

## Environmental Taxes

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## EXECUTIVE SUMMARY

The case for using taxes, charges, and emissions trading schemes (rather than regulation) to help achieve environmental goals is primarily a matter of cost-efficiency. Economic instruments may be able to achieve a given level of environmental protection at lower cost by providing incentives for polluters to choose the most cost-effective abatement mechanisms and by encouraging the greatest abatement effort from those polluters for whom it is least expensive. Economic instruments also provide ongoing incentives for innovation in pollution control. They may also be less prone to influence by polluters themselves than regulations negotiated case-by-case with individual firms. However, they are not a panacea. They can encourage costly avoidance activities, such as illegal waste dumping, and in some cases they may have significant distributional consequences, placing heavy burdens on the poor. They are most useful when wide-ranging changes in behaviour are needed across a large number of polluters—the costs of regulation in such cases are large, and the efficiency benefits of economic instruments are likely to be greater. Little will be gained, however, by making the tax structure too sophisticated when the environmental costs are low.

The choice and design of the instrument is crucial. One broad choice is between taxes and emissions trading schemes. In a world in which the costs of pollution abatement are certain, the two are virtually indistinguishable, but when there is uncertainty about these costs trade-offs do occur. When the need to reduce emissions below a set threshold is urgent, the cap on the quantity of pollution implied by auctioning a fixed number of permits may be preferable. But under a trading scheme the costs of pollution abatement are uncertain, and excessive costs could be incurred. Better policy might use some combination of taxes and trading that implies both a ceiling and a floor on the costs of pollution abatement. Where trading is involved, it is imperative that the market for pollution permits be competitive and that the case be made strongly for up-front auctioning of allowances.

In environmental tax design, a direct tax on the quantity of emissions generated is ideal but often infeasible because emissions cannot be directly measured at reasonable cost. Where close proxies for emissions exist that are measurable and already subject to market transactions, green taxes can be successful. Fuel combustion is directly related to carbon emissions, and so a fuel tax closely resembles a carbon tax, for example. Where such links do not exist, a combination of taxes may generate better targeted environmental incentives than any one isolated instrument.

The potential for revenue generation from environmentally related taxes has led to calls for a 'green switch' in the tax base, with higher environmental taxes and commensurate reductions in other taxes. The rhetoric recalls the idea of a 'double dividend'—using green tax receipts to pay for reductions in distorting taxes like income tax can achieve not only environmental benefits but also a more efficient tax system. The economic argument is, however, far from clear. Environmental taxes create their own distortions, raising the price of goods, which may or may not be offset by reduced distortions elsewhere in the tax system. The case for environmental tax reform should appeal first and foremost to the potential environmental gains.

It is not obvious that environmental taxes have significant revenue-raising potential. Existing large-scale taxes such as excises on motor fuel are already near the upper limit of what can be justified by the environmental costs involved. Taxes on waste management represent an interesting case for reform but are unlikely to raise much additional revenue. Only, perhaps, in the case of a widely applied carbon or energy tax might we get large extra revenues. Even then, political pressures to exclude households or energy-intensive industry could limit the revenue potential.

Empirical evidence on the scale of the environmental damage is crucial for good policymaking. Moves towards a carbon tax need to consider the right rate to set. However, the damage from carbon is extremely uncertain and hard to value—partly because the effects of emissions are spread over a long period and affect future generations. Given the global nature of climate change, and the insignificant impact that could be made by unilateral action, coordinated international action is essential. Barriers to implementing a domestic carbon tax could also come from concerns over international competitiveness and distribution. It would be undesirable for production to move abroad as a result of a unilateral carbon tax, reducing any net environmental gain, and widespread sectoral exemptions from any tax would significantly blunt its environmental impact. In addition, compensating low-income households for the burden of a domestic carbon tax is likely to be complicated and imprecise.

In terms of transport policy, significant gains could be made by a more precisely targeted structure of economic instruments. By far the largest external cost of motoring comes from congestion, yet existing taxes are targeted almost entirely on fuel purchases. While fuel is relevant for carbon emissions, it has little relationship to congestion. On the other hand, the development of a national system of road pricing that could accurately target the costs of congestion faces formidable implementation and political barriers. In addition, any congestion pricing system would almost certainly have

to be accompanied by substantial reductions in fuel taxes. Targeting the environmental externality more precisely is difficult—direct exhaust emissions measurement is impractical. However, combinations of taxes and regulatory instruments can provide gains that are similar to those available from direct emissions taxation. A similar multi-instrument approach may be desirable for aviation where severe constraints limit the range of possible instruments that can be used: the best available package would include fuel taxes and ticket excise taxes on domestic flights coupled with suitably varying taxes on international departures based on the characteristics of the flight.

