32 pence/kWh in order for the end-user price in 2020 to reach the same nominal price as in S1. As discussed above, in B3 the wholesale price of gas was increased by assumption to reach the same (nominal) end-user price as in the GFR scenarios. In contrast, in B3 the electricity price is substantially increased over those in S1 and S2, because electricity is far more affected by world market price increases than by the GFR (because power stations are in the EU ETS).

In S1 in 2020, £87.2 billion is available for recycling. Some 62 per cent of this revenue was used to reduce employers' National Insurance Contributions and the remainder was recycled into a reduction in income tax. The reduction in income tax implies a reduction in the standard rate of tax from 20 per cent in B1 in 2020 to just over 18 per cent in S1. Over 2010-20 a total of £410.8 billion is recycled.

In S2, the amount of funds available for recycling reaches almost £110 billion with the split between reductions in social security contributions and income tax broadly similar between S2 and S1. The implied income tax rate in S2 in 2020 falls to 17.5 per cent. A total of £496.8 billion is recycled over 2010-20 in S2.

The Effect of GFR on Energy Demand by Industry and Households

GFR reduces energy demand from industry and households, as might be expected.

In B1, energy demand from Industry falls by 1.1 per cent per annum over 2010-20. Energy demand falls faster in S1 over the same period, averaging -1.4 per cent per annum owing to the substantially higher energy taxation imposed. Industrial energy demand in 2020 is 3.3 per cent lower in S1 than in B1. In absolute terms, the largest reductions in energy demand are in 'Other Industry' followed by 'Chemicals' (in which the largest percentage reductions are seen compared to the baseline).

Industrial energy demand falls at a much slower rate in B2, by 0.5 per cent per annum over 2010-20, and the effect of the environmental taxation is to increase this rate of decline to 1 per cent per annum. The largest reductions in industrial energy demand by fuel, as a result of a GFR, come from the fossil fuels coal and gas, with the share of fossil fuels in the fuel mix reduced. The consequent emissions reduction between B1 and S1 is thus larger than the reduction in energy demand. Emissions of CO_2 from Industry in 2020 are 4 per cent lower in S1 than in B1 (whereas the demand reduction is 3.3 per cent). The reduction in energy demand is greater between B2 and S2 than between B1 and S1 owing to the heavier taxation imposed and the switch from gas to electricity is more pronounced. Emissions from Industry in 2020 in S2 compared with B2 are reduced by 5.7 per cent compared to an energy demand reduction of 4.9 per cent.

For households, in contrast to the slight growth in energy demand projected in B1, household energy demand falls under the GFR in S1 in which households face energy taxes of the level of the increased CCL, by 0.5 per cent per annum over 2010-20. Emissions from households in 2020 are 6.7 per cent lower in S1 than in B1 (compared to a reduction in energy demand of 6.3 per cent) and 10.4 per cent lower in S2 compared to B2 (the corresponding reduction in energy demand is 9.8 per cent).

Effect of GFR on Energy Demand by Transport

In the B1 and B2 baselines, demand for road transport (as expressed in passenger kilometres) increases by 0.5 and 1 per cent per annum, respectively; lower oil prices lead to lower road fuel prices (the main variable cost of road travel) and thus more travel demand. In contrast, road travel demand falls in S1 and S2, by 1.3 and 1.4 per cent per annum, respectively (the results are similar because the road fuel prices have been equalised between these two scenarios). In 2020, demand for road travel in S1 is 18.1 per cent lower than in B1 and 23.1 per cent lower in S2 compared to B2. The vehicle purchase taxes imposed in the GFR scenarios serve to reduce the incentive to buy new vehicles, as evidenced by a vehicle stock in 2020 that is 2.7 per cent lower in S1 than in B1 (2.4 per cent lower in S2 compared to B2).

The reduction in road travel demand reduces road fuel demand substantially, by 21.3 per cent in S1 and 27.6 per cent in S2 when compared to their respective baselines (see Chart 7.7). This result arises from the much higher fuel prices faced by users from the Fuel Duty Escalator imposed (the weighted average of petrol and diesel prices in 2020 in S1 is almost double that of B1). Road fuel prices in B1 grow by 3.7 per cent per annum over 2010-20 compared to 10.2 per cent per annum in S1 with the price of petrol growing somewhat faster than the price of diesel.

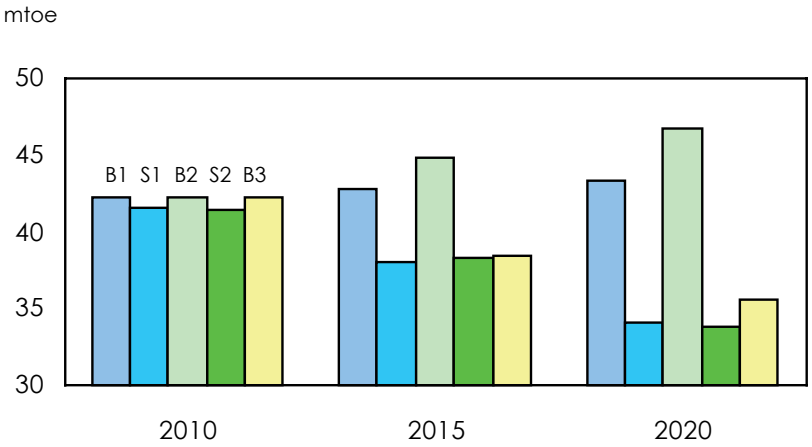


Chart 7.7: Total Energy Demand from Road Transport

Source(s) : DECC and Cambridge Econometrics.

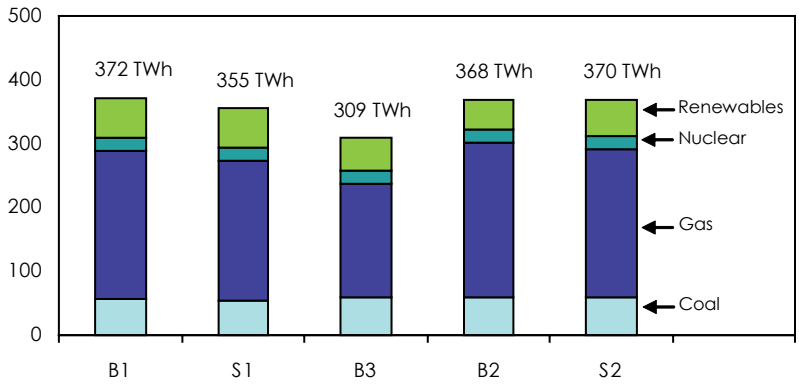
The reduction in demand for road fuel is greater under GFR than is implied by the reduction in demand for road travel because of a more efficient vehicle stock under GFR. In 2020 the UK vehicle stock is 2.4 per cent more fuel efficient in S1 compared to B1 and 3.3 per cent more efficient in S2 compared to B2, as consumers buy more efficient vehicles. Carbon emissions in 2020 from road transport are 21.8 per cent lower in S1 (than B1) and 28.2 per cent lower in S2 (than B2).

GFR also brings about a marked reduction in the growth of international aviation, due to a higher price for air travel. Spending on air travel is lower in S1 by £4.3 billion in 2020. Demand for jet fuel still grows in S1 to 2020 but the average growth rate is 1.1 percentage points lower (2.1 per cent per annum compared to 3.2 per cent pa). As a result, demand for aviation fuel in 2020 is 9.8 per cent lower in S1 than in B1. A larger reduction in the growth in energy demand is seen in S2 compared to B2 (1.4 percentage points) and in 2020 the demand for aviation fuel is 12.4 per cent lower in S2 than in the corresponding baseline.

Effect on the Power Generation Sector

Over 2010-20, in all three baselines, emissions from power generation fall, even though demand for electricity rises over the same period. This is the result of switching to more gas-fired generation (away from coal) and the increasing penetration of electricity sourced from renewables (see Chart 7.8). In B1 emissions from power generation fall by 0.7 per cent per annum over 2010-20. The decline in emissions with GFR is more rapid largely as a result of a reduction in electricity demand. CO_2 emissions from this sector in 2020 are 4.5 per cent lower in S1 than B1 while demand for electricity from final users is 3.3 per cent lower as a result of the higher energy taxes they face under GFR. In the GFR taxes are not levied directly on the power sector, as this is in the EU ETS, but power generators are affected by world market fossil fuel prices, which explains the large dip in emissions from power generation in the high world market fossil fuel price Baseline B3.

Chart 7.8: Electricity Generation Mix in 2020



Note(s) : Total generation from main fuel sources is reported above each column.

