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Tax Preferences for Environmental Goals: Use, Limitations and Preferred Practices

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ENVIRONMENT WORKING PAPER No. 71: TAX PREFERENCES FOR ENVIRONMENTAL GOALS: USE, LIMITATIONS AND PREFERRED PRACTICES

By James Greene and Nils Axel Braathen

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ABSTRACT

This paper reviews the use of tax preferences to achieve environmental policy objectives. Tax preferences involve using the tax system to adjust relative prices with a view to influencing producer or consumer behaviour in favour of goods or services that are considered to be environmentally beneficial. They take various forms, typically a partial or total exemption from a specified tax. Because tax preferences help to avoid or reduce costs for businesses or consumers, there are often pressures on governments to favour them over other instruments. As a result, they are sometimes used inappropriately, typically to address negative externalities for which they are not well suited. The paper suggests that the comparative advantage of tax preferences is in providing support for *positive* externalities, that is situations in which a subsidy would help to deliver more social benefits than would otherwise be the case. When designing tax preferences, care must be taken to ensure that they do not encourage technological lock-in, provide perverse incentives for environmentally harmful activities (the rebound effect), or reward producers or consumers for actions they would have taken anyway. Since tax preferences are a form of subsidy, they should be subject to the same degree of scrutiny and oversight as other forms of public expenditure.

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RÉSUMÉ

Ce document examine la question du recours aux avantages fiscaux pour atteindre les objectifs de la politique de l'environnement. Les avantages fiscaux consistent à utiliser le système fiscal pour ajuster les prix relatifs afin d'influencer le comportement des producteurs ou des consommateurs en faveur de biens ou de services considérés comme bénéfiques pour l'environnement. Ils prennent diverses formes, le plus souvent une exemption totale ou partielle d'une taxe particulière. Étant donné que les avantages fiscaux contribuent à éviter ou réduire les coûts pour les entreprises ou les consommateurs, des pressions sont souvent exercées sur les pouvoirs publics pour qu'ils les préfèrent à d'autres instruments. Aussi sont-ils parfois utilisés à mauvais escient, généralement pour traiter des externalités négatives pour lesquelles ils sont mal adaptés. Ce document tend à montrer que l'avantage comparatif de ces instruments réside dans le soutien qu'ils apportent aux externalités *positives*, à savoir les situations dans lesquelles une subvention aiderait à procurer plus d'avantages pour la collectivité que ce ne serait le cas autrement. Pour concevoir des avantages fiscaux, il faut veiller à ce qu'ils n'encouragent pas le verrouillage technologique, ne créent pas d'incitations perverses en faveur d'activités dommageables pour l'environnement (effet rebond), ou ne récompensent pas les producteurs ou les consommateurs pour des actions qu'ils auraient entreprises de toute façon. Étant donné que les avantages fiscaux sont une forme de subvention, il convient de les surveiller d'aussi près que les autres formes de dépenses publiques.

Classification JEL : H20, H23, H25, H30, Q58

Mots clés : Avantages fiscaux motivés par des considérations environnementales ; Comportement influencé par l'impôt ; Effets environnementaux

FOREWORD

This paper provides a summary of the use in OECD countries of targeted tax preferences to further environmental objectives. It analyses the characteristics of tax preferences as compared with other environmental policy instruments, drawing on a number of policy examples, and sets out a series of best practices on employing and designing environmental tax preferences. It is intended, not as a comprehensive analysis, but as a kind of guide to relevant considerations for use by policy advisors, planners and advocates who are called on to consider the potential use of environmental tax preferences.

The paper includes a variety of illustrative examples of policy experience, including a case study on the tax allowance for energy investments by firms in the Netherlands (Ruijs and Vollebergh, 2013). Assistance with respect to analysis of *bonus-malus* schemes from Professor Maria Grazia Pazienza of the University of Florence, who was a visiting research scholar in the OECD's Centre for Tax Policy and Administration (CTPA) during 2012, is gratefully acknowledged.

The paper was originally drafted by James Greene while he was Head of the Tax and the Environment Unit in CTPA, with input from Nils Axel Braathen of OECD's Environment Directorate. After James Greene left the OECD, Nils Axel Braathen updated the description of the current use of environmentally motivated tax preferences and made some further additions to the paper.

EXECUTIVE SUMMARY

Many countries use tax preferences to achieve environmental policy objectives. Tax preferences involve using the tax system to adjust relative prices with a view to influencing producer or consumer behaviour in favour of goods or services that are considered to be environmentally beneficial. Tax preferences are subsidies in the sense that they involve foregone government revenue. In effect they transfer resources from taxpayers to the beneficiaries of the tax preference. Other terms are also used to describe tax preferences such as tax expenditures, tax breaks, tax relief or tax subsidies. They take several forms, including:

- Reduced tax rates or exemptions on:
    - general value-added and retail sales taxes (e.g. reduced VAT rates or rebates for energy-efficient appliances); and
    - specific environmentally related taxes (e.g. reduced tax rates for electrical vehicles in motor vehicle taxes; or an exemption from fuel taxes for biofuels on the basis that their direct carbon emissions are lower than in the case of conventional petroleum fuels);
- Tax credits against personal or corporate income taxes (e.g. for carrying out R&D); and
- Accelerated depreciation of preferred capital assets against corporate income taxes (e.g. pollution control equipment).

Because tax preferences help to avoid or reduce costs to businesses or consumers, there are often pressures on governments to favour them over other instruments. As a result, tax preferences are often used inappropriately. In particular, they are sometimes used to address negative externalities; that is, situations in which there is no market incentive for firms and households to control pollution, and where the environmental impact and cost affect people other than the polluter. To address this problem, instruments such as environmental taxes should be preferred as they help to internalise the environmental cost in the price of the polluting goods and services and thereby create incentives for consumers to choose less polluting alternatives. Tax preferences do not internalise environmental costs.

The comparative advantage of tax preferences is in providing support for *positive* externalities, that is situations in which a subsidy would help to deliver more social benefits than would otherwise be the case. Government support for R&D is a good example. Firms are likely to invest in less R&D than is socially optimal because, even with patent protection, new innovations and knowledge often provide benefits to third parties, not just the innovating firm. To address this, governments often use tax breaks to encourage firms to invest more in R&D. Other examples include payments for ecosystem services where, for example, financial support is provided to landowners who manage their property in a way that preserves or enhances natural capital, or a tax credit is provided for donations of ecologically sensitive land to government or land trust organisations.

Even when there is an agreement to use tax preferences, they need to be designed to avoid some common pitfalls. First, by favouring some products or activities over others, tax preferences risk contributing to “technology lock-in”. Favouring one activity creates a relative disadvantage for other

activities that may have similar benefits. It may also encourage firms and consumers to adopt the subsidised solution, even in cases where another solution would have been more cost-effective. For example, a subsidy for low-emission vehicles steers the consumer toward a driving solution, even though s/he may be willing to consider alternative forms of transportation with lower emissions, such as public transport or cycling, or reducing the amount of travel. In contrast, a tax on high-emission vehicles or motor fuel would allow these low-emission alternatives to "compete" on a level playing field with low-emission vehicles. One way to avoid technology lock-in is to base tax preferences on performance standards rather than specified products or on inputs. For example, rather than exempting all biofuels from an excise tax, only biofuels that meet a minimum environmental standard could be exempted.

A second pitfall is the rebound effect. A subsidy to purchase or use a less environmentally harmful form of a product is still a subsidy that encourages the use of a product with environmental impacts. While the subsidy may shift usage to the less harmful product, it may increase overall usage and therefore potentially increase the overall level of environmental harm – the opposite of the result intended. This effect is well-known in the area of energy efficiency where, for example, if cars become more fuel-efficient, each kilometre of travel becomes cheaper, and users may respond by increasing the number of kilometres they drive.

A third design challenge concerns windfall gains and free-riding. There is a risk of tax preferences providing a subsidy to those who would have undertaken the preferred activity anyway. The result is that public resources reward existing behaviour and do not achieve an improved environmental outcome. One way to avoid this pitfall is target the support on actions that go beyond a business-as-usual baseline. If the eligibility criterion is gradually made stricter as technologies develop, the measure is less likely to provide benefits to those who would have undertaken the activity without support. In some cases, this is achieved by regularly updating lists of technologies eligible for a tax preference. However, in such cases, governments face the challenge of negotiating with industries that have more extensive information; the challenge of information asymmetry.

Since tax preferences are implemented in specific tax systems, they should be designed to take advantage of the main features of those systems. For example, general income and consumption tax systems are implemented by tax officials who would not normally have any competence in environmental issues. Thus simple, clear criteria for awarding benefits that can be implemented by them with little or no discretion are likely to be most effective and to minimise administrative costs. The use of complex eligibility criteria that require specialist staff is likely to be more expensive and less effective.

Since tax preferences are a form of subsidy, they should be subject to the same degree of scrutiny and oversight as other forms of public expenditure. Thus clear objectives should be established against which their effectiveness can be evaluated. Before implementation, some assessment should be made indicating that the benefits are likely to outweigh the costs. The tax preferences should be established for a defined time period, and their costs and benefits assessed at appropriate intervals. The assessments should be issued to the public. When the tax preferences are not cost-effective they should be abolished or reformed.

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TAX PREFERENCES FOR ENVIRONMENTAL GOALS: USE, LIMITATIONS AND PREFERRED PRACTICES

1. Introduction

1. Despite the recent recession, the global economy is projected to nearly quadruple in size between now and the year 2050. Rising living standards will be accompanied by ever-growing demands for energy, food and natural resources – and more pollution, unless effective counter-measures are taken. Based on the resulting pressure in areas such as climate change, biodiversity, water and the health impacts of environmental pollution, the costs of inaction could be very large both in economic and human terms (OECD, 2012, 2014).

2. Notwithstanding long run growth prospects, governments for the moment are struggling to create the conditions for growth and restore fiscal balances in significantly weakened economies. Doing this and responding to mounting environmental concerns at the same time is challenging. In this context, the OECD has launched a Green Growth Strategy – a practical framework to help countries foster economic growth while preserving the environmental assets on which our well-being relies (OECD, 2011a).

3. The Green Growth Strategy underlines the important role that taxation can play in supporting sustainable growth. In particular, it discusses three ways in which tax policy can be harnessed to environmental ends:

- pricing pollution and other environmental degradation using *environmentally related taxes and charges*;
- removal or reform of *environmentally harmful tax preferences*; and
- use of *environmentally targeted tax preferences* to encourage more environmentally benign practices by businesses and individuals.

4. This paper focuses on the third group – environmentally favourable tax preferences. While such measures may seem attractive and can be easy to "sell", they have a number of important limitations, including the potential for substantial costs, in both fiscal and economic terms.

5. To establish the context, each of these three tax approaches is briefly considered in turn. Following this introduction, the scope of the tax preferences covered by the paper is briefly clarified. The third section of the paper describes the range and profile of environmental tax preferences currently reported by OECD countries through the OECD's database of instruments used for environmental policy. A brief discussion follows concerning the circumstances in which tax preferences should be considered relative to other instruments of environmental policy. The paper then examines in turn the principal characteristics of tax preferences and their associated limitations, particularly in comparison with other instruments. In each case, preferred practices are put forward in order to identify the situations in which tax preferences are more likely to be successful, and to discuss the policy design and management features that can maximise their effectiveness, and determine whether or not they are the optimal instrument in a particular case.

6. Many of the principles of tax design and comparative instrument analysis discussed in this paper are relevant to the consideration of tax preferences in other fields. However, this paper is focussed on the particular issues that arise in the environmental policy area, and the particular alternatives that are available in that context. The general principles in the paper are illustrated with reference to policy examples from OECD member countries. Particular reference is made to a case study concerning the *Energy Investment Tax Allowance* in the Netherlands (Ruijs and Vollebergh, 2013), which was prepared for the purposes of the project.

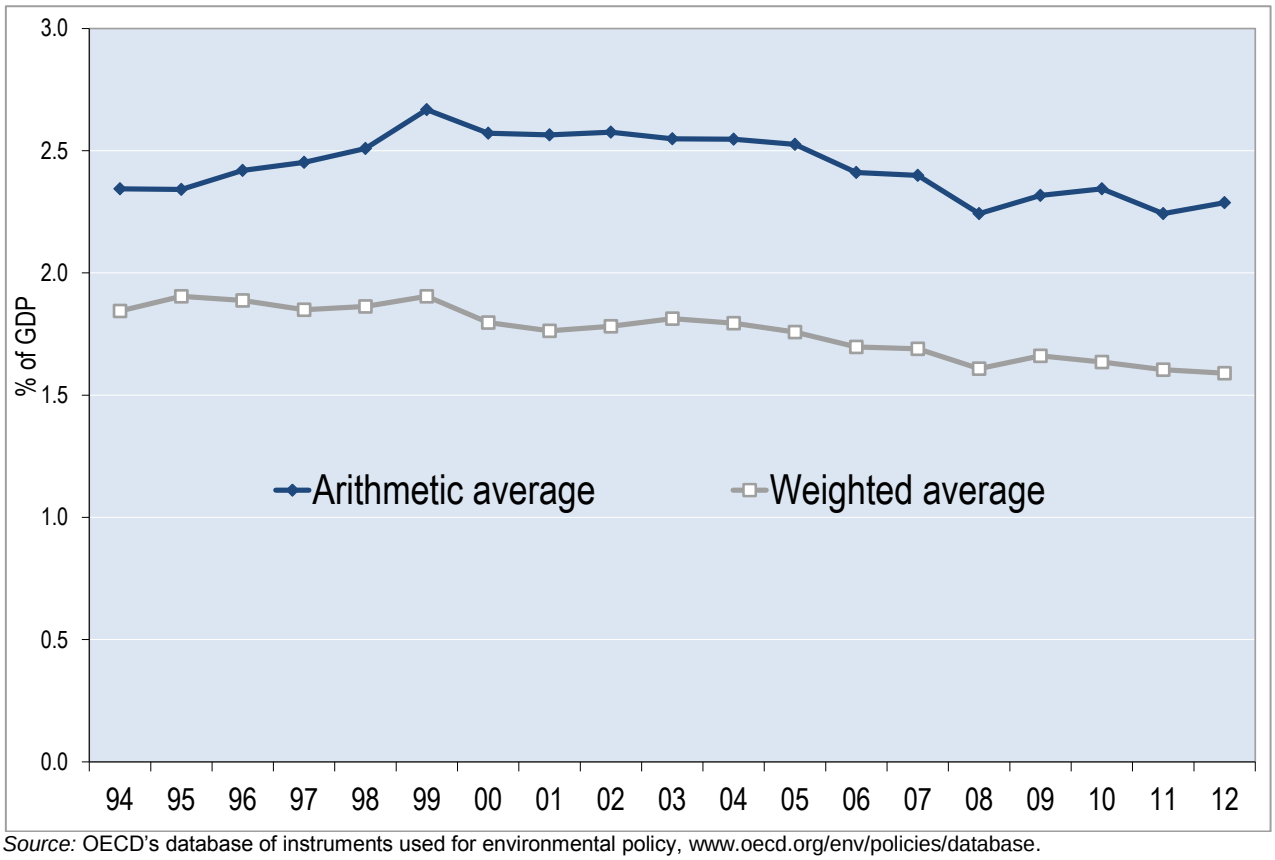
Environmentally related taxes

7. OECD work has consistently recommended the use of market-based instruments like taxes and tradable permits to price pollution and scarce natural resources and thereby harness markets to serve environmental objectives. Environmentally related taxes and charges – i.e. those imposed on environmentally significant tax-bases – can ensure that market prices reflect some portion of the social environmental cost (or externality) associated with particular products or activities. This causes producers and consumers to take these costs into account in their decision-making, and adjust their behaviour accordingly. OECD analysis has highlighted, with the benefit of practical case studies, the cost-effectiveness of environmentally related taxes in achieving environmental objectives (see, for example: OECD, 2001, 2006, 2008a, 2010a, 2011b, 2013d).