Decisions over waste management need to take into account the environmental impact of the various options—such as landfill, incineration, or recycling. One of the first explicit environmental taxes introduced in the UK was a Landfill Tax, initially set at rates reflecting best estimates of the costs involved. However, subsequent large increases in the rate, and the introduction of the Landfill Allowance Trading Scheme, appear designed to ensure compliance with EU targets on landfill reduction. These targets look too stringent to be justified by the environmental costs.

Reforms to waste taxes may see unit charges for waste collection introduced for households. International experience suggests that unit charges may have some impact on the amount of waste generated, although the possible gains could be small and charges may lead to avoidance activities like waste dumping. A more complex multi-instrument scheme might include taxes, subsidies, and regulation. An artful combination may achieve more desirable outcomes, such as promoting efficiencies in packaging at the producer level and encouraging efficient levels of recycling and reuse.

## 5.1. INTRODUCTION

Growing concern about climate change has brought environmental issues to the forefront of the policy agenda in many European countries. In addition to the substantial scientific literature assembled under the auspices of the Intergovernmental Panel on Climate Change, the October 2006 Stern Review of the Economics of Climate Change argued strongly for immediate and urgent action to mitigate the potential costs of global climate change. Taxes, charges, tradable permits, and other economic instruments can play an important role in achieving cost-effective control of greenhouse gas emissions, but their potential scale and revenue contribution raise many wider economic

and fiscal policy implications. A number of European countries introduced carbon taxes during the 1990s, though a proposal for an EU-wide carbon-energy tax was ultimately unsuccessful. More recently, attention has shifted to emissions trading, and the EU Emissions Trading Scheme, introduced in 2005, is the most substantial application to date of this approach.

In the UK, a number of tax measures have been implemented primarily with environmental objectives in mind.<sup>1</sup> They have included three new national environmental taxes: on landfill, industrial energy use (the climate change levy), and the extraction of aggregates (quarry products). Taxes on motor fuels and the annual vehicle excise duty have both been restructured, with differential rates reflecting the different environmental attributes of fuels and vehicles. In London, the transport authority has introduced a congestion charge for vehicle use in the central area. In addition to these explicitly environmental tax measures, a wider range of areas of tax policy-making routinely include some discussion of environmental issues.

The increasing use of environmental taxes, emissions trading and other economic instruments has been partly driven by a recognition of the limitations of conventional environmental regulation. To make any serious impact on some of the major environmental problems now facing policy-makers—acid rain, global warming, traffic congestion—environmental policy cannot be approached purely as a technical issue, to be resolved merely by requiring the use of specified abatement technologies and setting emissions limits on large firms. Extensive and far-reaching changes to existing patterns of production and consumption will be needed, and these changes will inevitably entail substantial economic costs. The search for instruments capable of minimizing these costs, and of achieving behavioural changes across all sectors, has led policy-makers to pay much closer attention to the potential for incentive-based environmental regulation, that is, through economic instruments.

This approach to environmental policy has the potential to generate additional government revenues—in the form of environmental tax receipts, or the proceeds of auctioned emissions trading allowances. This calls for a much closer interaction between environmental policy and tax policy than in the past. At one level, the new government revenues that could be generated may provide an opportunity for tax reform. At a deeper level is an issue about how far the availability of environmental taxes alters the constraints and costs of current tax policy, in terms of the distortionary impact of existing

<sup>1</sup> See Chapter 1 for a brief description of UK environmental taxes. More detail is given in the online appendix to this chapter at <[http://www.ifs.org.uk/mirrleesreview/reports/environment\\_app.pdf](http://www.ifs.org.uk/mirrleesreview/reports/environment_app.pdf)>.

taxes on labour and capital markets. Here, the issues are more complex. ‘Packaging’ environmental tax reform with offsetting reductions in taxes on labour income or the payroll taxes paid by employers may have political attractions, but the fiscal benefits of this type of tax substitution are much more contentious.

This chapter provides an overview of key economic issues in the use of taxation as environmental policy. Following this introduction, the chapter has two main parts. First, Sections 5.2 to 5.4 discuss the economic principles of environmental taxation, reviewing the arguments for using taxes and other market mechanisms in environmental policy, the efficient design of environmental taxes, and the fiscal value of the revenue contribution from environmental taxes. In what sense—if at all—would an environmental tax reform provide a ‘double dividend’, in the form of a less distortionary fiscal system as well as a cleaner environment? Second, Sections 5.5 to 5.8 apply these principles to four specific environmental tax areas—energy, road transport, aviation, and household waste. The first two of these—general taxes on energy and taxes on road transport—perhaps have the greatest revenue potential, but in all four areas taxes or other similar instruments could make a significant contribution to efficiency in environmental policy.