Source(s) : BERR, Cambridge Econometrics.

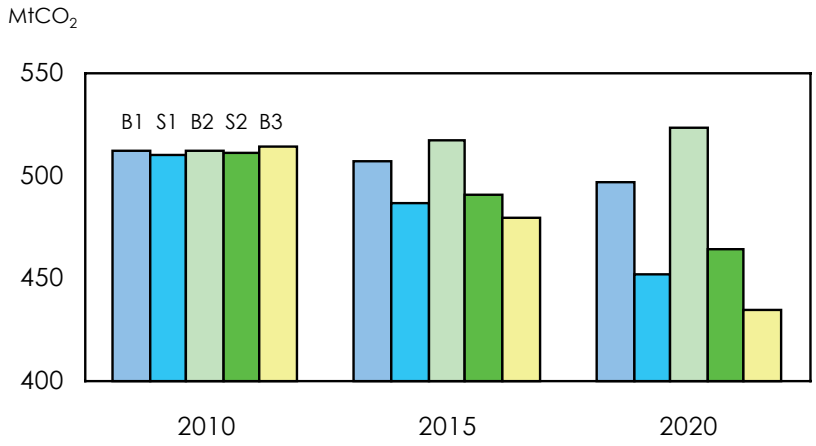
Effect on CO_2 emissions

Chart 7.9 shows that CO_2 emissions in the B1 baseline fall by 0.3 per cent per annum over 2010-20 to 497.1 $MtCO_2$, largely because of the rising fossil fuel prices. The emissions reductions in this run are driven by the non-EU ETS sectors, specifically Commerce, Households and non-traded industry. Emissions from Road Transport increase in B1 over the projection period.

The non-EU ETS sectors continue to drive the emissions reductions in S1, with a substantial reduction in emissions coming from Road Transport as a result of the purchase and fuel taxes. Total emissions over 2010-20 fall by 1.2 per cent per annum in S1 to 451.7 MtCO2.

UK territorial emissions in B2 rise by 0.2 per cent per annum over 2010-20 because fossil fuel prices are much lower. A substantial reduction in emissions is seen with GFR in S2 once again driven by a marked reduction in emissions from Road Transport.

Chart 7.9: Total UK (IPCC) CO_2 Emissions



Note(s) : CO2 emissions have been reported on an IPCC basis.

Source(s) : NAEI and Cambridge Econometrics.

In B1 in 2020 emissions of GHGs on a Kyoto basis stand at 606.4 $MtCO_2e$, a 21.5 per cent reduction on the 1990 level. Therefore the 34 per cent target for GHG emissions reductions by 2020 (and the implied target of a 29 per cent reduction in CO_2 emissions) is not achieved.

By contrast, the GHG and CO_2 emissions-reduction targets are met in S1 as a result of GFR. With both calculated on a Kyoto basis, CO_2 emissions fall 31.6 per cent in relation to the 1990 level, and GHG emissions fall to 506.9 $MtCO_2e$, a reduction of 34.4 per cent (see Chart 7.10).

GFR has a similar effect in a world of low fossil fuel prices. The GHG emissions-reduction target is also met in S2 with a fall of 34.1 per cent (GHG emissions total 508.9 $MtCO_2e$ in 2020) compared to a 19.1 per cent reduction in B2 (emissions of 624.4 $MtCO_2e$), both against the 1990 level.

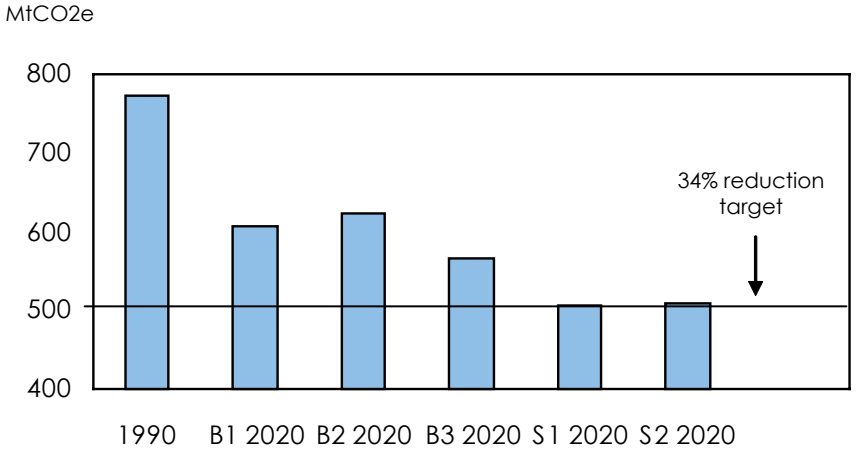


Chart 7.10: GHG (Kyoto) Emissions in 2020

Source(s) : NAEI, Cambridge Econometrics.

The Economic Effects of GFR

GDP in 2020 is 0.6 per cent lower in S1 and 0.7 per cent lower in S2 (compared to their respective baselines). This can, at least in part, be attributed to a reduction in the UK's price competitiveness as it is assumed that no additional policy effort to reduce GHG emissions is made internationally. The competitiveness effect is mitigated somewhat by the recycling of tax revenues back to firms through lower social security contributions, lowering their labour costs.

Therefore the GDP impact of the GFR (compared to the baselines) is negative, but small. The reduction in GDP is larger in S2 (because the tax shift is larger) but average growth over 2010-20 in this scenario compared to its baseline (B2) is little more than 0.07 percentage points less each year and well within the margin of measurement error associated with official statisticians' estimates of historical economic growth.

The impact on GDP of high energy prices, as illustrated in B3, is substantial; 6.3 per cent lower in 2020 when compared to B1. High fossil fuel prices, which are set in international markets, raise the cost of primary energy to UK power generators and, in turn, the energy prices faced by industry and consumers. Unlike GFR, the economic rent from higher energy prices to industry is not captured by the UK government and available for recycling. Instead, it is international oil and gas producers that benefit.

Unsurprisingly, the reductions in income taxes and employers' social security contributions lead to a reduction in labour costs and thus an increase in UK employment, of 1.3-1.7 per cent in 2020 depending on the fossil fuel prices assumed (and the consequent GFR modelled). The effect is greater in the case of low fossil fuel prices because the size of

the tax shift is greater and thus a much larger sum of money is available for recycling into reduced employers' social security contributions.

Chart 7.11 shows that employment in all broad sectors rises as a result of GFR because employers' labour costs are reduced from lower social security contributions. By 2020 GFR has created 455,000 new jobs when S1 is compared to B1 with the majority in financial, other business and public services because they are typically more labour intensive than the manufacturing sectors. Employment in services suffers most in B3 compared to B1.

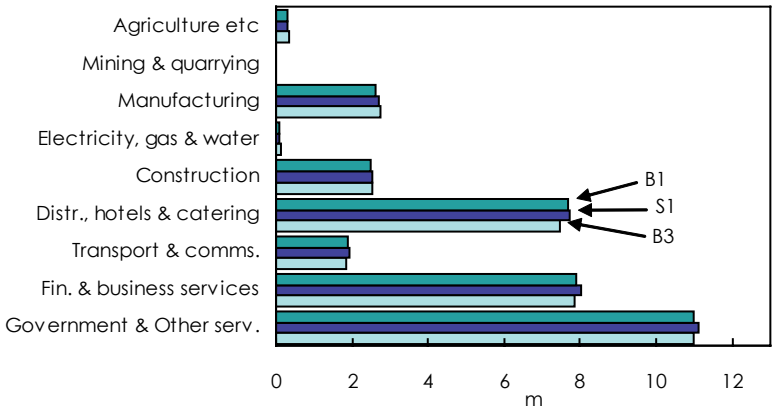


Chart 7.11: Employment by Sector in 2020

Source(s) : ONS, Cambridge Econometrics.

Results of the Eco-Innovation Scenarios

Renewable Electricity

Here the effects of GFR and eco-innovation investment in scenarios E1 and E2 are compared to the results from the two standard GFR scenario projections S1 and S2. The qualitative results are broadly the same between E1 when compared to S1 and E2 when compared to S2. The size of the change is typically larger in E2 owing to a greater tax shift in the S2 scenario, so that a larger amount of funds is made available for investment in eco-innovation. In 2020, £7.1 billion is invested in eco-innovation measures in E2 (10 per cent of the extra green tax revenues in that year) compared to £5.5 billion in E1.

As already noted, the eco-innovation spending was split by subsidising three measures: renewable power generation (offshore wind), cavity wall and loft insulation, and hybrid cars.