8. While almost all countries now deploy environmentally related taxes, revenue from such taxes has generally been stagnant among OECD countries as a proportion of GDP over the past decade-and-a-half. According to the OECD's database of instruments used for environmental policy (www.oecd.org/env/policies/database), despite an increase in the late 1990s, the arithmetic average of revenue from such taxes for OECD countries as a proportion of GDP was lower in 2012 than it was in 1994 – 2.28% versus 2.34% of GDP (see Figure 1). The weighted average has also declined over this period, in part because of the impact of rising fuel prices in depressing demand for motor fuels and, consequently, tax revenues.

9. Nonetheless, in Slovenia, Denmark, Turkey and the Netherlands, environmentally related taxes account for more than 3.5% of GDP. For most other OECD countries, therefore, it would appear that there are substantial unexploited opportunities. The OECD publication *Taxing Energy Use* (OECD, 2013a) sets out a profile of energy use in OECD countries, highlighting the uneven price signals sent by existing taxes on energy use which in turn suggest a number of avenues of potential reform.

Figure 1. Revenue from environmentally related taxes in OECD countries (1994-2011)



Source: OECD's database of instruments used for environmental policy, www.oecd.org/env/policies/database.

Reform of environmentally harmful tax preferences

10. Another stream of OECD work has focussed on the important benefits from elimination and reform of environmentally harmful subsidies, including inefficient tax preferences. In the OECD's 2009 Declaration on Green Growth, 34 countries agreed to "encourage domestic policy reform, with the aim of avoiding or removing environmentally harmful policies that might thwart green growth, such as subsidies: to fossil fuel consumption or production that increase greenhouse gas emissions …" (OECD, 2009a). Three months later, G-20 leaders committed to "rationalise and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption". They noted that inefficient fossil fuel subsidies "encourage wasteful consumption, distort markets, impede investment in clean energy sources and undermine efforts to deal with climate change" (G20, 2009). In November 2009, a similar commitment was made by leaders of the Asia-Pacific Economic Cooperation forum (APEC, 2009).

11. Rationalisation of inefficient support for fossil fuels offers the opportunity for three "wins":

- improved environmental outcomes;
- increased economic efficiency; and
- better fiscal balance.

12. The OECD has been supporting country efforts to reform policy measures that support fossil fuel production or use by improving the availability of information about support policies. The *Inventory of*

Estimated Budgetary Support and Tax Expenditures for Fossil Fuels 2013 (OECD, 2013b) for the first time consolidates information about support measures in all 34 OECD countries. It covers some 550 measures, of which two thirds are tax expenditures, with an aggregate value in the order of USD 55-90 billion per year over the 2005-2011 period. The contents of the *Inventory*, together with data from the International Energy Agency (IEA) on fossil fuel consumer subsidies in developing countries, are available online in a joint OECD-IEA database (www.oecd.org/iea-oecd-ffss).

Environmentally motivated tax preferences

13. Despite the strong policy-case in favour of environmentally related taxes (i.e. taxing environmental *bads*) and the reform of (among others) tax preferences favouring fossil fuels, both can involve political challenges. Concerns are expressed, for example, about producer and consumer reaction to higher taxes or the loss of tax preferences with respect to the goods and services they consume.

14. For these reasons, rather than tax environmental *bads*, some countries have attempted to adjust relative prices and influence producer and consumer behaviour by providing tax preferences for environmental *goods* or environmentally beneficial behaviour. Such policies may be variously referred to as tax preferences, tax incentives, tax expenditures, targeted tax relief, tax reductions or tax subsidies. In this paper, the term "tax preferences" is used.

15. From a political point of view, a perceived advantage of using tax reductions to prefer some activities (the "carrot") is that it rewards desirable behaviour and creates winners, while introducing new taxes (the "stick") punishes undesirable behaviour and may create losers. There is often pressure from industry groups and sometimes NGOs to use targeted tax preferences or other subsidies as an "easier" way of promoting environmental objectives. By avoiding or reducing cost increases, subsidies avoid concerns about the impacts on international competitiveness of domestic industry often associated with environmentally related taxes or emissions trading programmes with auctioned quotas (Dietz and Vollebergh, 1999). Perhaps for these reasons, tax preferences have been a common policy approach.

16. Despite the political attractiveness of tax preferences, however, there are important limitations associated with their use. As will be discussed, tax preferences do not necessarily create fewer losers than other policies. The losers from a tax preference are typically those who have to pay higher taxes in order to fund the preference for others. These losers from the policy, however, may often not appreciate the fact that they *are* losers. OECD analysis has consistently pointed out the economic and administrative benefits of a general policy of applying taxes where possible on a broad tax-base and at low rates (OECD, 2010b). Targeted tax preferences depart from this principle and the case for them needs to carefully assessed.

2. Scope of the study

17. Tax preferences to promote environmentally preferable products or behaviour take various forms, such as:

- Reduced tax rates or full tax exemptions for environmentally preferable products. These policies are seen in the context of both:
  - general value-added and retail sales taxes (e.g. reduced VAT rates or rebates for energy-efficient appliances); and
  - specific environmentally related taxes (e.g. reduced tax rates for electrical vehicles in motor vehicle taxes);
- Tax credits against personal or corporate income taxes for certain environmentally preferable expenditures; and

- Accelerated depreciation of environmentally preferable capital assets for the purposes of assessing corporate income taxes.

18. This study is focussed on preferential tax features that are intended, or may reasonably be expected, to have a favourable environmental impact (whether or not they are successful in having such an impact). This focus has two implications.

- The study does not cover environmentally harmful tax preferences – measures, typically intended to serve some other policy purpose, that have a negative impact on environmental performance. An example would be fuel tax relief for low-income households that encourages greater use of fossil fuels and increased air emissions. Such measures are addressed by a separate body of OECD work discussed above.

- Within the scope of environmentally related taxes (taxes on environmentally significant bases like fuel, automobiles and pollutants), this study concerns only targeted tax preferences that are intended to have a direct, environmentally favourable impact (recognising that whether the impacts are in fact favourable may sometimes be a matter of discussion). An example is an exemption from fuel taxes for biofuels on the basis that their direct carbon emissions are lower than in the case of conventional petroleum fuels. By contrast, preferences that are not intended to have a direct positive environmental impact, such as a reduction in fuel taxes intended to protect low-income taxpayers from price increases, are not covered, even though it might be argued that such reductions were the "price" paid in order to make the environmental tax politically acceptable or to allow it to be imposed at a particular rate.[1]

3. Environmentally favourable tax preferences in OECD countries

19. The OECD's database on instruments used for environmental policy and natural resource management (www.oecd.org/env/policies/database) provides detailed information about a wide variety of measures in member countries of the OECD and a number of other countries. Instruments covered include environmentally related taxes, fees and charges; tradable emission permit systems; deposit refund systems; environmentally motivated subsidies; and voluntary approaches. Within the instrument category "environmentally motivated subsidies" is a subcategory for "tax reductions", the focus of this paper.

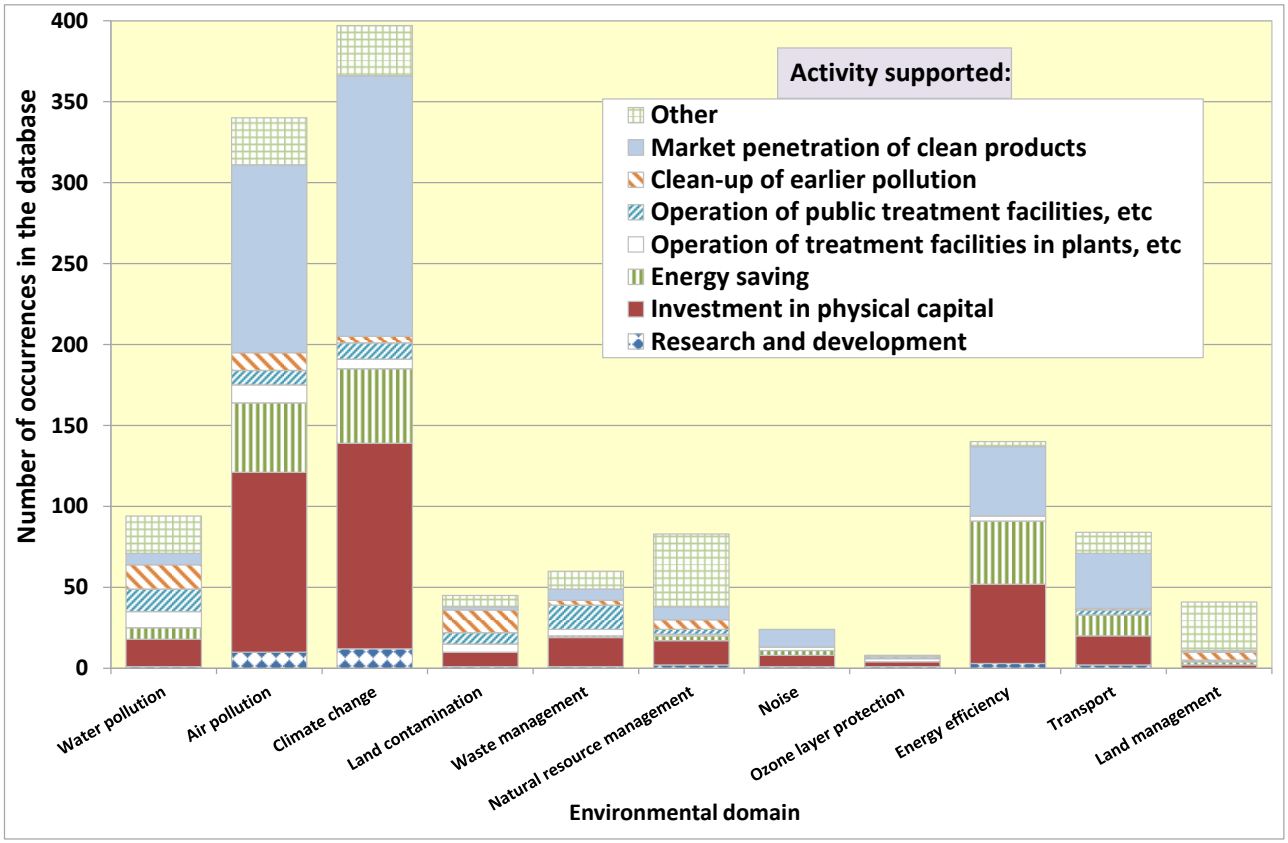
20. Within the database, each subsidy scheme may contain one or more sub-schemes. Sub-schemes may, for example, concern different economic sectors, with differences in the rules applying across the sectors concerned. In the summer of 2014, the database identifies 290 schemes in 21 countries classified as "tax reductions", compared to a total of 711 schemes across all subsidy types (see the list in Appendix A). If broken into sub-schemes, they may be classified as 397 total provisions, compared to a total of 1281 sub-schemes across all subsidy types. These provisions are classified further in the following discussion.

21. Figure 2 classifies the tax preferences covered in the database according to two criteria. The horizontal axis reflects various environmental domains to which schemes are directed – water pollution, air pollution, climate change, etc. The differently shaded segments in the vertical bars reflect the various activities supported by the schemes – the modalities by which environmental benefits are sought to be brought about, e.g. research and development, investment in physical capital, market penetration of clean products, etc.

[1] The statistics in this paper focus primarily on environmentally motivated tax preferences within non-environmentally related taxes. This is because preferences within environmentally related taxes are often not separately identified in the subsidies section of OECD's policy instruments database, but rather are included in the tax section of the database within the description of the environmentally related tax.

22. Figure 2 indicates that the environmental domains to which the largest number of measures is addressed are 'air pollution', 'climate change' and 'energy-efficiency'. The dominant activities supported are 'investments in physical capital', 'market penetration of clean products', 'other' and 'energy saving'. It should be kept in mind, however, that a given tax reduction scheme can be related to several environmental domains, and a given sub-scheme can be linked to one or more supported activities. As a result, there is double-counting, so the bars in the charts must be interpreted carefully. For example, many instruments related to 'climate change' could also be classified as having relevance to 'air pollution' and 'energy-efficiency'.