Before embarking on the main analysis of the chapter, we have some preliminary observations of a general nature about this field of tax policy, and about the approach we have adopted:

First, the focus of the chapter is primarily on the economic aspects of environmental taxes. In addition to economic considerations, however, both politics and public opinion will play a crucial role in determining the scale of action needed, and the range of acceptable measures. This is a fast-changing landscape, and we have tried, as far as possible, to avoid constraining the analysis by our own personal speculations about what measures would be publicly or politically acceptable in current circumstances.

Secondly, technology is developing rapidly, and is a key issue in determining the types of environmental taxes that are practicable. For example, technological advances that make it easier and cheaper to measure emissions directly may open up new possibilities for direct, targeted emissions taxes, based on measured emissions. Also, as viable technologies are developed for large-scale carbon capture and storage, it may be necessary to replace straightforward taxes on energy use with more complex and targeted taxes that provide appropriate incentives for the use of carbon capture.

Thirdly, environmental policy choices depend on some key value judgements as well as objective data. For example, a central issue in deciding

whether the costs of action to curb greenhouse gas emissions are justified by the environmental benefits is the weight to be given to the interests of future generations. The Stern Review's conclusions on the scale of the damages from global warming, which are much higher than many earlier economic estimates, reflect not only the accumulating scientific evidence about the severity of climate change, but also a judgement that the interests of future generations should be weighted more heavily than in much of the literature.

Finally, while the primary focus of the chapter is on national tax policy, a key international dimension to some major areas of environmental policy-making cannot be neglected. For energy and carbon, in particular, the relevant externalities are global in their impact—all greenhouse gases emitted in any country have similar global effects. This means that effective policy cannot be implemented by a single country, and that national policies have to be formulated in the context of wider international policy developments.

## PRINCIPLES

### 5.2. ENVIRONMENTAL REGULATION: INSTRUMENT CHOICE

From the perspective of environmental policy, the case for using environmental taxes, emissions trading, and other economic instruments is primarily a matter of efficiency.<sup>2</sup> In comparison with 'conventional' regulatory policies based on technology mandates or emissions standards, economic instruments may be able to reduce the costs of achieving a given level of environmental protection (or, alternatively, can achieve a greater environmental impact for a given economic cost). Not all environmental problems, however, are best tackled in this way, and other approaches, including various forms of command-and-control (CAC) regulation, may be preferable in some cases.<sup>3</sup> Likewise, different economic instruments have various advantages and disadvantages, and the balance between these will vary from case to case.

<sup>2</sup> The potential use of environmental taxes is assessed by, among others, Smith (1992), OECD (1993, 1996), Bovenberg and Cnossen (1995), Fullerton (2001), Bovenberg and Goulder (2002), Stavins (2003), and Newell and Stavins (2003). The seminal work is Pigou (1920).

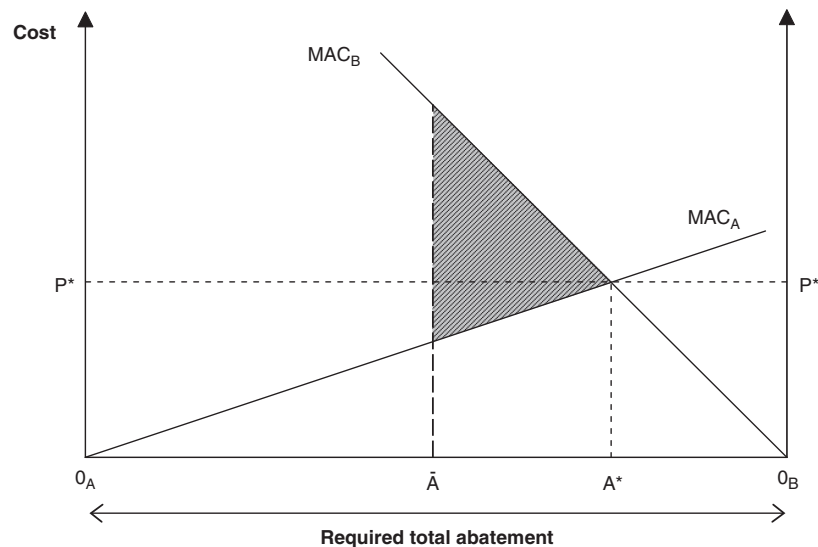
<sup>3</sup> Bohm and Russell (1985) and Fullerton (2001) also review the goals and objectives of environmental policy, and they discuss how the trade-offs among these goals might imply when to use incentives, direct regulation, or other policies.