In the case of cavity wall insulation and loft insulation, retrofitting is completed before the end of the projection period (around 2019 in S1): all possible lofts and cavity walls in the UK have been fully insulated. The 'spare' funding has then been used to subsidise additional offshore wind capacity and hybrids. There is therefore considerable investment in offshore wind and hybrid vehicles towards the end of the modelling period. In the E2 scenario this occurs even earlier and so there is even more funding made available.

In scenario E1 21.6 GW of offshore wind capacity is built by 2020 compared to just 3.6 GW in S1. As the eco-innovation spending is greater in E2 a total 29.3 GW of offshore wind capacity is built by 2020 compared to just 0.3 GW in S2. Furthermore, the Renewables Obligation target for 20 per cent of electricity sales to be met by renewable generation, in 2020, is

exceeded in both E2 (28.5 per cent) and E1 (25.5 per cent) compared to S2 (14.1 per cent) and S1 (16.1 per cent). Chart 7.12 shows the share of electricity generated by each major fuel source, illustrating the impact of the eco-innovation investment on boosting renewable energy in the power sector. However, the UK's target of 15 per cent of final energy demand coming from renewables is still not met in the E1 (6.8 per cent) and E2 (7.2 per cent) scenarios but does increase from 4.7 per cent and 4.4 per cent in S1 and S2 respectively.

The result of the eco-innovation spending on offshore wind is to reduce power generation emissions by 11.1 $MtCO_2$ in E1 compared to S1 and by 32.6 $MtCO_2$ in E2 compared to S2. This sizeable difference occurs for two reasons, first the funding available is larger in E2 and second because the domestic retrofitting is completed at an earlier stage, more funding is made available to offshore wind earlier.

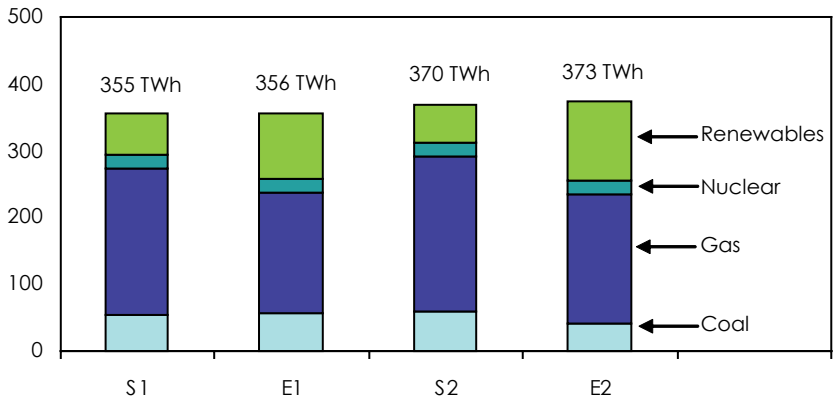


Chart 7.12: Electricity Generation Mix in 2020 in Eco-innovation Scenarios

Note(s) : Total generation from main fuel sources is reported above each column.

Source(s) : DECC, Cambridge Econometrics.

Hybrid Vehicles

In E1, funds made available to subsidise the additional production cost of hybrid vehicles over cars with conventional internal combustion engines are sufficient to increase the share of hybrid vehicles in the UK vehicle stock to 25.5 per cent. The number of vehicles on the road in E1 in 2020 is less than 3 per cent lower than in B1 and most of the substitution is away from petrol-driven cars (as opposed to diesel-engined ones). The impact on carbon emissions from spending on hybrids is modest for a number of reasons:

- in both the S1 and S2 scenarios the fuel efficiency of new petrol and diesel cars increases by approximately 20 per cent, by 2020, and so the impact of switching to hybrids is diminished,
- hybrid vehicles still require petrol, although substantially less,
- emissions from cars do not account for all of the emissions arising from road transport in S1 in 2020.

Direct emissions from road transport fall, from 93.9 $MtCO_2$ in 2020 in S1 to 89.5 $MtCO_2$ in E1, a reduction of 4.7 per cent. In E2 the 2020 emissions reduction is 4.4 $MtCO_2$ when compared to S2. Road transport emissions in E2 are projected to be 88.4 $MtCO_2$ in 2020.

Insulating Housing

In E1, the entire housing stock can be retro-fitted with loft insulation (7.4 million houses were estimated from the English Housing Condition Survey to be without it) and cavity wall insulation (10.7 million) by 2020. There was in fact revenue left over following the retro-fitting programme which was split evenly between the other measures as noted earlier. In the E1 scenario the incremental effect of the eco-innovation spending is around 10 per cent when E1 is compared against S1 (the reduction in gas demand from the eco-innovation measures when they are applied on top of the GFR). Total emissions from households in E1 in 2020 are 8.7 per cent (5.5 $MtCO_2$) lower when compared to S1.

The economic impacts of E1 and E2 are small. When comparing the eco-innovation scenarios against S1 and S2 there is very little impact on employment and GDP, even by sector.

Table 7.3 brings together the major results for CO_2 emissions for all the scenarios in 2020, with the 1990 emissions given for comparison. It shows both CO_2 and GHG emissions, calculated on both the territorial (IPCC) and Kyoto bases (which were the same in 1990, as there was no emissions trading then).

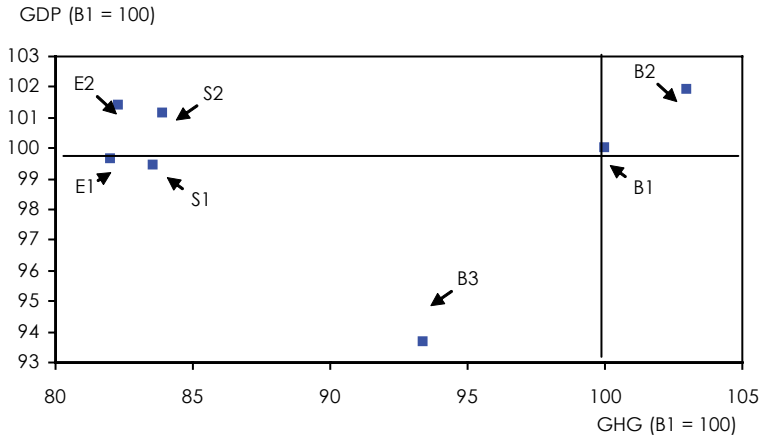
Table 7.3: Results for CO_2 Emissions for All the Scenarios

	2020							
	CO2 IPCC Levels MtCO2	Below 1990, per cent	Kyoto Levels MtCO2	Below 1990, per cent	GHG IPCC Levels MtCO2	Below 1990, per cent	Kyoto Levels MtCO2	Below 1990, per cent
1990	589.4	0	589.4	0	772.2	0	772.2	0
B1	497.1	-15.7	501.1	-15.0	602.4	-22.0	606.4	-21.5
B2	523.4	-11.2	518.3	-12.1	629.5	-18.5	624.4	-19.1
B3	435.0	-26.2	463.0	-21.4	538.2	-30.3	566.2	-26.7
S1	451.7	-23.4	403.1	-31.6	555.4	-28.1	506.9	-34.4
S2	464.4	-21.2	404.9	-31.3	568.4	-26.4	508.9	-34.1
E1	430.8	-26.9	393.9	-33.2	534.3	-30.8	497.4	-35.6
E2	421.6	-28.5	395.4	-32.9	525.2	-32.0	499.0	-35.4

It is clear that the S and E scenarios all meet the 2020 CO_2 reduction target of a 29 per cent cut, and a 34 per cent cut in GHGs, by 2020 on a Kyoto basis (which is the basis on which the targets are calculated), when all the baselines do not.

The other striking thing about the table is the extent of the extra emission cuts achieved in the E scenarios. Spending only 10 per cent of the extra tax revenues on green investments results in a further reduction in CO_2 emissions from 1990's level of 3.5 per cent from S1 to E1, and 7.3 per cent from S2 to E2 (both on an IPCC basis), compared with a 7.7 per cent reduction for S1 (from B1) and a 10.0 per cent reduction in S2 (from B2). In this way, the environmental spending greatly enhances the environmental impact of the GFR.

Conclusions



Note(s) : GHG figures have been calculated on a net carbon account basis in MtCO2e.

Source(s) : ONS, NAEI, Cambridge Econometrics.

Chart 7.13: Comparison of GDP and GHG (Kyoto) Emissions in 2020 across All Scenarios

Chart 7.13 shows a comparison of indexed GDP and GHG emissions, calculated on a Kyoto basis, for all of the seven scenarios.