Figure 2. Environmental domains and activities supported



Note: See the text for a discussion of the overlaps between different domains and activities supported.
Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

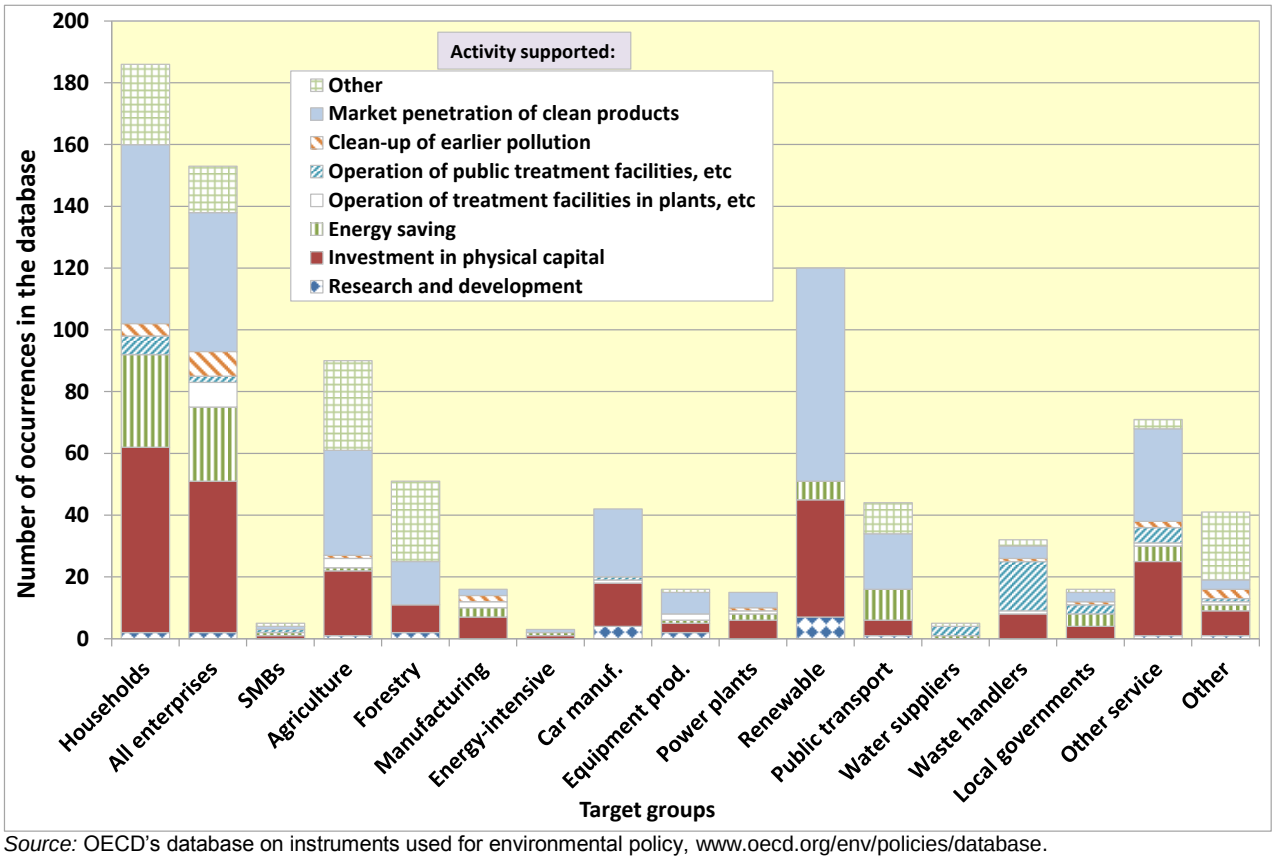
23. The principle information in the graph is the height of the individual segments within a bar, reflecting the number of sub-schemes addressing a particular activity within a particular environmental domain. Within Figure 2, therefore, the overall height of each bar generally exceeds the number of sub-schemes addressing that environmental domain. For example, a tax credit relating to air pollution control in industrial plants might address two activities: 'operation of treatment facilities' and 'investment in physical capital' and could thus appear in more than one segment within the 'air pollution' bar. Likewise, an accelerated tax depreciation provision could support investment in physical capital in a number of different environmental domains and thus appear in several different columns.

24. The database also allows identification of the beneficiaries or target sectors of each sub-scheme – e.g. households, various business sectors, NGOs, etc. – at least in formal, first order terms. Figure 3 indicates along the horizontal axis the various target groups identified for the sub-schemes in the database (though information is lacking for a number of sub-schemes). The segments in the bars show the activities

supported by the various sub-schemes. As in the previous figure, there is a clear element of double-counting in and across the vertical bars, so the figures should be interpreted with caution. Nonetheless, it can be seen that a considerable number of measures are targeted at the 'households' sector, while measures directed at 'all enterprises' or 'renewable energy producers' are also quite significant. In terms of activities, 'market penetration of clean products' is supported relatively often, particularly among 'renewable energy producers', 'households' and 'other service sectors'. 'Investment in physical capital' is an another activity frequently supported, with the most common targets being 'households', 'all enterprises' and 'renewable energy producers'.

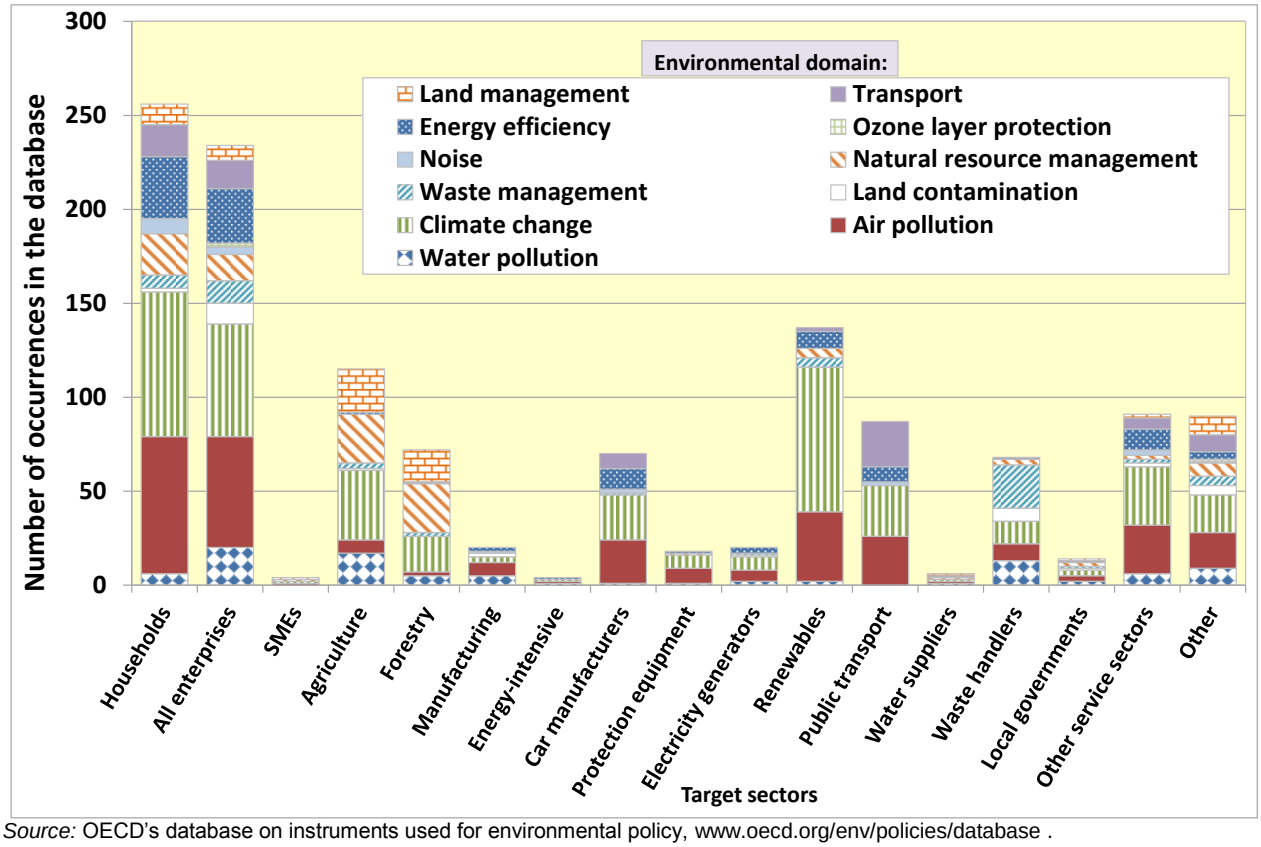
25. In Figure 4, information regarding target sectors (which is given by sub-scheme) is combined with information regarding the environmental domains (which is given for the scheme as a whole). Once again, the figures should be interpreted with caution, due to the overlaps. Nevertheless, the figures indicate that 'households', 'all enterprises' and 'renewable energy producers' are among the main targeted sectors, with 'climate change' and 'air pollution' among the most important environmental domains being addressed.

Figure 3. Target sectors and activities supported



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure 4. Target sectors and environmental domains



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database .

26. The database, in addition to the classification of information discussed, also provides a description of the purpose and key features of each tax preference (see Annex A). There is also a field for information on the net public financial cost of the measure. This is essentially an estimate of the tax expenditure. This cost portion of the database, however, is not very complete, often reflecting differences in approaches to tax expenditure reporting and the lack of an official estimate. This information is therefore not amenable to summarisation or graphical presentation at present. As a result, it is not possible to comment on the overall financial scale of the measures included in the database.

27. A relatively large share of the tax preferences discussed in this section refers to State-level tax preferences in the United States. Annex B provides a comparison of the environmentally motivated tax preferences applied in the United States to the similar tax preferences applied in other OECD countries.

28. To shed additional light on the characteristics of the environmentally motivated tax preferences across all OECD countries, Annex C compares them to the characteristics of the environmentally motivated grants that are included in the OECD's database on instruments used for environmental policy. This can give an idea of the extent to which these two instrument types are used in different contexts.

4. Choosing a tax preference vs. another environmental policy instrument

Start with the problem, not the solution

29. While policy literature often focuses on analysis of particular policy tools – taxes, subsidies, regulations, fines, etc. – one normally does not start with the tool in policy development. To do so amounts to promoting a policy solution in search of a problem. Before considering the appropriateness of a tax

preference (or any other measure) to address an environmental issue, an analysis should be undertaken of the nature of the policy problem and the appropriate role for government. The case for government intervention will typically be based on identification of a "market failure" – a situation in which an unregulated market delivers results that are not considered socially optimal. This analysis should consider the inappropriate result, the nature of the market failure and whether and how appropriately targeted government action can address it.

30. Assessment of the benefits and costs of government intervention should consider the respective advantages and disadvantages of the various policy instruments that could be deployed to address the issue. Where a tax preference is being considered, a key question will be whether a tax subsidy is a cost-effective way to address the particular market failure as compared with other instruments, and if so, how a subsidy can best be targeted.

31. There is a developed body of work from the OECD and other sources on the issue of instrument choice in environmental policy (see, for example: OECD, 2007; Goulder and Parry, 2008; Duval, 2008). It involves consideration of such instruments as:

- environmentally related taxes;
- tradable emission permits;
- financial assistance or subsidies, including cash grants, tax preferences, loan guarantees and low-interest loans;
- command-and-control regulations, such as standards or mandates, which may be performance-based (e.g. maximum levels of SO_2 emissions from a plant or sulphur content in fuel) or technology-based (e.g. mandatory use of emissions scrubbers or bans on particular fuels);
- price regulations, such as feed-in tariffs which guarantee a particular price for energy from prescribed renewable sources;
- information programmes (e.g. equipment labelling requirements regarding environmental performance, government advertising campaigns); and
- government procurement policies, negotiated agreements with selected industrial sectors, and other measures.

32. It is beyond the scope of this paper to consider the relative merits of the full range of possible instruments. It focuses on the particular characteristics of tax preferences, their limitations, and preferred practices in their use. In doing so, however, it makes reference to the characteristics of other instruments (particularly environmentally related taxes) in comparison with which tax preferences should be assessed. While a number of clear advantages *in principle* can be identified in using environmentally related taxes, *in practice*, environmental taxes, like other policies, are often not implemented optimally – the rate may be too low to internalise the full external costs, exemptions may limit the scope of the price signal – or a tax may be rejected for reasons of "political acceptability". Real-world policy choices therefore often involve consideration of second-best options.

➔ *Preferred practice: Consideration of new policies should be supported by a robust analysis of the policy problem and the case for intervention; analysis of alternative instruments should follow.*

5. Characteristics and limitations of tax preferences and preferred practices

33. As an instrument of environmental policy, tax preferences have a number of characteristics and limitations that are important to keep in mind when choosing a policy tool:

- Tax preferences do not internalise negative externalities into prices
- Tax preferences can address true positive externalities
- Tax preferences often attempt to "pick winners"
- Tax preferences are not well suited to address certain market failures
- Tax preferences can lead to increased pollution
- Tax preferences require clear, objective standards
- Tax preferences can cause windfall gains or "free-riding"
- Tax preferences require costly funding
- The cost of tax preferences is often not transparent
- Tax preferences are often less scrutinised than alternative policy instruments
- Tax preferences may not be helpful to non-taxable entities
- International coordination of tax preferences is difficult
- Tax preferences need to be coordinated with other domestic policies

34. Each of these characteristics is discussed in turn in this section of the paper. Preferred practices are proposed, with a focus on approaches than can help to enhance effectiveness where a tax preference is chosen. Many of these characteristics and preferred practices are common to tax preferences used in other policies areas, beyond the environment. Some of them are also characteristics of subsidies in general – whether provided by way of tax relief or as direct cash payments. In all cases, however, the context and examples are drawn from the realm of environmental policy, which is the focus of this paper.[2]

Tax preferences do not internalise negative externalities into prices

35. To outline the nature and impact of tax preferences as an instrument of environmental policy, it is useful to compare and contrast them with environmentally related taxes. Environmental taxes generally involve taxing environmental "bads" (the "stick" approach), while environmentally motivated tax preferences provide tax reductions for environmental "goods" (the "carrot" or subsidy approach). While both taxes and tax expenditures are used to influence market prices in a way that favours environmentally preferable actions, they generally apply to very different bases and operate in a different way; they are therefore typically not close substitutes.

[2] An outline of principles that may guide the consideration of use of tax instruments to meet environmental objectives is set out in Department of Finance Canada (2005).

36. Pollution and other types of environmental degradation are examples of "negative externalities". Without government intervention, there is generally no market incentive for firms and households to take pollution into account, since its impact and cost are spread across many people other than the polluter – it is an "externality". Therefore, protection of the environment generally requires collective action, usually led by government.

37. Taxes (along with systems of tradable emission permits) levied directly on pollution, or on close proxies for the pollution (e.g. on fossil fuels) are generally considered the most effective instruments available to address such negative externalities.[3] A well-designed environmental tax increases the price of a good or activity to reflect the cost of the environmental harm that it imposes on others.[4] The cost of the harm to others is thereby internalised into market prices. The use of taxes to "price in" environmental costs ensures that consumers and firms take these costs into account in their decisions. The tax provides a strong economic incentive to reduce the activity – emitting – that gives rise to the tax.

38. The key to the cost-effectiveness of environmentally related taxes is that they provide an economic incentive to reduce pollution, but leave businesses and individuals with the flexibility to decide the best or least costly way for them to do so. This characteristic of favouring the lowest-cost available emissions reduction opportunities is referred to as *static efficiency*. By setting a price on emissions, environmental taxes provide an ongoing incentive to consider abatement at all levels of emissions. Essentially, a firm will continue to reduce emissions as long as the cost of doing so is cheaper than the tax that would otherwise have to be paid on the emissions. By contrast, a tax preference to install emission-reducing equipment (or a regulation requiring the use of such technology) provides no incentive for firms to abate beyond that achieved by use of the technology. Environmental taxes also increase demand for low-emission alternatives, like wind and solar power. This results in economies of scale that help to make such alternatives more viable, without a need for direct subsidies.