### 5.2.1. Advantages of environmental taxes and other economic instruments

#### *'Static' efficiency gains through reallocation of abatement*

Where the costs of pollution abatement vary across firms or individuals, economic instruments such as environmental taxes and emissions trading have the potential to minimize costs, as discussed in Box 5.1, for two reasons. First, other policy instruments cannot fully differentiate between polluters with different marginal costs of abatement, and thus may require some to undertake abatement with high costs. Economic instruments provide each polluter with incentive to abate in all of the least-expensive ways, thereby achieving a given level of abatement at lower total abatement cost. Second, economic instruments can side-step the need for the regulatory authority to acquire detailed information on individual sources' abatement costs, which lowers the authority's administrative costs. Newell and Stavins (2003) find that the cost of abatement using command-and-control regulation can be several times the minimum cost achieved by using an emissions tax.

**Box 5.1.** The static efficiency gain from the least-cost pattern of abatement compared with uniform abatement when two types of polluter differ in abatement costs





Point A\* represents the least-cost division of a given total abatement requirement between two groups of polluters with different marginal abatement costs, represented by the schedules  $MAC_A$  and  $MAC_B$ , measured from the origins  $0_A$  and  $0_B$  respectively. The pollutant is assumed to be 'uniformly mixed', so that the environmental benefits are a function only of the total abatement achieved, and not of how this is divided between the sources. Economic instruments such as taxes or trading should achieve point A\* (e.g. through emissions trading in a competitive market, with equilibrium allowance price equal to  $P^*$ , or through an emissions tax set at a rate  $P^*$  per unit of emissions). If, instead the informational limitations of command-and-control regulation compel the regulator to give the two types of polluter equal abatement requirements (point  $\bar{A}$  in the diagram), higher total abatement costs will be incurred, shown by the shaded area.

A large number of empirical studies have used data on marginal abatement costs for a range of different sources to compare the costs of achieving a given abatement outcome using uniform and least-cost regulation. The cost savings are a function of differences in marginal abatement costs between sources. Where these are large, the efficiency saving from the least-cost pattern of abatement is correspondingly large (Tietenberg (1991); Newell and Stavins (2003)).

### *Dynamic innovation incentive*

Regulatory policies which stipulate that polluters must use particular technologies or maintain emissions below a specified limit may achieve compliance but do not encourage polluters to make further reductions below this specified limit. Indeed, where regulations are negotiated on a case-by-case basis, polluters may fear that any willingness to exceed requirements may simply lead the regulator to assign the firm a tougher limit in future. By contrast, environmental taxes provide an ongoing incentive for polluters to seek to reduce emissions, even below the current cost-effective level, since the tax applies to each unit of residual emissions, creating an incentive to develop new technologies that have marginal cost below the tax rate (see e.g. Fischer et al. (2003)).

### *Robustness to negotiated erosion ('regulatory capture')*

Efficient implementation of regulations requires firm-by-firm negotiation of individual abatement or technology requirements. CAC regulatory policies should require different amounts of pollution abatement from different firms to minimize total abatement costs. The regulator is dependent on the

regulated firms for information about their abatement costs, however, and is liable to be drawn into dialogue and negotiation with the firms. The regulated firms, in turn, then control a key element in the process by which regulatory policies are set, and may be able to extract a price from the regulator for their cooperation, in the form of less stringent abatement targets, or other changes that work to their advantage.

In contrast, uniform environmental taxes achieve a cost-effective distribution of abatement, taking account of the different abatement costs of individual firms, while taking a robust, non-negotiated form. All firms face the same pollution tax rate. The regulator has no need to consider the circumstances of individual firms, and thus individual polluters have little scope to negotiate more favourable terms. The risk is thus substantially reduced that this process of negotiation would erode the environmental effectiveness of the policy.

### *Revenue potential*

Environmental taxes and auctioned tradable permits raise revenues, as a result of the payments made on each unit of residual emissions. The extent to which these revenues should really count as a further *benefit* of the use of environmental taxes or emissions trading has been controversial, and we defer discussion of this so-called 'double dividend' to Section 5.4.

From a fiscal policy perspective concerns are also sometimes raised about the stability and predictability of environmental tax revenues, and, in particular, their erosion as a result of the behavioural responses of polluters. We suspect this problem has been greatly overstated. The revenue from all taxes is affected by behavioural responses, and environmental taxes based on inelastically demanded commodities such as energy might well be less affected by behavioural responses than other tax bases.

## **5.2.2. Disadvantages of environmental taxes and other economic instruments**

Economic instruments such as environmental taxes have, however, a number of identifiable drawbacks and limitations that may be sufficiently important to rule out their use in particular applications.

### *Geographically varying damage*

If pollution damage varies with the source of emissions, then a uniform pollution tax is liable to result in inefficiency, and source-by-source regulation

































































































































































































































