The key conclusions from the modelling are:

- High world market fossil fuel prices reduce GHG emissions, but at high cost to the economy. The main reason for this is that they cause financial resources to flow from an energy-importing country (like the UK) to energy exporting countries. Countries would therefore do well to reduce their vulnerability to high world market fossil fuel prices by becoming more energy efficient. One way of doing that is through GFR.
- GFR also reduces GHG emissions, but at effectively no cost to the economy and with increased employment. Because the extra taxes in the GFR implemented here are largely focused on the non-EU ETS sectors, the GHG emission reductions come from these sectors, which can be difficult to achieve with other instruments.
- Using some of the tax revenues from a GFR to invest in eco-innovation can further reduce GHG emissions without adverse consequences for the economy. It may also develop new economic sectors with export potential (as, for example, Denmark and Germany have found with investments in wind energy), but that is outside the scope of this modelling.
- Became energy use tends to increase with income, and became of the rebound effect, the promotion of energy efficiency by itself (i.e. without increasing energy prices at the same time) is most unlikely to reduce GHG emissions to the extent now required by the UK government. This leaves GFR as the preferred policy instrument to meet the UK's GHG emission reduction targets, in the absence of greatly increased world market energy prices. It may be possible to reach them by other policy means, but the outcome of such means will be more uncertain and more costly.

These results from a single modelling exercise from a single class of models are clearly not definitive. Different models have different strengths and limitations, and further work from different perspectives would be desirable to get more insights into the likely results of a GFR on this scale. But the model used was designed precisely to look at such issues as GFR and has a good track record in such analysis. Moreover, the results are theoretically plausible and internally consistent. In the absence of evidence to the contrary, they suggest that GFR is a very attractive policy indeed.

8. Obstacles to a Green Tax Shift – and how they can be overcome

The two obstacles to green fiscal reform that are most often cited are its perceived effects on the competitiveness of businesses and countries, and on households. The next two sections examine the evidence on these issues in turn and suggest how the impacts of GFR in those areas may be addressed.

Competitiveness and Green Fiscal Reform

Summary

The concept of competitiveness is different depending on the level at which it is applied. For firms, it is simply the ability to sell their products in competitive markets, at home or abroad. For sectors in a particular country, it is their ability to maintain their market share in markets at home and internationally. For countries it is their ability to engage in international trade such that they maintain or increase their national income and employment with an acceptable balance of payments. This section is about the implications for competitiveness at all levels of green fiscal reform (GFR).

There is no theoretical reason why the tax shift of GFR should have negative effects on national competitiveness, provided that reductions in other business taxes compensate for increased environmental taxes on business. There is also little evidence that environmental policies in general, or environmental (mainly carbon/energy) taxes and GFRs in particular, have had negative effects on competitiveness. Moreover, the competitiveness of relatively few sectors (those that are energy intensive and exposed to international trade) is at risk from GFR. However, in the future, without mitigating policies, more stringent energy and climate policies have the potential to increase the threat to the competitiveness of vulnerable sectors. The relocation of these sectors would redistribute, rather than reduce, global emissions, offsetting the environmental benefits of GFR. This threat could be addressed in a number of ways, but all of them require international action if the full environmental benefits of GFR are to be realised.

In a world in which carbon emissions are an increasing cost and liability, the development of international comparative advantage in new low-carbon technologies could become a major new source of competitiveness. The development of such new technologies will take large-scale investment, which, if it is to be private investment, will have to be profitable for the companies concerned. Through ambitious GFR, while making appropriate arrangements to protect vulnerable sectors from the worst short-term competitiveness effects, governments can create the context for this investment and long-term competitiveness in the future.

Definitions of Competitiveness

In recent years, as trade and globalisation have become perceived as increasingly important sources of economic growth and development, concern has intensified about the possible effects of more stringent environmental policies within the EU, in particular the EU energy and climate policy plans, on the competitive situation of European industry compared to their main foreign competitors.

While on first consideration the concept of competitiveness seems straightforward, in fact its meaning varies with the level at which it is being considered. Most simply, for the firm it relates to whether the firm's products can be sold in competitive markets, whether domestic or foreign markets. An industrial sector consists of many firms, some of which will be more competitive than others. The sectoral competitiveness of a given country therefore relates to whether the sector as a whole can retain or expand its share of markets. Again, the markets may be domestic or international.

At the national level the concept is different again, and has been defined by the OECD as the "degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the longer term".

There are many factors which affect competitiveness at the firm, sectoral and national levels. The international dimension of competitiveness is affected by factors such as the existence and the nature of trade barriers between countries and exchange rate variations. In contrast at the national level such factors as real wage rates, factor prices and national policies and regulations, and their interaction, are significant. Although it may be thought that these factors are common for all businesses in the same industrial sectors, in fact wide differences exist in the competitiveness of individual firms. The economic performance of a whole industrial sector is a reflection of the performance of individual firms, some of them over-performing and others under-performing with respect to the average firm.

There is no single measure of competitiveness. Factors found in the literature as being relevant in assessing competitiveness are costs of production, market share (share of global production), and import and export intensity, as well as sector profitability. All these factors have in common that they are quantifiable as compared to non-price factors, such as the quality of the workforce, infrastructure, and the legislative and regulatory framework (how it is implemented and whether it is adhered to), corruption, and so on, which can also affect the competitiveness of firms, sectors or nations.

It is clear, therefore, that despite its apparent simplicity, the competitiveness concept is actually rather complex, and the complexities are multiplied when one seeks to find evidence as to whether past GFRs have damaged competitiveness, or whether they might do so in the future. In order to address these questions, the evidence at the national level, the firm level and the sectoral level needs to be examined separately.

Environmental Taxes, GFR and Competitiveness

Since the early 1990s several European countries have made more widespread use of environmental taxes or GFR in environmental policy. The reasons for this are that environmental taxes and GFR are perceived to have major economic advantages over other instruments for achieving certain kinds of environmental improvement, so that, other things being equal, they will achieve a given environmental benefit at lower cost, and therefore with a smaller impact on competitiveness than other policy instruments.

Competitiveness considerations are the major reason why EU member states have granted special tax provisions in the form of partial tax exemptions to industries, in particular when they have introduced special energy/carbon taxes during the last two decades. These special tax provisions can have serious implications for the efficiency and effectiveness of environmental taxes.

There is a relatively simple logic behind the fear of loss of competitiveness caused by energy/carbon taxes or having to pay for emission permits under the EU Emissions Trading Scheme (EU ETS). Energy/carbon taxes, or paying for permits, make energy for production processes more expensive and therefore, other things being equal, lead to an increase in production costs. If these taxes or permit schemes are implemented unilaterally (either at the national level or at the EU level), the extra production costs may impair the international competitiveness of the affected firms and industrial sectors. However, other things are typically not equal.

Differences in national energy prices

Import prices of the same energy product can vary greatly, even between EU member states, and are of course affected by exchange rate movements. So can end-user electricity prices, because of the relatively big differences in the network charges between European countries. Such changes are historically larger, and can affect competitiveness more, than changes in energy/carbon taxation.

Competitive markets and international trade

If increases in energy or environmental taxes increase the prices of the affected fuels or activities, producers will be able to pass on to consumers a greater or lesser proportion of those price increases, and so maintain their profitability and competitiveness to a greater or lesser extent, depending on whether they are in less or more competitive markets. In addition, international competitiveness effects will obviously only be relevant to goods and services that are highly internationally traded. By no means all energy-intensive goods are in this category.

Increased energy efficiency

One result of any tax increase may be to cause firms to discover and implement cost-effective energy efficiency measures which they had previously overlooked, or seek to reduce their energy use by purchasing energy-efficient products from appropriate companies. This could have multiple economic effects. First, it will reduce the energy use of the company implementing the measures or making the investment, and this will serve to offset wholly or partly the increased tax expenditures (so that company energy expenditure may actually be lower than before the tax increase). Second, it may add to the output of energy efficiency companies, serving to offset wholly or partly any reduction in output from the increased taxes on energy. Thirdly, the investment may increase productivity in other ways – more energy-efficient equipment is often more productive in other ways as well.

Increased innovation

The stimulation of energy efficiency is just one example of how increasing the costs of environmental damage or resource use may stimulate industrial innovation. This may even increase competitiveness, as companies seek to develop less environmentally intensive products and processes, and environmental industries are created to help other companies reduce their environmental impact. A number of studies suggest that environmental industries are likely to be a fast-growing sector of the economies of many European countries, and will make a substantial contribution to their national income.