39. Environmental taxes also provide incentives to reduce emissions over time. By increasing demand for pollution reduction, the tax mechanism creates strong incentives for firms to innovate and develop new technologies that can reduce pollution at even lower cost. This characteristic is referred to as *dynamic efficiency*. Enhanced innovation lowers the cost to society of addressing environmental challenges in the long run (see OECD, 2010a and 2011b).

40. Environmentally related taxes harness market forces to provide an incentive to reduce pollution and to innovate across the entire range of activities that contribute to reductions in pollution. For example, a tax on industrial sulphur oxide (SO_x) emissions could induce emissions reductions through many direct and indirect channels. It could induce coal-based power plants

- to optimise combustion processes to minimise SO_x emissions per unit of fuel (reduce pollution intensity per unit of input);
- to increase plant efficiency by re-using waste heat (to reduce input use per unit of output);
- to switch from high-sulphur to low-sulphur coal (less emission-intensive inputs of the same type);
- to install scrubbers to remove SO_x from flue gases (end-of-pipe remediation);

[3] OECD (2013d) provides empirical evidence of this in relation to greenhouse gas emission abatement.

[4] Within a given environmental tax, it is possible to vary the tax rate depending on the relative harm of the different tax-base, such as different types of fossil fuels.

Furthermore, it could induce

- power companies to invest in natural gas plants rather than coal-based plants (capital investment to switch to less emission-intensive inputs of a different type);
- power companies, equipment manufacturers and innovators to develop new processes or equipment to facilitate all of the above actions;
- power companies to produce (and consumers to use) less power in response to the higher price of electricity caused by the SO_x tax; and
- manufacturers and innovators to develop and produce equipment that is more energy-efficient in response to the higher price of electricity.

➔ *Preferred practice: Negative externalities like pollution are usually best addressed by internalising the cost they represent to society, e.g. by using environmental taxes.*

Tax preferences can address true positive externalities, such as innovation spin-offs

41. Like an environmental tax, a tax preference is also a way of adjusting market prices – it reduces the after-tax price of the taxed-preferred product or activity. There is a well-established economic case for subsidising *positive* externalities – cases where one party's actions create social benefits that the first party would not be expected to take into account.

42. On this basis, one area in which subsidies may have a sound rationale is the development of new technologies, including environmental technologies. Firms are likely to under-invest in research and development because even with patent protection, new innovations and knowledge often provide benefits to third parties that the originating firm would not take into account in its investment decision. This implies a potential role for government support, particularly with respect to more basic R&D. The extent of externalities, however, and thus the case for subsidies could be weakened as one moves along the technology chain from basic research to development to technology demonstration and then deployment.

43. It is sometimes suggested that environmental innovation merits greater support than other types of innovation since it involves both positive innovation externalities and positive environmental externalities. This thinking confuses two separate issues. The *development* of a new emission reduction technology, for example, may well give rise to innovation spillovers – knowledge benefits beyond those captured by the inventor. It is not obvious that these would be any greater for environmental technologies than for other types of technology. The environmental externality, in contrast, arises from *deployment* or *adoption* of the technology to reduce emissions. The environmental impacts here are the same as in the case of deployment or adoption of an existing technology. They are best dealt with by the instrument chosen to address the pollution problem – which is ideally a broad pricing instrument like an environmental tax that leaves firms free to consider all the possible ways to reduce emissions, of which deployment of this particular technology would be only one.

44. Despite the above qualification, there may be true innovation-type spillovers (as contrasted with environmental spillovers) associated with the early deployment stages of newly developed technologies. Even once a new technology has been developed and demonstrated, high costs due to limited production volumes and limited information about operating costs and experience create uncertainty and risk for early adopters. The experience of early adopters can create important "learning-by-doing" and "learning-by-using" information which benefits later adopters. In principle, these kinds of external benefits may merit public financial support, such as a tax preference. The challenge in such cases is to identify the

technologies that provide such early adopter externalities, target the support, and withdraw it once these spillovers cease to be significant. This issue is discussed further below in the context of targeting.

45. Other examples of the use of tax preferences and other subsidies to address positive externalities include:

- Financial support to landowners who manage their property in a way that preserves or enhances natural capital (typically at a level above that required by regulation) and its ability to provide ecosystem services that benefit other people, such as flood protection, water purification, wildlife habitat or landscape beauty. Such government support is an example of a payment for ecosystem services (OECD, 2010c).

- A tax credit for donations of ecologically sensitive land to government or land trust organisations so as to protect the ecological services provided by such lands (Olewiler, 2008).

➔ *Preferred practice: Consider subsidies (including tax preferences) for true positive externalities.*

Tax preferences often attempt to "pick winners"

46. In practice, the most common use of environmental tax preferences is not to address positive externalities as such, but rather to avoid negative externalities. Tax relief is often given to encourage actions and products that are environmentally preferable relative to common, baseline practices, for example, because they produce lower emissions. This reduction in emissions may be seen as a kind of positive externality – but it is essentially the avoidance of the environmental harm (a negative externality) which would be caused by the baseline practices. Despite some similarities, however, tax preferences for "environmental goods" generally do not have the same efficiency characteristics as taxes on "environmental bads".

47. If a tax preference were actually targeted directly to reducing emissions (or other environmental damage) in this way, it would operate similarly to a direct tax on pollution or an emission trading system, providing a continuous incentive for each firm in respect of every unit of pollution.[5] In practice, however, tax preferences are typically deployed at some distance from the externality – not directly on emissions reductions, but rather on actions or goods that may bring about reduced emissions. The result is a substantial loss in effectiveness and efficiency.

48. In order for a tax preference or other subsidy to have the same effect as the tax on SO_x emissions discussed above, the government would have to subsidise equally emission reductions through all the possible channels noted in the example and other similar avenues. In practice, governments do not have the information that would be needed to do this, and even if they did, the policy would likely be too complicated to implement. Since it is not usually possible to subsidise all the ways in which emissions might be reduced, tax subsidies often involve subsidising one or a few alternatives – "picking winners". This has a number of downsides.

49. While a subsidy may correct the relative price of the subsidised good or behaviour relative to a more environmentally harmful alternative, the subsidy distorts other relative prices. Favouring one beneficial activity or product creates a relative disadvantage for other activities that may have similar

[5] It could, however, be a substantial challenge in such a system to define the baseline level of emissions. Further, while a direct subsidy to pollution abatement may operate similarly to a tax on emissions or a cap on emissions with tradable emission permits in terms of firm abatement incentives, a subsidy can have perverse impacts at the industry-wide level – see the section below "Tax preferences can increase pollution".

benefits. It encourages firms and consumers to adopt the subsidised solution, even in cases where another solution would have been more cost-effective. Encouraging particular technologies or solutions can also contribute to "technology lock-in".

50. For example, a tax preference focussed on *new* equipment reduces the market incentive to consider changing practices with respect to technologies already in place. In the case above, a tax preference for the installation of scrubbers to "clean" SO_x from coal plant emissions may result in firms adopting this approach even if it would have been cheaper for them to switch to low-sulphur fuel or to invest in increased plant efficiency. Similarly, in the context of individuals, a subsidy for low-emission vehicles steers the consumer toward a driving solution, even though he or she might have been willing to consider alternative forms of transportation with lower emissions, such as public transit or cycling, or reducing the amount of travel. In contrast, a tax on vehicle emissions (or, as a proxy, on motor fuel) would allow these low-emission alternatives to "compete" on a level playing field with low-emission vehicles.

51. By favouring particular solutions, targeted tax preferences and other subsidies short-circuit the ability of firms and consumers to respond innovatively when faced with the true cost of environmental impacts and find the lowest-cost way of reducing their emissions. It is also often the case that this year's innovation becomes tomorrow's standard technology, so unless governments are forever amending the list of eligible technologies, the target soon loses its potency at the margin. By favouring a particular path, tax preferences increase the social cost of achieving any given reduction in emissions. Some new evidence on the relative cost-effectiveness of different policy instruments used to promote reductions in CO_2 emissions is set out in Box 1.

52. The market distortion brought about by subsides can also undermine natural innovation by unpredictably changing the rules of the game. For example, a tax reduction for one technological solution can damage the prospects of firms that have invested in a different technology that the government has chosen not to support, and suddenly becomes the "wrong" technology. These firms will be disadvantaged relative to firms that invested in the government-supported solution. A policy of government support for particular technologies or solutions can therefore be expected to result in substantial private resources being wasted by firms in lobbying government to obtain and preserve favourable treatment for *their* particular products.

Box 1. Cost-Effectiveness of taxes versus other types of policy instruments

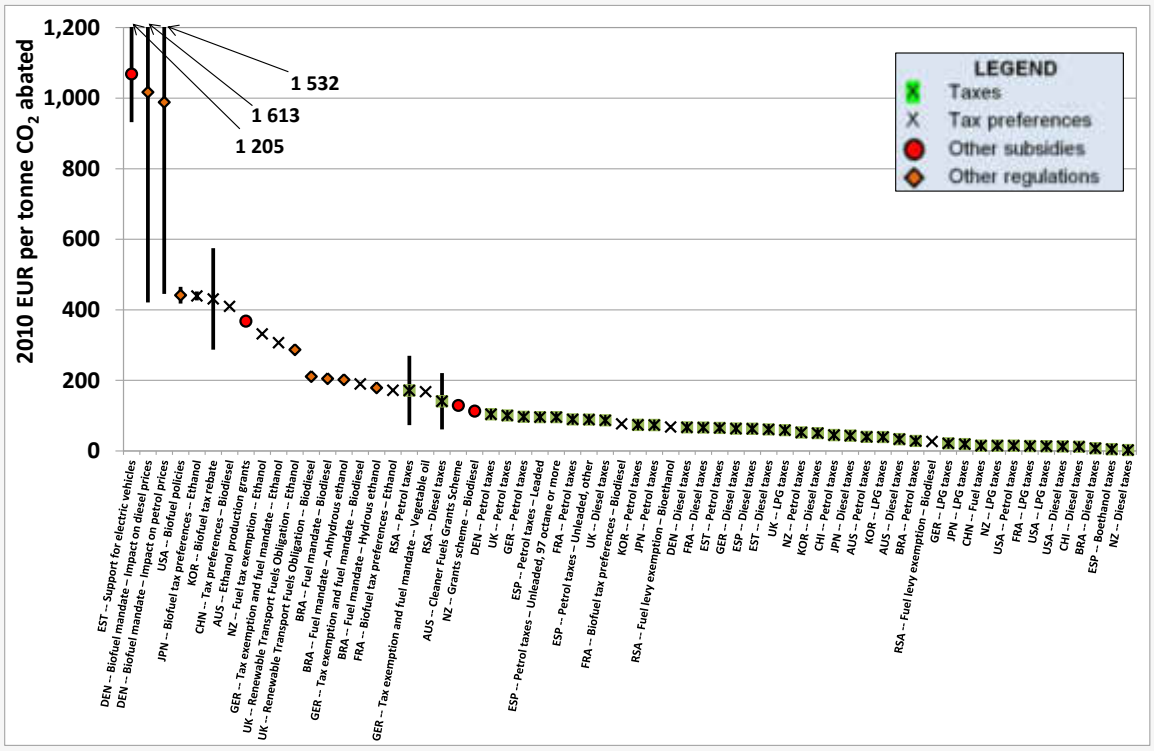
New evidence regarding the relative cost-effectiveness of different policy instruments used to promote reductions in greenhouse gas emissions is presented in OECD (2013d). Examining a range of policy instruments used in fifteen countries in e.g. the road transport and the household sectors, the study found that environmentally related taxes were consistently among the lowest cost instruments in terms of the cost per tonne of CO_2 abated – see the graphs below. Tax preferences and other subsidies were generally more expensive, sometimes considerably so, as were regulatory instruments.

The main point with the graphs is ***not*** to focus on individual policy instruments – and it is certainly difficult to read the labels giving the name of each of them. Instead, the idea is to illustrate the distribution of the various instrument types – represented by the different symbols in the graph. It should be easy to see that taxes dominates the right-hand, low-cost part of the graphs, while various subsidy types and regulations dominates the left-hand, high-cost part – in some cases with extremely high costs per tonne of CO_2 abated.

These results are consistent with the general principles discussed above – that the economic cost of environmentally related taxes tends to be lower than other instruments like tax preferences and subsidies because of the flexibility of taxes provide in allowing firms and households to choose least-cost responses.

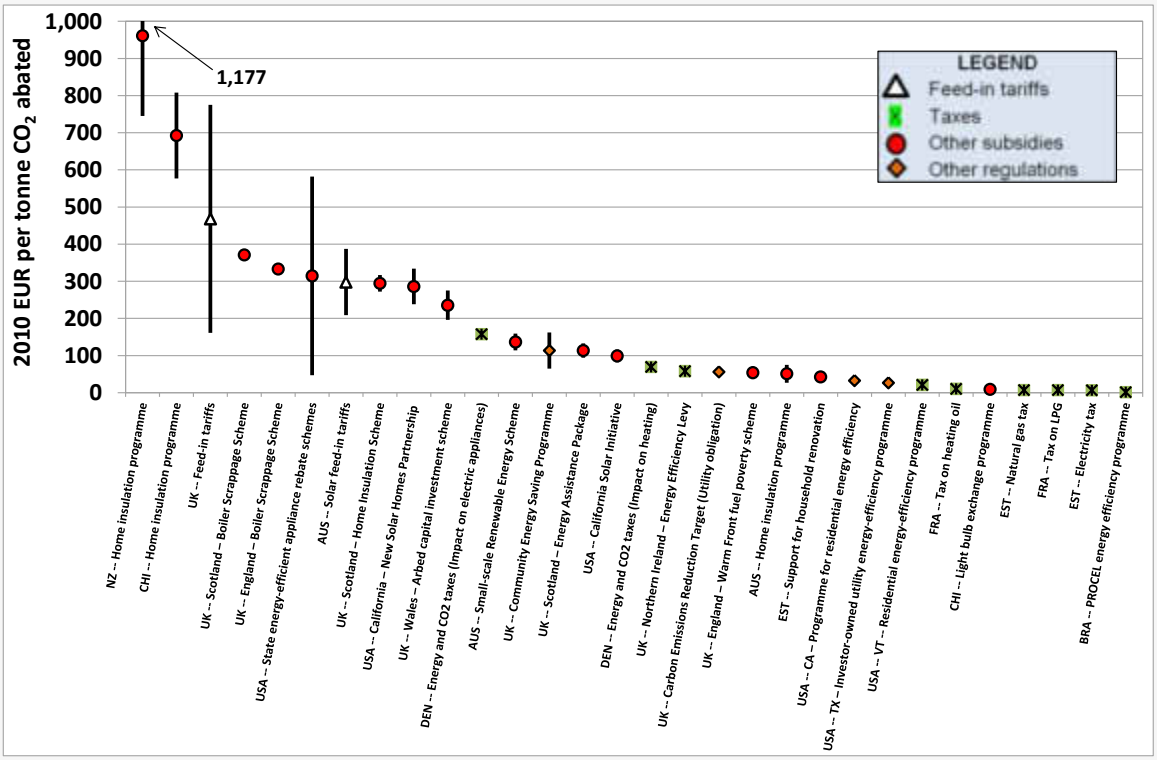
Estimated effective carbon prices in the road transport sector, by instrument

2010 EUR per tonne of CO_2 abated



Estimated effective carbon prices in the household sector, by instrument type

2010 EUR per tonne of CO_2 abated



Note: Ranges shown for some instruments reflect different choices about assumptions used in the estimates.