GFR and revenue-recycling

The environmental taxes may be imposed as part of a GFR, which, as discussed earlier, is a tax shift, rather than a tax increase. In this case the effect of GFR on competitiveness depends on which taxes have been reduced to compensate for the increase in environmental taxes, which is called 'revenue recycling'. Most commonly the tax reductions have been in income tax or social security contributions (called National Insurance contributions in the UK).

If the reduced taxes are business taxes, then this will tend directly to offset any competitiveness effect on businesses. Of course, different firms will be affected differently; some will emerge from the tax shift as net gainers, others will be worse off. If, for example, the tax increase is on energy and the tax decrease is on the business costs of employment (such as a reduction in employers' social security contributions), then winning sectors and companies will be those with relatively high labour, compared to energy, intensity. Losing sectors and firms will have the opposite characteristic.

If the reductions are in labour taxes, then the reduction in the cost of labour may stimulate increased labour demand and even cause output to increase – the so-called 'double dividend' effect. The revenue recycling mechanism will also affect prices, perhaps directly by reducing the cost of other inputs into production, when this might reduce the prices of goods and services, therefore wholly or partly offsetting the inflationary effect of the tax increase.

All these effects act in different ways on different companies (depending on how their managements respond to the tax increase), different sectors (depending, among other things, on their energy intensities and openness to international trade) and different countries (depending on their overall economic structure). Moreover, there is continuous interaction and feedback at all levels between these effects and all the other influences on economic activity. The effects of GFR on international competitiveness are, therefore, multi-faceted and complex, and need to be examined in detail at different levels.

Competitiveness Effects at Different Levels

National competitiveness

One way that insights can be generated into such effects in a complex system like a national economy is through economic modelling. Economic models are constructed using both theoretical insights about the relationships between different economic variables (for example, it is normally assumed that the quantity of a good demanded is reduced if its price is increased, and vice versa), and through statistical estimation of the parameters of these relationships. There are different kinds of economic models which make different theoretical assumptions and therefore have different structures. Researchers rely on different modelling approaches, assumptions, and parameter estimates whose signs and magnitudes are disputed. Many of these models do not consider the induced development and diffusion of technologies, as well as information, policy and political changes brought about by the environmental taxes or GFR. Thus, different models can give different outcomes in their modelling of economic interventions such as GFR.

There is general agreement in the literature that the international competitiveness of economies and sectors may be affected by mitigation actions, such as GFR. In the long run, exchange rates change to compensate for persistent loss of national competitiveness, but this is a general effect and particular sectors can lose or gain competitiveness. In the short run, higher costs of fossil fuels may lead to a loss in sectoral price competitiveness especially in energy-intensive industries, which may lead to the re-location of industry.

..the revenue recycling effect, which reduces taxes elsewhere, plays a key role in compensating for the increased price of carbon/ energy.

One comprehensive modelling of GFRs in six European countries was carried out as part of the European research project COMETR, as mentioned earlier in Section 3. The model used was a macro-econometric European model (including the 25 countries which were members of the EU in 2006, plus Norway and Switzerland) called E3ME.

The modelling results show the difference between what happened with the GFR and associated provisions for energy-intensive sectors, and what would have happened had there been no GFR (with both cases projected to 2012). Most importantly from the point of view of national competitiveness, all six of the GFR countries showed a small increase in GDP as a result of the GFR. Examination of the detailed results shows that the revenue recycling effect, which reduces taxes elsewhere, plays a key role in compensating for the increased price of carbon/energy.

Firm and sectoral competitiveness

In principle, it is clearly possible for environmental policy, including environmental taxes, to increase costs and reduce the competitiveness of firms. As noted earlier, however, pollution prevention can also save money and stimulate cost-saving, and market-creating innovation.

Comparative analysis of firms in a number of different sectors has found that marginal firms might be seriously challenged by environmental regulations, but averagely competitive firms tended to be able to take them in their stride, while well-managed firms often did respond to them in ways that spur innovation and reinforce competitiveness. However, concluding from such results that environmental regulation in general can lead to 'win-win' outcomes of economic as well as environmental improvement remains controversial, clearly running counter to economists' normal assumptions of efficient, competitive markets and the standard economic trade-off model, whereby environmental benefits are gained at the expense of growth and competitiveness.

It is unlikely that this debate will ever reach a definitive resolution, because it is clear that there are different impacts of environmental regulations on different firms, and it will always be possible to find case studies that show net costs of regulation, or induced innovation leading to net benefits. Moreover, most of the above analysis was carried out in relation to environmental regulations rather than environmental taxes, which may raise more serious competitiveness issues than regulations for firms in environmentally intensive sectors. This is because, after compliance with regulations, firms may use the environment without further payment; with environmental taxes, firms pay for all use of the environment (which is why environmental taxes give an incentive for continuous environmental improvement), and this may result in the costs imposed by environmental taxes on firms being higher than the costs of regulation.

Because of the differing impacts on different firms, it may therefore be more fruitful to seek to identify competitiveness impacts of environmental policy in general, and environmental taxes in particular, on particular economic sectors. From the literature to date in this area, there is little evidence that environmental policy has either caused sectors to relocate or had a negative impact on their performance in their home countries.

However, one reason for this lack of effects on sectoral competitiveness is that policy makers have listened to the concerns of businesses about the threat of environmental taxes and GFR to competitiveness, and have implemented these policy measures quite differently from the recommendations of environmental economic theory. Tax rates are generally set at different rates for different energy users, with energy-intensive users usually facing lower tax rates. In addition, the energy/carbon tax rates are regularly not set according to the energy or carbon content of the energy products. For the EU ETS the solution to competitiveness concerns that has been adopted is to delay the auctioning of permits to the most vulnerable sectors.

There are two other possible approaches to mitigating competitiveness impacts, which do not have the effect of blunting the efficiency and effectiveness of the policy measure. One is to adjust import and export taxes at the European border or make some other 'carbon equalisation' provisions for international trade in the output of vulnerable sectors.

The second option is to arrive at some global agreement for the limitation of carbon emissions from vulnerable sectors, which would ensure that sectors from Europe subject to energy/carbon taxes or the EU ETS were not at a competitive disadvantage, because the same sectors in other countries were committed to similar levels of effort. Negotiations on such agreements are part of the negotiating process under the Framework Convention on Climate Change. It is too early at the time of writing to know whether the negotiations on international sectoral agreements will have any substantive outcome.

Conclusions

National competitiveness is quite different from sectoral competitiveness, because it takes account of all the impacts of revenue recycling in non-energy intensive sectors, and the effects of investments in energy efficiency and low-carbon energy supplies which are missed by sectoral studies. There is no theoretical reason why a shift in the taxation of factor inputs of the kind discussed in this report should have a large or negative impact on GDP, and, as Section 7 showed, the modelling of such shifts has not found such impacts to be significant.

A number of conclusions can be drawn from the extensive work on the competitiveness implications of European and US environmental policy, including environmental taxes and GFRs, to date. The first is that there is no convincing evidence that environmental policy has influenced business location. The second is that possible international competitiveness effects are limited to relatively few vulnerable sectors. In respect of carbon/energy taxation, these are the sectors which simultaneously exhibit the characteristics of high energy intensity and share of energy expenditures in costs, low market power (and therefore a low ability to pass costs through to consumers), and high trade intensity.

For the GFRs that have been introduced so far, no adverse sectoral competitiveness effects have been discovered by research, but this may be due to the very great efforts which most countries have made to shield their vulnerable sectors from these effects, by giving them tax rebates or making other tax provisions. In addition to reducing effects on competitiveness, these special provisions are likely to have reduced the effectiveness and efficiency of the policy instrument.

If future efforts at carbon abatement are more stringent than they have been in the past, which seems likely, the competitiveness implications for vulnerable sectors are more pronounced, and either these sectors are likely to be exempted from some of the provisions of measures like the EU ETS, or other arrangements such as border tax adjustments or international sectoral agreements will be put in place to mitigate competitiveness effects.

At the same time, faced with the prospect of increasingly stringent carbon reduction, governments are more and more looking to new competitiveness advantages that might be gained through the development of new, low-carbon industries. The development of such industries will only come about through large investments in new technologies, processes and products, which are likely to come from businesses rather than the government, the major role of which is rather to support the innovation process and to establish the market conditions that stimulate the investment.

It is this role that provides the rationale for an ambitious GFR. The key issue now for climate policy is whether governments will price carbon so that high-carbon investments become economically unviable, and low-carbon investments become businesses' first choice and the foundation for competitiveness in the future. While such a policy may be challenging for energy-intensive sectors in the short term, these challenges can be addressed. It is difficult to see how the kind of ambitious carbon targets that are now being adopted, by European countries at least, can be reached in any other way.

For the GFRs that have been introduced so far, no adverse sectoral competitiveness effects have been discovered by research…

Fairness for Households

Summary

An important consideration in the introduction of environmental taxes and green fiscal reform (GFR) is fairness. This section looks at the distributional issues involved in GFR, and in particular how tax increases on home energy use would affect different households.

The UK is committed to reduce its emissions by 80 per cent by 2050. Household energy use will need to play its part in that reduction. Householders will need assistance to improve the insulation of their properties, but there will also need to be obligations and financial measures to ensure that the improvements are made. Since increasing incomes and improvements in energy efficiency lead to greater demand for energy services, there is a case for a carbon tax to be introduced, to make the use of carbon-based energy more expensive, as well. Because household energy use is regressive (it rises much more slowly than income), taxing household energy is politically controversial. In fact, the revenues can be recycled to households such that most low-income households would gain. The problem really lies in the effect on those low-income households in energy-inefficient homes. A scheme to identify and improve the thermal efficiency of their homes would be required to make the carbon tax politically acceptable.

Fairness demands that rich societies like the UK do their utmost to mitigate climate change. This will require energy prices to rise. The approach described here could enable this to be achieved without unfair impacts on vulnerable households.

Introduction

Climate change is not fair. It is hitting and will hit hardest those alive today in the poorest countries, and those in future generations, who have done least or nothing to contribute to it. Fairness therefore requires that societies, especially relatively rich societies like the UK, do their utmost to reduce the extent of climate change.

Home energy use will need to make a significant contribution to emissions reduction if the government's climate change targets are to be met. This report suggests that GFR has a major role to play in reducing carbon emissions from energy use. This section describes the distributional effects of a GFR that includes increased taxation of home energy use, and the complementary measures that will need to be introduced if vulnerable households are to be treated fairly by such a policy.

Reducing Carbon Emissions From Household Energy

Meeting the UK government's 2050 target of an 80 per cent reduction in greenhouse gases will require at least the same order of percentage reduction of carbon emissions from the UK housing stock. The only way that this can be achieved, while maintaining the warmth of housing in winter, is through a massive refurbishment of existing housing to achieve a great change in its energy/thermal performance. The scale of the necessary programme is huge. Raising the energy efficiency of existing housing to the necessary level could cost an average of around £10,000 per home, or about £250 billion for the entire UK housing stock, if it were carried out through a bespoke programme. It would cost much less if the necessary work had to be carried out when homes were being refurbished or redecorated anyway.

Energy efficiency and conservation work seems simple, but the level of energy-saving envisaged is actually technically difficult to achieve. Any programme would have to be carried out by skilled workers and carefully monitored. Current levels of expertise in this area in the UK building industry are nowhere near adequate, and monitoring of energy upgrades is very rarely carried out.

There is strong reason to believe that nothing like enough people will upgrade the energy performance of their buildings to permit a purely voluntary programme to build to the necessary scale. Both stronger incentives and obligations will be required for this. A legal obligation could require both householders and contractors to do the necessary improvements when other work is being done.

Fuel Poverty

The government also has a target to abolish fuel poverty 'as far as reasonably practical' by 2016 and among 'vulnerable groups'(households with children, over 60s and disabled people) by 2010. Fuel poverty is defined in terms of what a household would have to spend to achieve a standard heating regime defined as 21°C in the living room and 18°C in other rooms 8 hours a day on weekdays if everyone in the household goes to work or school and 16 hours a day otherwise. If the cost of that and other expected energy services is greater than 10 per cent of income then the household is considered to be in fuel poverty.

Fuel poverty fell dramatically in the years between 1996 and 2003. The reduction in the numbers of households in fuel poverty has been attributed as follows:

- 61 per cent from extra income,
- 22 per cent to lower fuel prices,
- 17 per cent to energy efficiency measures.

Due largely to rising energy prices, the number of fuel poor households in England increased from 1.2 million in 2003 to 3.5 million in 2008, more than the 3.4 million households in 1998.

A considerable number of low and zero-carbon technologies and insulation measures would be required to alleviate fuel poverty, but with current technology there will still be a hardcore group of fuel poor - about 30 per cent of them – who cannot be lifted out of fuel poverty by current technical measures alone. That is due to a combination of low incomes, high fuel prices, under-occupancy and inherently inefficient housing. Unless these issues are addressed, and despite current anti-fuel poverty programmes, fuel poverty – far from being abolished – will actually increase over the period to 2016.

Ideas for Radically Improving Housing Energy Efficiency

A number of ideas have recently been put forward for encouraging or facilitating people to improve the energy efficiency of their homes.

- Pay As You Save: this is a financial mechanism that enables people to undertake the necessary work on their buildings, with no upfront cost to the householder – the cost of the works would be paid back through their energy bills.
- A council tax incentive: British Gas operates a scheme with 64 local authorities where householders are given a one-off council tax reduction of £125 if they have cavity wall insulation installed.
- Area based schemes: there are a number of programmes to improve the energy efficiency of dwellings on a street by street basis, including the installation of low carbon technologies such as solar water heating.
- Regulation of private landlords: the energy performance of the private rented sector has been improving only very slowly. The most effective approach to remedy this would be to require landlords to undertake all the basic insulation measures recommended in their Energy Performance Certificate (EPC) before they could rent out a property.
- Regulation of all householders: all homes would receive an energy rating. Owners would be required to meet a particular standard before the home could be resold or re-let. The standard required would increase over time.
- A revenue-neutral carbon tax: the only change in economic circumstances that has been shown systematically to reduce energy consumption is an increase in energy prices. This is the only policy that contributes to all three possible options for meeting the carbon reduction targets: stimulating low carbon investment, increasing energy efficiency and decreasing demand for energy services. With a GFR regressive effects would need to be avoided through a much expanded home energy efficiency scheme and appropriate recycling of the revenues from the increased green taxes. Other measures to help vulnerable households could include a five-year grace period during which those on benefits could have their carbon tax refunded, to allow the energy efficiency programme to get fully established, or restructuring of Winter Fuel Payments to contribute to the loan repayments of vulnerable households.

The Need for a New Policy Approach

Current government policies on home energy are both dominated and constrained by concerns about fuel poverty. As already discussed, the level of fuel poverty as presently defined derives from a complex combination of and interaction between a number of factors: incomes, energy prices, home energy efficiency, building occupancy and the norms of the 'standard heating regime'. The main result of political commitments to reduce or 'abolish' fuel poverty have in practice been government attempts to keep home energy cheap. This has undermined parallel government efforts to persuade householders to improve the energy efficiency of their homes, and reduced the impact of the energy efficiency measures that have been implemented because of the inexorable rise in the demand for energy services as general incomes rise and energy use becomes more efficient. It is very unlikely that the required improvements in home energy efficiency, and

reductions in overall home energy use, will be delivered if this approach is maintained. Such improvements will require a systematic, substantial and sustained increase in the price of home energy.

If the government is to be able to raise home energy prices (through green fiscal reform, so that other taxes are simultaneously reduced) in order to help meet its carbon dioxide reduction targets, a new policy approach to energy-use by low-income households is required. A political commitment that vulnerable people should not have to be cold in an affluent society like the UK does not require a political commitment to 'abolish' fuel poverty, which is probably unachievable on its current definition, as discussed above. Rather government could guarantee to facilitate the necessary improvement in the energy efficiency of the homes of all vulnerable householders, through a scheme with the elements outlined in Box 9.1, some of which have already been touched on. Where the problem of excessive heating costs is more related to the size of the property and its under-occupation than to its thermal inefficiency, government could provide support for vulnerable householders to enable them to move to more suitable accommodation.

While the programme in Box 9.1 clearly needs much refinement on the basis of detailed analysis, it is unlikely that carbon emissions from buildings can be reduced by the required extent by 2050 without all these elements being present in some degree.

…a new policy approach to energy-use by low-income households is required.