Source: OECD (2013d), Effective Carbon Prices, OECD Publishing, Paris.

53. There are, however, strategies that can reduce the need to try to pick winners. To maximise cost-effectiveness, a tax preference should be related as closely as possible to the actual positive externality (reduction of emissions), so as to leave the maximum flexibility in terms of how to bring it about. For this reason, it should preferably be based on a measure of outputs – results or performance – rather than on a measure of inputs, like the value of investment, or type of equipment or fuel used. This avoids the need to pick winners by choosing technologies. It also serves to reward and incentivise productivity.

54. For example, if a policy of subsidising renewable power generation is chosen in order to shift energy toward low-carbon sources (instead of the more direct route of taxing carbon), it would generally be more efficient to provide a tax credit of a given financial amount per unit of incremental emission-free electricity produced than to subsidise investment in a range of specific technologies by covering a percentage of eligible costs. This, in principle, preserves the market incentive to adopt the lowest cost technologies and so tends to reduce overall abatement costs. (Though note that even this policy of subsidising clean production provides no support for the option of reducing electricity consumption, and thus will not be as cost-effective as a tax on a fuel used to produce electricity.) If instead, specific technologies are specified, the net should ideally be cast broadly, to maximise firm flexibility. Support levels should normally be equalised across technologies unless there are particular externalities that vary by technology.

55. One approach to making subsidies more technology or input neutral is to base them on *performance standards* rather than specified products. For example, rather than simply exempt all biofuels from excise tax as many countries do, Switzerland only exempts biofuels that meet a minimum environmental standard. The Netherlands' *Energy Investment Tax Incentive* has a list of eligible technologies, but it also has a generic category covering any investment in energy-saving technology that meets a certain minimum threshold, measured in the amount of energy saved per euro invested. Provided the standard is rigorous enough, this approach can provide some incentive for innovation to develop new products that meet the standard.

56. For a performance standard to be effective, however, it needs to be regularly assessed and periodically updated as the average level of equipment performance improves, to ensure that it continues to represent a "stretch" target beyond common practice. This is discussed further below in the section on reducing windfalls.

➔ *Preferred practice: Tie support as directly as possible to the desired results (the positive externality) rather than to inputs; remain technology-neutral*

Tax preferences are not well suited to address certain market failures

57. Tax preferences can be used to respond to a wide variety of environmental policy problems. While they may play a positive role in many situations, they will often not be the most cost-effective instruments. Policy instruments should be chosen which best address the market failure identified.

58. Sometimes the analysis of an environmental problem may point to a capital market failure. For example, firms or households may decide that they would like to invest in energy-efficient equipment that would be cheaper over the product life-cycle due to lower energy costs, but are unable to finance the higher up-front costs of such equipment, perhaps due to limited access to credit.[6] This kind of problem suggests

[6] Limited access to credit for some households does, however, not *necessarily* reflect a capital market imperfection. On the contrary, it may reflect that markets work efficiently.

that the most cost-effective way for government to provide assistance may be by way of credit support like loan guarantees or low-interest loans, which are better focussed on the problem.

➔ *Preferred practice: Capital market failures are often best addressed by credit policies.*

59. Another common market failure is "split incentives", also known as the principal-agent problem. Higher energy costs caused by energy taxes that reflect environmental costs normally provide an incentive for consumers to conserve energy by using it more efficiently. In a residential setting, this could be done by reducing energy usage (turning down the heat) or by investing in more energy-efficient facilities and equipment (better insulation, more efficient heating equipment). In the case of rental property, however, there is a disconnect – a building-owner has little incentive to invest in energy-saving equipment because the cost savings accrue to the tenant, who – depending of the rental contract used – pays the energy bills. It is also possible that the tenant is not planning to stay in the dwelling for a long enough period of time that would allow him or her to recoup the reduced energy bills, whereas the landlord inherits the windfall capital improvement that is reflected in property prices.

60. It is important to keep in mind that this type of principal-agent problem sometimes, at least in part, can be caused by rental laws that restricts the landlords' possibility to cover the costs of investments to increase the energy-efficiency through increases in the rents they charge from their current tenants.

61. Tax preferences or other subsidies to landlords would be an expensive way to address this problem since they would likely have to cover the full incremental cost of the more efficient equipment in order to induce landlords to invest. Approaches more likely to be cost-effective include giving landlords better possibilities to pass on the cost of these kinds of capital improvements to tenants or minimum energy-efficiency standards for rental buildings.

➔ *Preferred practice: Principal-agent problems, for example split incentives between landlords and tenants, might sometimes be better addressed by changes in regulation.*

62. There can also market failures in relation to information, both on the demand side, among consumers or firms that buy various goods and services, and on the supply side, among the firms that produce these goods or services.

63. Regarding the first case, studies have found that consumers and businesses sometimes do not undertake environmentally favourable investments that would in the long run save them money because they do not have adequate information about the costs and benefits of the technologies involved. While a tax preference could be one mechanism for tipping the balance in such cases, a programme directed at ensuring the availability of relevant information may be more cost-effective. Examples could include government information campaigns, mandatory labelling of products with energy and environmental performance information, environmental performance ratings systems for products (like the EnergyStar system, originally launched by the U.S. EPA, but now used in a number of countries), and mandatory disclosure of energy and environmental performance information about apartments by landlords to prospective tenants.

64. On the other hand, the designation of a product as eligible for a government subsidy or tax preference (e.g. inclusion on a list of eligible environmental technologies) can itself perform a "signalling" function to the public which, apart from the financial support, encourages businesses or consumers to investigate potential use of the product when they might not otherwise have done so. For the suppliers of relevant goods or services, the potential inclusion on the list of eligible technologies could serve as a motivating factor.

65. Ruijs and Vollebergh (2013), for example, note that the list of technologies eligible for the *Energy Investment Tax Allowance* (EIA) in the Netherlands provides information about proven technologies that meet certain standards to firms planning to buy new equipment, something which can reduce their technology search costs. Apart from the implicit government endorsement of the listed product, they suggest that a financial benefit – even if modest – may serve an important attention function that would not be achieved by the government list on its own. They note, however, that De Beer et al. (2000) concluded that it is difficult to determine the "attention value" of the EIA list, with only 4% of respondents to a survey indicating that it had affected their investment decision.

66. Another issue noted by energy policy analysts is that consumer and business investment in energy-saving technology is often characterised by high implicit discount rates – the rate that would equalise the present value of the energy-savings over the life of the equipment and the additional capital cost of the equipment (relative to conventional assets). In other words, businesses and consumers often forego capital investments that would pay for themselves from future energy-savings if those savings were discounted at typical borrowing rates (Geller and Attali, 2005).

67. While tax preferences or other subsidies could be used to "buy down" the discount rate on the energy saving equipment, this would likely be an expensive way of trying to address these issues. It is more likely to be cost-effective to address head-on the factors that cause people to discount future savings, such as insufficient information about expected energy-savings or split incentives (discussed above). One potential explanation of seemingly irrational energy choices is that people's actions may be more influenced by habits than a dispassionate economic calculus. This might suggest the need to target information campaigns to people who are more likely to be in a position to change their habits (e.g. because they are changing residence) (Baveye and Valenduc, 2011).

➔ *Preferred practice: Information gaps are best addressed by information policies.*

Tax preferences can indirectly lead to an increase in pollution

68. Since tax preferences and other subsidies make the subsidised activity cheaper, they may perversely increase activity levels and the level of environmental harm.

69. This phenomenon is often called the "rebound effect" and is particularly noted in the energy-efficiency literature. Improvements in energy-efficiency often do not translate fully into reductions in energy use because they effectively make activities that use energy "cheaper" in terms of energy cost. For example, if cars become more fuel-efficient, each kilometre of travel becomes cheaper, and users may respond by increasing the number of kilometres they drive. Similarly, greater fuel-efficiency in housing may encourage people to live in larger houses. This effect results in the level of energy savings being less than the degree of improvement in efficiency, and in an extreme case, could result in an increase in energy use.

70. Rebound effects can in this way reduce the cost-effectiveness of subsidies and in some cases eliminate them altogether. For example, a tax incentive to purchase a new energy-efficient appliance is still a subsidy to appliance use. It may well encourage a family to replace their current refrigerator with a new, more energy-efficient model. If, however, the family keeps its old refrigerator in service as a supplementary device (e.g., a "beer fridge"), the perverse result may be an overall increase in energy use. It may be possible to reduce the likelihood of such effects by making the incentive conditional on the consumer handing over the old appliance for recycling. This would not, however, prevent the family from using the subsidy to replace its old refrigerator with a bigger (albeit more efficient) appliance. In general, the overall level of energy use would likely decline less than implied by the increase in average efficiency, and could even increase.

71. The Swedish National Audit Office (SNAO) raised similar concerns in its audit of Sweden's tax exemption for biofuels. The SNAO found that a tax exemption for low-level blended biofuels in gasoline and diesel will, all other things being equal, contribute to lower prices for gasoline and diesel and therefore to higher consumption of fuel overall. According to the SNAO's assessment, even a marginal increase in total fuel consumption can cut the reduction in emissions brought about by the low-level blending of biofuels by almost a quarter. If the degree of low-level blending were raised, the effect would become even more pronounced (SNAO, 2011). Similar findings concerning vehicle *bonus-malus* schemes are set out in Box 2.

Box 2. Potential for perversity – bonus-malus schemes

Environmentally motivated subsidies, whether provided through the tax system or by cash transfers, risk having perverse results. A subsidy to purchase or use a *less* environmentally harmful form of a product is still a subsidy encouraging a product or activity with environmental impacts. While the subsidy may shift usage to the less harmful product, it can increase overall usage and therefore potentially increase the overall level of environmental harm – the opposite of the result intended.

An example of this difficulty is so-called *bonus-malus* or feebate schemes, which have been used to promote the use of more CO_2-efficient vehicles in several jurisdictions, including Austria, Canada (where the subsidy element was dropped after two years), France and Wallonia (Belgium). Such schemes typically combine a tax, with increasing tax rates for vehicles with emissions above a certain limit, with a subsidy to low-emission vehicles, where the subsidy might increase with decreasing emission levels.

In 2007, France put in a place such a scheme, with two main components:

- A payment to those who purchased a low-emitting vehicle of an ecological *bonus* or rebate (originally between EUR 100 and EUR 5 000) depending on the vehicle's emissions rating – a subsidy;
- A payment by those who purchased a high-emitting vehicle of a *malus* (penalty) or fee, both on the registration of the vehicle (originally in the range of EUR 200 – 2 600) and annually (originally EUR 160) – an environmental tax.

In theory, since CO_2 emissions from fuel use are a direct function of the quantity of fuel, the social cost of CO_2 emissions from automobiles is best internalised by including a component in fuel taxes that reflects the social cost of carbon, without need for supplemental measures. However, the upfront financial penalty imposed by a *bonus-malus* system may be justified if asymmetric information and myopic behaviour (i.e. an unusually high discount rates) mean that consumers do not fully take into account, with the fuel tax in place, the reduced lifecycle cost (including capital and fuel costs) of more carbon-efficient cars. The problem with the bonus or subsidy part, by contrast, is that by subsidising even low-emission cars, it encourages car purchases, which contribute to CO_2 emissions (OECD, 2013c).

The evidence regarding the French *bonus-malus* system suggests that it has been very successful in achieving *some* of its purpose. The Cour des comptes, the French national public audit agency, found that it contributed to a decline in average CO_2 emissions for new vehicles from 149 g of CO_2/km in 2007 (the year before the system came into effect) to 130 g of CO_2/km in 2010 (Cour des comptes, 2012a). However, the court noted that a recent study had found that the global effects were likely very different. Givord and d'Haultfoeuille (2012) found that in the short-term, CO_2 emissions had likely increased, primarily due to the inducement given to the construction of new cars, which is CO_2-intensive. Based on the initial trends they predicted that in the long-run, if the original policy setting had remained in place, despite the reduction in average fuel-efficiency of the vehicle fleet, there would have been a substantial increase in total emissions (in the range of 9.3-13.7%) due to: 1) the expansion of the fleet, and 2) increased driving induced by the reduction in driving cost associated with increased fuel-efficiency (the "rebound" effect). They estimated that even with a substantial tightening of the programme terms, the effect on CO_2 emissions would be approximately neutral (in the range of -0.4% to +1.4%) rather than materially positive.

72. This problem is not unique to tax preferences that favour a particular technology; it may be present even in the case of tax preferences that apply directly to each unit of pollution abated relative to some baseline. At firm level, a tax preference to pollution abatement may provide a similar incentive on the margin as a tax on emissions or a cap-and-trade system. However, since a tax preference reduces firm costs, to the extent that it increases firm profitably and is available to new entrants, it could attract entry to

the industry and therefore encourage an increase in overall output and emissions (Hartwick and Olewiler, 1997).[7]

73. Use of environmental taxes to directly internalise the cost of the environmental damage does not give rise to the risk of inadvertently promoting environmentally harmful activities that may arise with tax preferences and other subsidies.

➔ *Preferred practice: Consider using environmental taxes to avoid the potentially perverse pollution impacts of tax preferences.*

Tax preferences require clear, objective standards

74. Unlike cash subsidies, which may be based on an application review process, with a tax preference, the exact terms of eligibility are usually set out unambiguously in the law so that taxpayers can determine whether or not a particular action or purchase will be eligible for the incentive. Eligibility for income tax benefits is usually based on self-reporting, while eligibility for value-added and sales tax preferences normally must be simple enough for merchants to be able to determine easily whether a given sale benefits from the provision.

75. The use of objective, and ideally relatively simple, criteria allows tax preferences to be administered as part of the general income or consumption tax system. This can allow for lower administrative costs for tax preferences relative to cash grants because issues concerning determination of eligibility and financial flows are handled largely by existing tax collection officials, avoiding the need for a dedicated administration team usually associated with cash grant programmes. Whether or not the administrative costs actually will be lower for tax preferences than for grants will, however, depend on many aspects of the tax- and support systems in place.