BOX 9.1

Elements of a possible Household Energy Efficiency Programme to achieve radical reductions in emissions without adverse effects on vulnerable households

1. Mandatory energy efficiency certification for builders (comparable to the CORGI scheme), with training provided by the government.
2. A 'Contractor Obligation', to apply to all builders and decorators, to ensure that mandated energy efficiency work is carried out on all buildings whenever they were called in to do other work.
3. A 'Householder Obligation' to have energy efficiency work done on their home whenever other building work was being carried out, or at the point of re-sale.
4. A 'Pay As You Save' financing mechanism, with zero-interest loans which stay with the house if householders move and which are paid back over 15-20 years through energy bills.
5. Installation of smart meters on an accelerated schedule, complemented by far more transparent and informative billing requirements.
6. A carbon tax on gas and other fuels used for heating, entailing about a 50 per cent increase on current gas prices by 2020, and on electricity too, to provide a further incentive for people to get the work done, with complementary measures to cushion vulnerable households against this increase.
7. Monitoring of energy use post-installation of measures in a representative sample of buildings in order to ensure proper delivery of improved building performance.

Conclusions

It is not controversial to say the imposition of environmental taxes in general, and the introduction of green fiscal reform in particular, must be 'fair'. The disagreements come in determining precisely what that means.

Fairness to poor people in other countries and to future generations requires that the UK drastically reduces its greenhouse gas emissions that contribute to climate change. The UK Government has adopted challenging emission reduction targets to that end. In order for those targets to be met, energy prices, including energy prices paid by householders, will have to rise substantially.

The fairest, and most efficient, way in which this can be achieved is through a green fiscal reform that reduces other taxes, with special complementary provisions for low-income and vulnerable households, while environmental, especially carbon and energy, taxes are being increased. In relation to home energy use, an additional essential complement to green fiscal reform is a thoroughgoing programme of home energy efficiency improvement such as that suggested above.

Government needs to sign up to a commitment that no-one needs to be cold in the transition to higher home energy prices and a housing stock of vastly greater energy efficiency than at present, and then put in place the necessary mechanism to deliver on that commitment. Many of the mechanisms are either in place or have been proposed. They now need to be implemented in a robust and joined-up way so that vulnerable people can be affordably warm even with higher energy prices, and emissions from the housing stock can begin a sustained fall towards the reduction of 80 per cent or more that is required by the middle of the century.

9. Conclusions

There has been substantial past experience in Northern Europe with green fiscal reform (GFR), which has shown that it is environmentally effective.

The GFRs to date have been relatively small. However, the modelling carried out for the Green Fiscal Commission suggests that a much larger GFR would also have positive environmental results, while the impact of such a policy instrument on output would be small and negative, and on employment small and positive. Moreover, the tax revenues from this large GFR are large and stable, which permit significant cuts in taxes on other taxes, especially those on labour (income tax for individuals and National Insurance contributions for businesses), which should be implemented in such a way as to mitigate the impacts of the tax increases on vulnerable business sectors and households. It is not clear that there is any other single policy instrument that could have such a large environmental impact at such a low cost.

Clearly one modelling exercise of a major policy instrument such as GFR does not yield definitive conclusions, but the results seem plausible and are both in line with what would be expected theoretically and similar to a wide range of modelling outcomes of GFR at a smaller scale. On this evidence an ambitious GFR would seem worthy of very serious policy consideration and further analysis.

However, a large-scale GFR will not be easy to implement. For its effect on carbon emissions it will need to target all the major uses of carbon-based energy: in industry, for transport and in the home. In respect of industry, voices will be raised against GFR on the grounds of its impact on business competitiveness. Such concerns have validity only for a few carbon-intensive sectors, which have been protected in the past from potential competitiveness impacts from GFR, and will need to be so again. It would be best if such protection could come through international agreements that ensured that all carbon-intensive sectors in different countries made comparable efforts to reduce their emissions. However, concern to ease the transition of a few high-carbon sectors to a low-carbon society should not obscure or get in the way of the ability of GFR to promote the low-carbon sectors that will provide the competitive advantage of the future.

In respect of transport, voices will be raised saying that road transport fuel in particular is already heavily taxed in the UK. This is true, but carbon emissions from transport are still rising and need to fall if the UK is to meet its carbon targets. Raising further revenue from road transport and aviation, rather than from higher taxes on household incomes or employment, is a clear way to reduce emissions efficiently and hasten the transition to a low-carbon transport system.

The political challenge of GFR is perhaps most difficult to meet in respect of home energy use, because keeping energy affordable in the face of energy price rises will require the systematic upgrading of the energy efficiency of the existing UK housing stock, which is technically demanding, financially expensive and difficult to achieve in practice. However, this task will have to be carried through even without GFR if the UK is to reduce its emissions by 2050 by 80 per cent, and the work will have to be well underway to meet the 2020 targets. GFR can give an extra incentive for householders to upgrade their homes, and generate revenues that can provide some cushion for vulnerable householders before their homes are improved.

Politicians have so far only nibbled at GFR as the need for significant reductions in carbon dioxide emissions gradually become clear. Now that this need has developed into a stark, and for the UK a statutory, imperative, the nettle of GFR is one they must grasp firmly. There will certainly need to be an array of other policies to complement it. But reaching the targets will certainly be more expensive, and may prove unattainable, without it.

10. Annexes

Annex 1: Terms of Reference of the UK Green Fiscal Commission

These Terms of Reference were agreed at the first meeting of the Green Fiscal Commission on 29th May 2007.

There is now general agreement among policy analysts that a significant programme of green fiscal reform (in which environmental taxes are increased, and other taxes are reduced in a fiscally neutral way) could play a considerable role in contributing to the cost-effective solution of environmental problems, and in particular climate change.

The objective of the Green Fiscal Commission (GFC) is to prepare the ground for a significant programme of green fiscal reform in the UK, in terms of both assembling the evidence base for such a reform, and raising stakeholder and public awareness of it. The GFC will achieve this through:

- Provision of authoritative, accessible and independent research on the options for environmental tax reform in the UK and assessment of the social, environmental and economic implications of these proposals;
- Use of media and other communication activities to raise awareness and understanding of the options for environmental tax reform and stimulate public and political debate on them.

The work of the GFC will investigate a green fiscal reform with the following characteristics:

- It will involve a substantial tax shift, such that, for example, 20 per cent of tax revenues come from green taxes by 2020;
- The environmental benefits will be amplified by selective use of a small proportion of the tax revenues to incentivise less environmentally damaging behaviour and investment in technologies that reduce environmental impacts;
- It will not have a disproportionate impact on already disadvantaged groups;
- It will take account of and seek to mitigate negative effects on business competitiveness, and foster new sources of comparative advantage as the basis for new businesses.

The Commission is independent of government. It is formed of Commissioners with wide experience drawn from a representative range of social, economic and political stakeholders. The role of Commissioners is to review, develop and approve the outputs of the Commission and bring in expertise from their particular background to bear on the Commission's work. The GFC will not be formulating recommendations for specific proposals for green fiscal reform, so it will not be seeking to arrive at any consensus on such proposals.

The Commission's Secretariat is provided by the Policy Studies Institute (PSI), an independent research institute and registered charity, with considerable expertise in the area of green fiscal reform. Its Chairman is Robert Napier, Chairman of the Met Office, with a distinguished career in business and the environment. Its Director is Professor Paul Ekins, formerly Head of the Environment Group at PSI, but now Professor of Energy and Environment Policy at the UCL Energy Institute, University College London.

Annex 2: Members and Secretariat of the UK Green Fiscal Commission

All members have served in a personal capacity; affiliations are given for information purposes only. Please note that where members have stepped down during the life of the Commission their affiliation is given as that at the point they stepped down.

Green Fiscal Commission Members

Chairman, Robert Napier	Chairman, Met Office; Chairman, Homes and Communities Agency
Director, Professor Paul Ekins	Professor of Energy and Environment Policy at the UCL Energy Institute, University College London.