76. On the other hand, the need for objective, legislated criteria can make it difficult to target preferences to the cases that most need support. In order to avoid uncertainty, there is typically little room provided for administrative discretion. Eligibility is usually based on clear lines and limits, which can mean rough justice, with no ability to take into account special or unusual cases. There are also limited opportunities to verify compliance since most tax incentives are only audited on a selective basis.

77. By contrast, spending programmes can have more detailed eligibility criteria. For subsidies with a large value, substantial information can be required of applicants and there is normally a screening process to determine eligibility. There may be some discretion to vary the value of the grant based on the perceived level needed to affect the behaviour of the applicant (though incrementality is difficult for any third party to judge). The screening officials would often be specialists, dedicated to the programme, whereas in a tax revenue administration, screening is most often done by generalist auditors who cover many issues, though potentially backed up by subject-area specialists who may, for example, conduct compliance audits.

78. The tax system can be an effective delivery mechanism for financial support when it is possible and appropriate to set clear, objective eligibility criteria, which can reasonably be verified by tax auditors. This may be possible, for example, where there is a system of environmental standards for products, set by some independent body – such as an energy-efficiency certificate or rating – which can be easily verified.

79. It is sometimes possible to make eligibility for a tax preference dependent on a more elaborate screening process based on review and acceptance of a proponent's application – a kind of pre-audit to

[7] The same is the case also for other types of subsidies.

ensure that the activities being supported meets the conditions for the preference. Normally, however, the amount of the tax reduction is fixed in nature and cannot be varied based on a determination of the degree of need for support. As the significance of this kind of administrative review increases, the benefit of using the tax system as a delivery mechanism declines.

➔ *Preferred practice: Tax preferences will be more feasible to the extent that simple, clear criteria can be used.*

Tax preferences can cause windfall gains or "free-riding"

80. Environmentally motivated tax preferences are usually intended to change behaviour – to encourage people to undertake activity that they would not otherwise undertake. One consequence of tax preferences being based on relatively general – common for all – criteria, however, is that it is difficult to restrict the benefit to those who require the subsidy to induce them to undertake the environmentally preferred activity. Therefore, a significant portion of the cost of tax preferences may relate to windfall benefits to those who would have undertaken the activity even without a subsidy (sometimes referred to as "free-riders" – those who enjoy a benefit they were not really intended to receive). This amounts to a change in the distribution of costs (from the private sector to government) with no change in the underlying behaviour. With free riders, public resources reward existing behaviour rather than motivating changes in behaviour. This "pat on the back" can be expensive.

81. Windfalls are a problem with any form of government financial assistance, due to the difficulty of determining how much of an incentive any given person needs in order to change their behaviour. It is particularly acute with tax incentives, which usually aim to have relatively simple eligibility tests so that they can be administered by tax collection authorities without need for a specialised bureaucracy. Empirical evidence suggests that free-ridership can be a serious issue with tax preference schemes. For example, an independent review of the *Energy Investment Tax Allowance* in the Netherlands found that 52% of respondents in a survey indicated that they would have made the same investment even if the allowance were not available. Measures were subsequently taken to improve the programme's efficiency (De Beer et al., 2000, cited in Ruijs and Vollebergh, 2013).

82. The fact that many beneficiaries of a subsidy may have undertaken the targeted activity even without support makes it difficult to evaluate the cost-effectiveness of these policies. Simple evaluations of such policies sometimes compare the amount of qualifying activity or the number of beneficiaries with the fiscal cost of the tax preference – for example, "EUR 80 million in tax reductions supported EUR 240 million in eligible investment in green technology". This is not a very helpful statistic, however. To evaluate the policy, it would be more relevant to compare the fiscal cost against the amount of *incremental* or *induced* eligible investment – the investment that would not have been undertaken *but for* the tax preference.[8] The difficulty in determining the amount of induced activity is that there is typically no data available on the baseline counterfactual situation – the amount of activity that would have occurred in the absence of the subsidy.

83. With a tax preference or other subsidy, to maximise incrementality and limit costs, the support should preferably be limited to actions that go beyond a business-as-usual baseline. If the eligibility criterion is gradually made stricter as technologies develop, the measure is less likely to provide benefits to those who would have undertaken the activity even without support. Ideally, conditions would be set based on firm-specific criteria (e.g. activity level in a baseline year). Because of inadequate information and administrative impracticability, however, in many cases, it may need to be done on a more general basis,

[8] Even if one managed to estimate the amount of additional investments, one would, however, still measure an *input* rather than an *output*. A carful policy assessment would rather consider the impact of the additional investment.

for example, by limiting eligibility for an investment incentive to equipment that is above industry norms – e.g. best available technology (BAT). For example, the Dutch *Energy Investment Tax Allowance* (EIA in Dutch) requires that eligible technology must result in a substantial reduction in energy consumption and not yet be in common use. In one programme adjustment, a *maximum* cost-efficiency standard was imposed, in order to exclude equipment with a very short payback period, which should be attractive even without support (Ruijs and Volleburgh, 2013). Such standards should be based on objective, easily verifiable criteria that are costly to mimic.

➔ *Preferred practice: Make eligibility dependent on an environmental performance that goes well beyond "business-as-usual", with a tightening of the criteria as technologies develop.*

84. Tax preferences for energy-efficiency or clean energy equipment in a number of countries (e.g. Canada, Ireland, the Netherlands and the United Kingdom) are based on lists of eligible equipment. Such lists may describe types of equipment generically or list particular product models of specific manufacturers.

85. If there are eligibility standards like performance thresholds or an equipment list, it is important that they be reviewed regularly and updated, to ensure that they continue to reflect a stretch target even as technology and practices evolve. Where there is a list, this requires both adding new items and removing those which are no longer "cutting edge". The EIA technology list in the Netherlands, for example, is updated annually, with additions and deletions. Equipment that has become widely used is removed from the list. In practice, this kind of updating can be challenging for officials. Aside from the pure technical issues of keeping on top of developments, there can be considerable lobbying pressure from suppliers and users of particular technologies to continue to be added to the list and retained during subsequent reviews. In addition to being more technology neutral, a performance standard also has the advantage of helping to avoid some of the administrative costs associated with lobbying that is associated with a fixed list.

➔ *Preferred practice: Ensure that standards and eligibility lists are updated regularly.*

86. Ruijs and Vollebergh (2013) found that more stringent eligibility standards and evaluation processes to update the EIA list seem to have improved the subsidy's effectiveness. A study released in 2007, for example, using the same survey as a 2000 study, found that the share of free-riders had decreased from 52% to 47% – though still a substantial number.

87. Nauleau (2014) also found evidence of high levels of free-riding in tax credits for home insulation in France, with an estimated average proportion of free-riders varying from year to year between 40% and 85%. She also found that the tax credit had no significant effect during the first two years, suggesting that it took time before people responded to the scheme, possibly due to the complexity of the tax credit scheme. She further found that the tax credit had an increasing, significant positive effect from 2007 to 2010, before slightly decreasing in 2011.

88. Tax preferences for particular technologies or inputs normally provide little incentive for innovation to develop new emission reducing technologies (dynamic efficiency effects). This shortcoming can be partly addressed, however, by use of a dynamic technology list. By helping to bring new products to the attention of users, a dynamic list can help speed up the market penetration of new technologies – a key challenge for innovators. This would be expected to increase incentives for innovators to develop new products, as long as they believe that these new products will be added to the list. The extent to which these dynamic incentives work in practice, however, has not been fully established (Ruijs and Vollebergh, 2013).

89. In some cases, it may be possible to exclude people or companies who are more likely to adopt the behaviour being promoted without support, based on some common characteristic, like firm size (Aalbers et al., 2011). This kind of selectivity, however, could give rise to complaints about fairness in some instances, and it might create perverse incentives in certain situations. One case where it may be justified would be a consumer measure supporting green purchases which is directed toward low-income consumers for whom the higher up-front cost of such appliances is more likely to be a barrier to purchasing. As discussed above, however, the appropriate policy response depends on a careful assessment of what the exact market failure is – inadequate information about the long-term cost savings, or a financial market failure that prevents the consumer from being able to finance the purchase.

➔ *Preferred practice: Consider focussing eligibility on those that are less likely to be free riders*.

Tax preferences require funding

90. Environmentally motivated tax preferences are sometimes politically appealing because they can be presented as a tax reduction, albeit a very targeted one. This can sometimes be attractive to a government that wishes to be seen as reducing taxes, controlling the size of government, and avoiding new spending programmes. Because of their targeted nature and purpose, and limited connection with the revenue-raising purpose of taxation, however, most environmentally motivated tax reductions can be viewed as a form of spending through the tax system. They are very different from broad-based reductions in tax levels.

91. On the other side, there is also a possibility that the public will view the introduction of new tax preferences as "a waste of taxpayers' money", which of course reduce any political benefits referred to above.

92. While targeted tax preferences are not always enumerated in annual government budgets, they have a real fiscal cost. A dollar of revenue foregone through a tax preference has the same impact on the government's overall fiscal position as a dollar spent through a grant programme. As with other subsidies, these revenue losses must be financed, either through:

- larger use of other taxes, which discourages the activity taxed (earning income in the case of income taxes, working in the case of payroll taxes, etc.) and tends to reduce overall economic output;[9]
- reductions in potentially welfare-enhancing public expenditures; or
- higher government deficits and debt.

93. These financing options in the case of tax preferences stand in contrast to the case of environmental taxes, which provide an opportunity to reduce other taxes, increase spending or reduce deficits.

94. In general, the connection between a particular preference and the need for higher taxes elsewhere may not be obvious, and the group of people impacted by higher taxes is likely quite diffuse. Meanwhile, the beneficiaries of a tax preference are usually clear and often concentrated, which facilitates

[9] The need to pay for tax incentives by the use of taxes that tend to reduce economic output is sometimes called the "revenue financing effect". Parry (1998), however, illustrates that subsidies such as tax incentives that decrease the price of consumption goods (e.g., tax preferences for "green" goods) also increase the effective real household wage by increasing people's purchasing power. This wage increase encourages people to work more, which has a positive effect on economic output. This "tax-interaction effect" can offset much, but generally not all, of the negative impact on economic activity from the revenue financing effect.

their lobbying in favour of the measure. This contrasts with environmentally related taxes, where the negative impact of the tax itself and its impact in increasing the price of particular goods may be more readily seen by consumers. The benefits in terms of environmental impact, however, tend to be more diffuse, making for a greater political "marketing" challenge. This highlights the importance of communication and transparency – so that policy makers and citizens alike recognise that there are no "free lunches".

95. The cost of tax preferences is also normally *fiscally open-ended*, being typically structured as entitlements. As long as a person meets the legislated terms of the measure, they are entitled to receive the benefit. Like for various grant schemes, fiscal cost therefore depends on the degree of take-up, which can be difficult to predict in advance, making cost control difficult. Some examples of these difficulties are set out in Box 3.

Box 3. The challenge of tax expenditure cost control

The experience of some OECD member countries indicates that the fiscal cost of tax preferences can be difficult to predict and control. This can be a serious issue at a time when countries are struggling to restore sound public finances.

The annual amount of tax foregone, for example, under the *Energy Investment Tax Allowance* in the Netherlands more than quadrupled between 1997 and 2002 to EUR 198 million as the programme grew in popularity. In several years, eligibility for the programme was closed before the end of the year, in order to avoid budget over-runs. Subsequently, standards were made more stringent and benefits reduced as part of a process of learning by doing. (Ruijs and Vollebergh, 2013).

In a 2012 review of France's *bonus-malus* scheme for automobiles (outlined in Box 2 above), the Cours des comptes, the national public audit agency, noted the findings of the INSEE study referred to above, that the measure had not likely reduced overall CO_2 emissions and may have increased them. On the fiscal side, the court found that while the measure had been intended to be roughly revenue-neutral, and despite rate adjustments, it had in fact cost EUR 1.25 billion over the 3-year period examined. The total cost was on the order of EUR 2.5 billion when one included the cost of additional bonuses paid to those replacing an old vehicle, which had been more than twice as costly as forecast. The court concluded that because of the difficulty of assuring fiscal equilibrium when relying on tax expenditures, it is generally preferable to rely on budgetary spending or on the use of taxes (Cour des comptes, 2012a, 2012b).

A subsequent *ex post* study found that it would have been very difficult to accurately predict the fiscal cost of the French programme in advance because the consumer reaction was much greater than normal estimates of the price elasticity of demand for vehicles would have suggested (D'Haultfoeuille, Durrmeyer and Février, 2011). This is consistent with a body of literature indicating that there may a higher responsiveness of consumer behaviour to tax- or other policy-induced price changes than normal market-price fluctuations, due to a "salience" or "signaling" effect (see: Rivers and Schaufele, 2012; Li, Linn and Muehlegger, 2012; Sunstein and Taylor, 2008). The resulting uncertainty underlines the risks in predicting the take-up and cost of tax subsidies.

96. Evaluation of tax preferences should include consideration of the fiscal cost of financing the revenue foregone and the economic cost of raising the necessary funds through other taxes. Government decisions on such measures should be supported by an assessment of the expected fiscal costs estimated over the usual fiscal planning horizon. When new tax preferences are announced, these estimated costs should be published (e.g. as part of the annual budget). These *ex ante* fiscal cost estimates should periodically be compared with the *ex post* tax expenditure estimates (discussed below) as a type of audit of the estimation process.

97. Some countries have addressed the fiscal exposure caused by the availability of a tax preference to anyone who meets its terms by placing budgetary ceilings on tax expenditures, similar to fixed funding envelopes for spending programmes. This generally requires some kind of pre-certification procedure so that the taxpayer can know at the time of the transaction whether or not they will benefit from the tax

relief. This increases administrative costs, however, and makes the provision more like a spending programme.

➔ *Preferred practice: The cost of tax expenditures should be managed as closely as cash expenditures.*

Tax preferences can have significant administrative costs

98. Aside from direct fiscal costs and economic costs, a tax preference, like other subsidies, can also involve significant administrative costs. It requires that government resources be devoted to evaluating various methods of reducing pollution, trying to determine which are the most appropriate, and then devising and administering subsidy mechanisms to support them. Changing technologies involve the government in a constant race to keep on top of new developments.

99. In contrast, with a tax or trading instrument that incorporates environmental damage into market prices, the government can leave the issue of technology choice to the market. Analysis is required to establish the approximate size of external damage caused and thus the appropriate level of the tax, but the resulting tax will generally be an excise tax of a fixed amount per physical unit of the good, involving relatively standard tax administration issues.

100. It is sometimes supposed that tax preferences have low administrative costs as compared with cash subsidies because they use the existing tax administration system. This is only the case where they use relatively straightforward, objective criteria. As noted above, use of objective performance criteria rather than detailed technology prescriptions also helps keep the measure technology-neutral, which will tend to favour the least costly solutions. If more detailed case-by-case assessments are required, there may be an advantage to using a direct subsidy programme with a staff of specialist administrators.

➔ *Preferred practice: Administrative costs are minimised when tax preferences are based on relatively simple, objective criteria.*

The costs of tax expenditures are often not transparent

101. Furthermore, the cost of a tax expenditure can be difficult to determine, even *ex post*. In some cases, like a reduced tax rate for a particular product, the determination is relatively simple. For other cases, the determination can be much more difficult.

102. The cost of tax preferences tends to be particularly opaque in the case of measures that affect the timing of tax deductions, such as provisions that allow accelerated depreciation of assets for tax purposes. While not changing the total amount deductible in respect of the cost of a capital asset, accelerated depreciation allows the deductions to be taken over a shorter number of years than would normally be the case. This reduces tax liability in the early years of an asset's life and increases them in later years. The net effect is beneficial to the taxpayer because the reductions in early years are more valuable in present value terms than the higher tax liability in the future. The impact of such measures on government budgets is not always obvious and can be presented in several different ways:

- a cash flow approach, focussing on how government tax receipts differ in any one year from what they would have been without the incentive; or
- a present value approach, which focuses on the present value at a point in time (usually the time of the initial investment) of the acceleration in the deductions.

103. The gap between tax and spending measures in terms of transparency can be significantly reduced by rigorous tax expenditure reporting. The cost of tax expenditures should be estimated and

publicly reported on an annual basis. Reporting should cover preferences under all aspects of the tax system, including personal and corporate income taxes, value-added and sales taxes, and excise taxes. The methodology and benchmarks used should be disclosed. As with cash accounts, the methods used should be subject to periodic scrutiny by independent government auditors. Ideally, these reports should be integrated into the annual budget process so as to encourage concurrent review of direct spending and tax concessions.

➔ *Preferred practice: Issue regular and comprehensive tax expenditure reports documenting costs and benefits.*

104. When tax preferences are used as instruments of environmental policy, the reporting mechanisms should include not only those specific to the tax system, like tax preference reports, but also reporting mechanisms which address environmental policies more broadly. This is particularly important when tax policy measures and environmental policy fall under the responsibility of two different ministries (e.g. Finance or Treasury on the one hand, Environment on the other). Even if, for example, the finance ministry is formally responsible for a particular environmental tax preference, for policy coherence it is important that the measure be covered in summary reports and assessments of environmental policy, usually prepared by the environment ministry. In either case, the reporting ought to describe as carefully as possible both the costs and the environmental benefits (if any) of the various tax preferences.

➔ *Preferred practice: Integrate reporting on environmental cash and tax expenditures and other environmental policies.*

Tax expenditures are often less scrutinised than alternative policy instruments

105. Tax expenditures also tend to be subject to a lower level or frequency of legislative scrutiny than spending programmes. Even if ministries of finance normally will be aware of existing tax preferences, it is not given that members of parliaments – and the public at large – have similar information. Tax measures are usually, though not always, implemented as permanent changes to the tax law. Thus, while they receive legislative scrutiny before being enacted, there is often no formal process to evaluate the operation of the measure over time and consider whether it continues to be justified in the face of changing circumstances. By contrast, spending measures usually rely on a financial appropriation of a fixed amount for a limited period that has to be renewed on a regular basis. This normally provides an opportunity for legislative oversight and an opportunity for questioning the impact and effectiveness of the measure.

106. Since they are written into legislation, tax expenditures can also, like many other policies, create a sense of entitlement and often carry considerable inertia. They typically continue by default unless a strong case is made for their removal. For those who will benefit from a tax preference, the perceived "permanency" of the support can be an important impetus to invest considerably in lobbying to obtain favourable treatment. Box 4 outlines an example from the United States of the difficulty of limiting even unintended beneficiaries once a tax preference is in place.

Box 4. Unintended beneficiaries – The curious case of black liquor

Since the 1930s, it has been a longstanding practice in the pulp and paper industry to use "black liquor", the residual from the chemicals used in breaking down wood pulp, as a fuel in pulp mills. In 2009, the United States Internal Revenue Service held that black liquor was an alternative fuel eligible for a longstanding fuel blenders' tax credit that had been put in place to promote the use of ethanol for motor vehicles. Pulp mills could qualify for the credit as long as they combined the black liquor with a small amount of fossil fuel. Since black liquor is widely used as fuel in the industry, the unanticipated claims cost the Treasury more than USD 4 billion, even though no new use of alternative fuels was encouraged.

Attempts to close the unintended loop-hole met with stiff opposition from the forest industry, which argued that it badly needed financial support at a time of stiff international competition and weak prices. Shortly afterwards, the Canadian government introduced new support measures for *its* pulp industry, which argued that it could not compete with U.S. competitors who were receiving the unanticipated tax credit. Eventually, the U.S. Congress amended the law so that black liquor would not qualify for the blenders' credit for years after 2009. They also amended the law to ensure that black liquor would not qualify as "cellulosic biofuel", which was eligible for a credit roughly twice as beneficial. The IRS, however, subsequently ruled that the new law did not prevent companies from retroactively claiming their black liquor as cellulosic biofuel for the year 2009, resulting in an additional USD 2.8 billion in payments (Weisman, 2012).

107. For policy makers, the sense of entitlement that any support measure can create, and the difficulty of reforming and terminating them, implies that the case for new preferences should be reviewed carefully and with the benefit of adequate information. As discussed above, they should be compared against alternative approaches to addressing the particular policy problem.

108. As with spending programmes, tax preferences should be evaluated on a periodic basis to determine whether they are meeting their objectives in a cost-effective manner. Fiscal management policies in the Netherlands, for example, require that ministries account for tax expenditures in the annual tax plan, which is submitted to the parliament with the annual budget. They are required to be evaluated every five years (Ruijs and Vollebergh, 2013). To ensure transparency, such evaluations should be published. The credibility of this kind of review is enhanced by involving respected, independent parties such as a government auditor or an independent research institute. The political difficulty of initiating a potentially critical review once a measure is in place may be addressed by committing at the time of announcement to undertake a review by a fixed date. Such a commitment could even be enshrined in legislation.

109. In areas where technology or economic conditions are changing rapidly or may reasonably be expected to change, a measure could be designed so that certain parameters can be updated more frequently without the need for the time-consuming process of returning to the legislature. Delegated authority could be given, for example, to a Minister or a committee to adjust certain details, like assistance levels, eligibility thresholds or lists of eligible assets, where these are expected to change regularly. This can help ensure that a measure does not get out-of-step. In recent years, for example, a number of countries have found that they needed to adjust assistance levels under renewable energy programmes when take-up levels and budgetary costs proved higher than anticipated as industry costs decreased.

110. Another method of ensuring that review takes place is to implement a tax preference with a sunset date – a fixed date at which the measure is automatically terminated unless extended by legislation. Ideally, a sunset date is combined with a formal evaluation process. It should be recognised, however, that even where sunset dates are fixed, the force of inertia can make it difficult to allow a measure to expire, particularly if there is a strong lobby of beneficiaries.

➔ *Preferred practice: Review proposed tax preferences rigorously before implementing; publicly evaluate on a set schedule; consider sunset dates.*

Tax preferences are not helpful to non-taxable entities

111. Most tax incentives (other than refundable measures, discussed below) only benefit those with positive tax liability. As a result, they do not provide any assistance to:

- firms and institutions that are tax exempt, such as non-profit organisations or local governments;
- firms and individuals that are subject to taxation, but who are not taxable in a particular year, *e.g.* because a firm is incurring losses (and therefore is "tax exhausted") or an individual's income is below the threshold level at which tax becomes payable.

112. In the case of some tax expenditures, the types of exclusions noted above may be appropriate, such as where the measure is intended to give relief from a particular tax. In the case of most environmentally motivated tax preferences, however, the activity that the government intends to support typically has no relationship to taxable status either generally or in a particular year. As a result, delivery through the tax system can result in the targeting of a measure being inappropriately limited. If, for example, certain low-income households do not benefit from a personal income tax credit because they do not pay tax, the measure could be inappropriately regressive.

113. If groups like those two listed are in fact intended to be included, a spending programme may be more appropriate to ensure that benefits are provided equally to all. The exclusion of notionally taxable firms and individuals who happen not to be taxable in a particular year can be addressed by making a tax credit refundable or non-wastable – i.e. to the extent that the taxpayer cannot benefit because its taxable income has already been reduced to zero, a cash payment is provided to the beneficiary equal to the value of the unclaimed tax benefit. A fully refundable tax credit is akin to a grant delivered through the tax system.

➔ *Preferred practice: Consider who the intended beneficiaries are; if support is not related to tax status, delivery outside the tax system may be more appropriate.*

Tax preferences are more difficult to coordinate internationally than taxes

114. International co-ordination can be highly important for the effectiveness of environmental policy in addressing problems with a global scope, such as climate change. Coordination helps ensure that policies send consistent signals to investors worldwide. By helping to ensure that comparable policies are in place, it can provide individual countries with assurance that burdens are being shared and that their actions will not undermine their relative competitiveness. Coordination does, however, have substantial transaction costs (Duval, 2008).

115. Subsidy policies such as tax expenditures are likely more difficult to coordinate internationally than taxes. This is due to the fact that eligibility criteria are often quite detailed and it can be difficult to get multiple jurisdictions to agree on the relevant targets and parameters, particularly when baseline tax systems differ. Periodic legislative reviews and the need for legislatures to decide on funding allocations on a regular basis also makes ongoing coordination challenging. In contrast, tax rates and bases are more readily comparable so that equal effort is easier to define.

Tax preferences need to be coordinated with other policies

116. Finally, when tax incentives are used in combination with other instruments that address similar environmental objectives, it is important to ensure that the policies are not counter-acting or otherwise distorting one another's operation. For example, a tax preference to stimulate investment in emissions

reduction technology in a sector that is subject to a cap-and-trade system will not reduce the expected level of overall emissions, which is fixed by the cap (assuming it is binding). Rather, it will tend to skew the pattern of emission reductions within the overall cap toward the subsidised technology and away from other reduction opportunities that are in fact less costly (Braathen, 2011).

➔ *Preferred practice: Tax preferences are usually more effective when they complement other environmental policies.*

6. Conclusion

117. Environmentally motivated tax preferences are widely used in OECD countries. They have a role in the environmental policy tool-kit, but they are the preferred instrument only in a relatively narrow set of cases dealing with true positive externalities. For issues involving negative externalities, such as pollution and environmental degradation, policies that directly incorporate the cost of damage into market prices like environmentally related taxes are likely to be more cost-effective due to the flexibility they leave actors in deciding how best to reduce their emissions or other impact.

118. When tax preferences are used to further environmental goals, they should be directed as closely as possible to the true externality. In order to minimise the hazards of trying to “pick winners”, eligibility should ideally be based on performance measures that are technology-neutral rather than use of particular inputs or technology. Eligibility criteria should represent behaviour that goes clearly beyond “normal” practice. In addition, regular review and tightening of thresholds are important as conditions change (e.g. as new technologies develop), in order to limit windfall benefits to free-riders. To ensure fiscal accountability, transparent and regular reporting of tax expenditures is required, as well as periodic evaluations.

REFERENCES

Aalbers, R, et al. (2011), "Reducing rents from energy technology adopting programs by exploiting observable information", CentER Discussion Paper No. 2011-109, http://ssrn.com/abstract=1937601.

APEC (2009), Asia-Pacific Economic Cooperation, 2009 Leaders' Declaration, Singapore, November 14-15, 2009, www.apec.org/Meeting-Papers/Leaders-Declarations/2009/2009_aelm.aspx.

Baveye, J.and C. Valenduc, "Are environmental tax incentives efficient?", *Bulletin de Documentation*, Services Public Fédéral Finances – Belgique, Vol 71., No. 2, pp.139-166.

Braathen, N. A. (2011), "Interactions between Emission Trading Systems and Other Overlapping Policy Instruments", *OECD Green Growth Papers*, No. 2011/02, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k97gk44c6vf-en.

Cour des comptes (2012a), "Impact budgetaire et fiscal du Grenelle de I'environnement ", 3 November 2011, Paris.

Cours des comptes (2012b), Speech by M. Didier Migaud, Hearing by the Commission des finances de l'Assemblée nationale, 18 January 2012.

De Beer, J.G. et al. (2000), *Effectiviteit energiesubsidies – onderzoek naar de effectiviteit van enkele subsidies en fiscale regelingen in de period 1988-1999*. Ecofys, OCFEB, EUR, VU, IVM.

Department of Finance Canada (2005), "A framework for evaluation of environmental tax proposals " in *Budget Plan 2005*, pp. 313-327, Government of Canada, Ottawa.

D'Haultfoeuille, X., I. Durrmeyer and P. Février (2011), "Le coût du bonus/malus écologique: que pouvait-on prédire ?", *Revue Economique*, Vol. 62 (3), pp. 491-499.

Dietz, F.J. and H.R.J. Vollebergh (1999), "Institutional barriers for economic instruments", in J.C.J.M. van den Bergh (ed.), *Handbook of Environmental Economics*, Edward Elgar, Cheltenham.

Duval, R. (2008), "A Taxonomy of Instruments to Reduce Greenhouse Gas Emissions and their Interactions", *OECD Economics Department Working Papers*, No. 636, OECD Publishing, Paris, http://dx.doi.org/10.1787/236846121450.

Geller, H. And S. Attali (2005), "The Experience with Energy-efficiency Policies and Programmes in IEA Countries: Learning from the Critics", IEA Information Paper, IEA, Paris.

Givord, P. et X. d'Haultfoeuille (2012), "Le bonus/malus écologique: éléments d'évaluation", *INSEE Analyses No. 3*, January 2012.

Government of Canada (2010), *Tax Expenditures: Notes to the Estimates/Projections 2010*, Department of Finance, Ottawa, www.fin.gc.ca/taxexp-depfisc/2010/TEE10Notes_eng.pdf.

G20 (2009), *Pittsburgh Summit Declaration*, September 24-25, 2009, www.g20.org/.

Goulder, L. and I. Parry (2008), "Instrument choice in environmental policy", *Review of Environmental Economics and Policy*, Vol. 2, Issue 2, Oxford University Press, pp. 152–174.

Hartwick, J. and N. Olewiler (1997), *The Economics of Natural Resource Use*, 2nd ed., Addison-Wesley, Reading, MA.

International Monetary Fund (2001), *Government Finance Statistics Manual 2001*, Statistics Division, International Monetary Fund, Washington, D.C. www.imf.org/external/pubs/ft/gfs/manual/.

Li, S., J. Linn and E. Muehlegger (2012), "Gasoline taxes and consumer behaviour", NBER Working Paper 17891, National Bureau of Economic Research, Cambridge, MA, www.nber.org/papers/w17891.