Members of the Houses of Parliament

Greg Barker MP (Con)	Shadow Minister for Climate Change
Colin Challen MP (Lab)	Environmental Audit Committee, All Party Parliamentary Climate Change Group
Chris Huhne MP (Lib Dem)	Shadow Home Secretary (former Shadow Environment Secretary)
Elliot Morley MP (Lab)	Former Minister for the Environment
Lord Ron Oxburgh	Ex-Chairman, House of Lords Science and Technology Committee, ex-Chairman, Shell UK
Lord Chris Smith (from March 2009)	Chairman, Environment Agency
Lord Adair Turner	Chairman, Financial Services Authority Chairman, Committee on Climate Change
Baroness Barbara Young (to June 2008)	Chief Executive, Environment Agency

Others

Allan Asher (to May 2009)	Former Chief Executive, energywatch
Neil Bentley (from December 2008)	Director, Business Environment, Confederation of British Industry (CBI)
Bernie Bulkin	Chairman, AEA Technology (also Sustainable Development Commissioner)
Rita Clifton	Chairman, Interbrand (former Sustainable Development Commissioner)
Andrew Duff	Group Chief Executive Officer, RWE npower (and Ofgem Environmental Advisory Group)
Tony Grayling (from August 2008)	Head of Policy, Environment Agency
Professor Nick Hanley	University of Stirling
Michelle Harrison	CEO of TNS-BMRB
Professor John Hills (to September 2008)	London School of Economics
Professor Tim Jackson	University of Surrey (also Sustainable Development Commissioner)
Nick Mabey	Chief Executive, E3G
Peter Madden	Chief Executive, Forum for the Future
Duncan McLaren	Director, Friends of the Earth Scotland
Ed Mayo (to December 2007)	Former Director, National Consumer Council
Paul Myners (to September 2008)	Chairman, Guardian Media Group, Ex-Chairman, M&S
Professor Stephen Potter	Open University
Michael Roberts (to March 2008)	Director, Business Environment, Confederation of British Industry (CBI)
Professor Andrew Sentance	University of Warwick, Member of Bank of England Monetary Policy Committee (former chief economist, British Airways)
Professor Kerry Turner	University of East Anglia

Green Fiscal Commission Secretariat

Ben Shaw, Head of Environment Group, Policy Studies Institute
Dr Simon Dresner, Research Fellow, Policy Studies Institute
Sarah Bell, Research Fellow, Policy Studies Institute
Ben Watson, Research Officer, Policy Studies Institute
Hilary Salter, Research Administrator, Policy Studies Institute
Jenny Lau, Research Administrator, Policy Studies Institute

Annex 3: Green Tax Commissions in Other Countries

This Annex considers green tax (or fiscal) commissions that have existed in nine European countries: Austria, Belgium, Denmark, France, Germany, Ireland, Netherlands, Norway and Sweden. It summarises the results of a scoping study produced to inform the setting up of the UK Green Fiscal Commission (GFC).

A literature search identified countries that had formed green tax commissions and reviewed information collated from a wide range of sources, including information produced by the individual commissions and papers from academic journals, books and other sources. A research template was used to structure comparable information on a wide range of aspects of each of the commissions identified: objectives, outputs, target audiences, form (size, leadership, secretariat etc.), the context to the commission's work and information on the impact of the commission. The main conclusions of the scoping study follow.

Commissions were mainly formed in the 1990s

A large majority of green tax commissions were formed and completed their work in the 1990s in a very different political and economic context to the present. Many of the commissions were created to formalise and develop broader policy and/or public debates that had been taking place in the late 1980s and early 1990s in each of the countries concerned, either on tax reform generally, or more specifically, on green fiscal reform. Only in the Netherlands and France were commissions active after 2000.

The lack of activity post 2000 is likely to be related to a combination of economic downturn and political shifts in the European countries with green tax commissions, which shifted the focus of political debate to more politically immediate economic issues rather than broader environmental considerations.

Commissions were almost all formed by government

Nine out of the ten European green tax commissions studied were formed by government. Green Budget Germany is the exception and was formed as an NGO in 1994. It continues its work to the present day in contrast to many of the government formed and led commissions formed at the same time.

Commission membership

The source of commission members varies widely across the commissions, from inter-ministerial working groups formed entirely of civil servants (Ireland, Denmark), to Parliamentary Committees with expert input (Sweden), to groups formed of external experts (Belgium) to groups with fuller stakeholder representation (Austria, France, Germany, The Netherlands and Norway). The size of commissions also varies with Norway having the largest commission membership, at 116 members, but the typical size is much smaller than this.

Objectives and function

The objectives of the commissions studied all tend towards the general, for example, to investigate the impact of GFR on the economy and environment, or the development of a range of proposals for a business energy tax. The scope of all the commissions covers environmental taxes and recycling revenues. Beyond this most commissions have considered GFR in the context of broader reform, but less than half of the commissions consider either environmentally damaging subsidies or other environmentally damaging fiscal effects.

The main functions of the commissions include:

1. Developing and evaluating new GFR options for consideration by government,
2. Evaluating existing (environmental or non-environmental) measures in place,
3. Developing principles or guidance for implementation of GFR,
4. Improving implementation of measures,
5. Gaining stakeholder involvement and buy-in to proposals.

Most of the commissions focus on the first three of these functions. Existing measures and new proposals were variously evaluated in terms of environment, social, economic, competitiveness and revenue raising impacts. The methods used to evaluate new or existing measures are often not given in detail. However, a number of the commissions use general equilibrium economic models to evaluate the effect of proposals and measures. These include the commissions in Denmark, Norway and Sweden. The Dutch commissions also appear to have used rigorous evaluation techniques. In Austria modelling was conducted by a body outside the commission.

It is striking that the green tax commissions do not seem to have given much consideration to public support for GFR generally, or to stakeholder views on the proposals that the various commissions have developed. All except two of the commissions had external input from either experts or stakeholders but how this involvement ensured a broader representation of views in the commissions' work is not made clear for the most part. The commissions' focus is mainly on policy development and the likely impact of GFR based on ex ante analysis. The UK GFC's work on public opinion is reported in Section 6 of this report.

Summary of recommendations made by commissions

As would be expected a large number of recommendations for specific tax measures were made by the various commissions in areas, for example, such as energy and carbon, vehicles, products, chemicals, waste and water, or on taxes that target specific sectors. The De Waard Commission in the Netherlands, which evaluated 66 taxes, is of particular note in this respect.

The commissions also make recommendations around the design of environmental taxes or broader GFR. For example, whether to hypothecate tax revenues or not; the size and stability of the tax base; the use to which tax revenue is put; how to recycle revenues; whether taxes should be revenue neutral; the effectiveness and efficiency of taxes; the level of tax required to create behavioural impact; the use and rate of escalators; and tax exemptions. A number of mentions in the more recent commissions are made of the need to look at incentives for pro-environmental behaviour through for example reductions in taxes or tax credits for particular activities.

Some of the commissions consider timescales over which it is feasible to implement particular taxes, for example, the Norwegian Governmental Commission on Green Taxes. This can provide a useful focus on what is possible now and what needs to happen to deliver the GFR agenda in the medium and long term. Related to this issue are recommendations that consider or highlight the need for more fundamental structural institutional changes that need to be made to the economy to deliver environmental objectives. Some commissions have outlined principles for the development of taxes rather than specific measures, for example, the commissions in the Netherlands, Norway and Sweden. One notable principle articulated by the Swedish Commission highlights the need for international action on this issue and also the need to assess whether particular measures just cause the transfer of impacts to a different location. Social impacts and equity issues are also considered by various commissions.

Annex 4: Briefings Produced by the UK Green Fiscal Commission

Briefing Paper 1	-	Lessons from Two Green Tax Shifts in the United Kingdom.
Briefing Paper 2	-	How Effective Are Green Taxes?
Briefing Paper 3	-	Public Opinion on a Green Tax Shift.
Briefing Paper 4	-	Doing What it Takes to Reduce Carbon Emissions: The Case for Green Fiscal Reform.
Briefing Paper 5	-	A Major Green Fiscal Reform for the UK: Impacts on the Economy, Employment and the Environment.
Briefing Paper 6	-	Reducing Carbon Emissions Through Transport Taxation.
Briefing Paper 7	-	Competitiveness and Environmental Tax Reform.
Briefing Paper 8	-	Achieving Fairness in Carbon Emissions Reduction: the Distributional Effects of Green Fiscal Reform.

Briefing Papers 1-4 are now available at www.greenfiscalcommisson.org.uk. Briefing Papers 5-8 will be published before 1st December 2009.

Green Fiscal Commission

The Green Fiscal Commission is an independent body and is not affiliated to any political party or government. Its members come from business, universities, the three main UK political parties, both Houses of Parliament, and consumer and environmental organisations. Members were all appointed in a personal capacity.

The Commission was set up in 2007 and one of its major aims was to assess the social, environmental and economic implications of a substantial green tax shift, such that 15-20 per cent of the UK's tax revenues come from environmental taxes by 2020. This report summarises its findings.

Green fiscal reform emerges as a crucial policy to get the UK on a low-carbon trajectory. It will help develop the new low carbon industries required to meet the UK's greenhouse gas reduction targets and provide competitive advantage for the UK in the future. Green fiscal reform also contributes to restoring UK fiscal stability after the recession. It is a key to future environmental sustainability and low-carbon prosperity.