Marron, Donald (2011), "Energy policy and tax reform", Testimony before the Subcommittee on Select Revenue Measures and the Subcommittee on Oversight of the Committee on Ways and Means, United States House of Representatives, September 22, 2011, www.urban.org/uploadedpdf/901452-Energy-Policy-and-Taxes.pdf.

Metcalf, Gilbert (2008), "Using tax expenditures to achieve energy policy goals", National Bureau of Economic Research Working Paper 13753, Cambridge, MA, www.nber.org/papers/w13753.

Metcalf, Gilbert (2009), "Tax policies for low-carbon technologies", National Bureau of Economic Research Working Paper 15054, Cambridge, MA, www.nber.org/papers/w15054.

Nauleau, Marie-Laure (2014), "Free-Riding in Tax Credits For Home Insulation in France: An Econometric Assessment Using Panel Data", *FEEM Nota di Lavoro 26.2014*, Fondazione Eni Enrico Mattei, Milan, Italy. www.feem.it/getpage.aspx?id=6239&sez=Publications&padre=73.

OECD(2014), *The Cost of Air Pollution: Health Impacts of Road Transport*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264210448-en.

OECD (2013a), *Taxing Energy Use: A Graphical Analysis*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264183933-en.

OECD (2013b), *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264187610-en.

OECD (2013c), *OECD Economic Surveys: France 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-fra-2013-en.

OECD (2013d), *Effective Carbon Prices*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264196964-en.

OECD (2012), *OECD Environmental Outlook to 2050: The Consequences of Inaction*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264122246-en.

OECD (2011a), *Towards Green Growth*, OECD Green Growth Studies, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264111318-en.

OECD (2011b), *Environmental Taxation: A Guide for Policy Makers*, OECD Publishing, Paris, www.oecd.org/dataoecd/17/7/48164926.pdf.

OECD (2010a), *Taxation, Innovation and the Environment*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264087637-en.

OECD (2010b), *Choosing a Broad Base - Low Rate Approach to Taxation*, OECD Tax Policy Studies, No.19, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264091320-en.

OECD (2010c), *Paying for Biodiversity: Enhancing the Cost-Effectiveness of Payments for Ecosystem Services*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264090279-en.

OECD (2009a), *Declaration on Green Growth*, adopted at the Meeting of the Council (MCM) at Ministerial Level on 25 June 2009, OECD Publishing, Paris, www.oecd.org/officialdocuments/displaydocument/?doclanguage=en&cote=C/MIN(2009)5/ADD1/FINAL.

OECD (2009b), *Survey of Firms' Responses to Public Incentives for Energy Innovation, including the UK Climate Change Levy and Climate Change Agreements*, OECD Publishing, Paris, www.oecd.org/officialdocuments/displaydocument/?doclanguage=en&cote=COM/ENV/EPOC/CTPA/CFA(2008)34/FINAL.

OECD (2008a), *Environmentally Related Taxation and Tradable Permit Systems in Practice*, OECD, Paris, www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?doclanguage=en&cote=com/env/epoc/ctpa/cfa(2007)31/final.

OECD (2008b), "An OECD Framework for Effective and Efficient Environmental Policies", adopted at the meeting of the Environment Policy Committee at Ministerial Level, 28-29 April, 2008, OECD, Paris, www.oecd.org/dataoecd/39/19/41644480.pdf.

OECD (2007), *Instrument Mixes for Environmental Policy*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264018419-en.

OECD (2006), *The Political Economy of Environmentally Related Taxes*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264025530-en.

OECD (2001), *Environmentally Related Taxes in OECD Countries: Issues and Strategies*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264193659-en.

OECD (1995), *Industrial Subsidies: A Reporting Manual*, OECD, Paris.

Olewiler, N (2008), "Securing natural capital and ecological goods and services for Canada", Policy Brief, Institute for Research on Public Policy, www.irpp.org/cpa/briefs/olewiler.pdf.

Parry, I (1998), "A second-best analysis of environmental subsidies", *International Tax and Public Finance*, Vol. 5, Kluwer Academic Publishers, Boston, pp. 153-170.

Rivers, N. and B. Schaufele (2012), "Carbon tax salience and gasoline demand", http://ssrn.com/abstract=2131468.

Ruijs, A. and H. R. Vollebergh (2013), "Lessons from 15 years of Experience with the Dutch Tax Allowance for Energy Investments for Firms", *OECD Environment Working Papers*, No. 55, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k47zw350q8v-en.

Sunstein, C. and R. Thaler (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness*, Yale University Press, New Haven, CT.

Swedish National Audit Office (2011), *Biofuels for a Better Climate – How is the Tax Exemption Used?*, Stockholm.

Weisman, J. (2012), "Tax loopholes block efforts to close gaping U.S. budget deficit", *New York Times*, 20 July 2012.

APPENDIX A – ENVIRONMENTALLY-MOTIVATED TAX PREFERENCES IN OECD COUNTRIES

In addition to the information noted below, the database[10] includes additional information such as the criteria used to determine the amount of the subsidy, details regarding the subsidy, its linkage to taxes and other policies, and its cost. The database also indicates:

- the environmental domain(s) to which a scheme is directed – water pollution, air pollution, climate change, etc.
- the activity(s) supported by a scheme, i.e. the modalities by which environmental benefits are sought to be brought about, e.g. research and development, investment in physical capital, market penetration of clean products, etc.
- beneficiaries or target sectors of each sub-scheme, e.g. households, various business sectors, NGOs, etc.

For reasons of space, the following table includes only national-level measures. It does not, for example, include Provincial- or State-level measures from Canada and the United States.

[10] See www.oecd.org/env/policies/database.

Country	Overall scheme name	Specific sub-scheme name	Purpose
Australia	Environment-Related Capital Expenditure	Deduction for environmental protection activities	To encourage environmental protection activities
Australia	Establishment costs for carbon sink forests	Establishment costs for carbon sink forests	Provides accelerated depreciation of establishment costs. New carbon sink forest legislation allows a tax deduction for the costs for establishing forests for the purpose of carbon sequestration, by treating the carbon sink forests as a capital item for tax purposes.
Australia	Tax deduction for mining site rehabilitation	Tax deduction for mining site rehabilitation	Limit negative environmental effects of mining activities.
Australia	Tax-deductible gifts to recipients on the Register of Environmental Organisations	Tax-deductible gifts to recipients on the Register of Environmental Organisations	The Register is a list of environmental organisations eligible to receive tax deductible donations.
Belgium	Deduction of up to 120% of business expenses incurred for the storage of bicycles	Deduction of up to 120% of business expenses incurred for the storage of bicycles	The purpose is to encourage bicycle use by commuting staff. Expenses covered: acquisition, construction or rehabilitation of buildings intended for bicycle storage and showers during working hours.
Belgium	Deduction up to 120% of the expenses for staff collective transport	Deduction up to 120% of the expenses for staff collective transport	Where minibuses, buses and coaches are used for the collective transport of the staff members between home and work, 120% of the expenses can be deducted by the employer or the group of employers.
Belgium	Income-tax reduction for energy-saving expenses in dwellings	Tax reduction for expenses related to roof insulation	The main purpose of this provision is to stimulate households to save energy.
Belgium	Investment deduction	Investment deduction for "green" R&D investments	The investment deduction allows deduction from the tax base part of the amount of investments made during the taxable period. It can be granted to individuals declaring profits or proceeds and to companies.
Belgium	Investment deduction	Investment deduction for energy-saving investments	The investment deduction allows deduction from the tax base part of the amount of investments made during the taxable period. It can be granted to individuals declaring profits or proceeds and to companies.
Belgium	Tax reduction for diesel vehicles fitted out with a particulate filter	Tax reduction for diesel vehicles fitted out with a particulate filter	To fight air pollution from particulate matters.
Belgium	Tax reduction on expenses incurred to acquire a "clean" car	Tax reduction on expenses incurred to acquire a motor car, a twin-purpose vehicle or a minibus emitting less than 105 g/km of CO2	To encourage the purchase of "clean" cars
Belgium	Tax reduction on expenses incurred to acquire a "clean" car	Tax reduction on expenses incurred to acquire a motor car, a twin-purpose vehicle or a minibus emitting from 105 to 115 g/km of CO2	To encourage the purchase of "clean" cars
Canada	Canadian Renewable and Conservation Expense (CRCE)	Canadian Renewable and Conservation Expense	Encourage efficient use of fossil fuels and alternate and renewable energies (i.e. generation and sale of electricity, energy use in industry)
Canada	Car Heaven	Car Heaven Alberta	Tax reductions for managing end-of-life vehicles via the 'Car Heaven' programme.
Canada	Car Heaven	Car Heaven British Columbia	Tax reductions for managing end-of-life vehicles via the 'Car Heaven' programme.
Canada	Car Heaven	Car Heaven Ontario	Tax reductions for managing end-of-life vehicles via the 'Car Heaven' programme.
Canada	Ecological Gifts Program	Tax incentive for donation of privately owned ecologically sensitive lands	To promote the donation of privately held lands certified as ecologically sensitive
Chile	Tax credit for solar water heating systems	Tax credit for solar water heating systems	Tax credit equal to all or part of the cost of adding these systems to new housing projects.

Czech Republic	Exemptions from the Real estate tax	Exemptions from land tax	
Czech Republic	Exemptions from the Real estate tax	Exemptions from tax on buildings	
Czech Republic	Reduced tax rate in the value-added tax for environmentally friendly goods and services	Reduced VAT rate for fuel wood	To enhance consumption of environmentally less harmful goods and services.
Czech Republic	Reduced tax rate in the value-added tax for environmentally friendly goods and services	Reduced VAT rate for public ground transport	To enhance consumption of environmentally less harmful goods and services.
Czech Republic	Reduced tax rate in the value-added tax for environmentally friendly goods and services	Reduced VAT rate for water treatment and supply services	To enhance consumption of environmentally less harmful goods and services.
Czech Republic	Reduced tax rate in the value-added tax for environmentally friendly goods and services	Reduced VAT rate for sewage treatment and related services	To enhance consumption of environmentally less harmful goods and services.
Czech Republic	Reduced tax rate in the value-added tax for environmentally friendly goods and services	Reduced VAT rate for municipal waste collection, transport and liquidation	To enhance consumption of environmentally less harmful goods and services.
Czech Republic	Reduced tax rate in the value-added tax for environmentally friendly goods and services	Reduced VAT rate for water transport of passengers	To enhance consumption of environmentally less harmful goods and services.
Czech Republic	Reduced tax rate in the value-added tax for environmentally friendly goods and services	Reduced VAT rate for entrance to zoological and botanical gardens, natural reserves and national parks	To enhance consumption of environmentally less harmful goods and services.
Czech Republic	Tax deductions in the Personal Income Tax	Allowable expenses on gifts	To motivate individual entities (natural persons) to donate for environmental purposes.
Czech Republic	Tax exemptions and deductions from Corporate Income Tax	Allowable expenses on gifts	To motivate legal entities (corporate bodies) to donate for environmental purposes.
Czech Republic	Tax exemptions and deductions from Corporate Income Tax	Exemptions from tax	To motivate legal entities (corporate bodies) to donate for environmental purposes.
Finland	Accelerated depreciation for investments in air and water pollution abatement	Investments in air and water pollution abatement -- Generally	Support to pollution control equipment.
Finland	Accelerated depreciation for investments in air and water pollution abatement	Investments in air and water pollution abatement -- Agriculture	Support to pollution control equipment.
Finland	Excise tax exemption for biogas	Excise tax exemption for biogas	Promotion of renewable energy.
Finland	Excise tax exemption for electricity used in rail transport	Excise tax exemption for energy used in rail transport	Promotion of cleaner public transport.
Finland	Excise tax exemption of wood-based fuels	Excise tax exemption of wood-based fuels	Promotion of renewable energy.
Finland	Exemption in the real property tax for forests, agricultural land and waters	Exemption in the real property tax for forests, agricultural land and waters	
Finland	Extended tax deduction; nature reserve swaps of real property	Extended tax deduction; nature reserve swaps of real property	Promotion of nature reserve availability.
Finland	Income tax exemption for non-current compensation for loss of financial benefit due to declaration of a nature reserve	Income tax exemption for non-current compensation for loss of financial benefit due to declaration of a nature reserve	Promotion of nature conservation
Finland	Income tax exemption of subsidy for sustainable development of forest	Income tax exemption of subsidy for sustainable development of forest	Promotion of biodiversity.
Finland	Railway tax relief for electric train (in freight traffic)	Railway tax relief for electric trains in freight traffic	Promotion of energy efficiency; climate change mitigation.
Finland	Reduced CO2 tax rate for co-generation of heat and power (CHP)	Reduced CO2 tax rate for co-generation of heat and power (CHP)	Promotion of energy efficiency.
Finland	Reduced VAT rate for industrial waste used for feeding animals	Reduced VAT rate for industrial waste used for feeding animals	Promotion of waste recovery.

Finland	Reduced VAT rate for passenger transport	Reduced VAT rate for passenger transport	Promotion of public transport.
Finland	Tax exemption of profit of the Nordic Environment Finance Corporation NEFCO	Tax exemption of profit of the Nordic Environment Finance Corporation, NEFCO	Promotion of environmental policies.
Finland	Tax exemption of sales profit; real property to the state, for nature reserve	Tax exemption of sales profit; real property to the state, for nature reserve	Promotion of nature reserve availability.
Finland	Tax relief for employer-subsidised public transport tickets	Tax relief for employer-subsidised public transport tickets	Promotion of public transport and hence environmental protection.
Finland	Transfer tax exemption for nature reserve swaps of real property	Transfer tax exemption for nature reserve swaps of real property	Promotion of nature reserve availability.
Finland	Vehicle tax exemption for buses	Vehicle tax exemption for buses	Promotion of public transport.
Finland	Vehicle tax exemption for vehicles fuelled by methane	Vehicle tax exemption for vehicles fuelled by methane	
Finland	Vehicle tax exemption of vehicles fuelled by wood-based and peat-based fuels	Vehicle tax exemption of vehicles fuelled by wood-based and peat-based fuels	
Finland	Vehicle tax refund for lorries transported by rail (combined transport)	Vehicle tax refund for lorries transported by rail (combined transport)	Improved environment, safety and energy efficiency.
France	Accelerated depreciation for industries	Environmental protection in industries	Support investments related to energy savings, treatment of industrial wastewater, air pollution and noise abatement.
France	Tax rebate for the purchase of a vehicle with low CO_2 emissions	Tax rebate for the purchase of a vehicle with low CO_2 emissions	To encourage the purchase of clean vehicles.
France	Tax rebate on some environmentally friendly house equipment	Tax rebate on some environmentally friendly house equipment	Create an incentive for equipment with low energy consumption (isolation, boilers)
Ireland	Accelerated capital allowances for energy-efficient equipment	Energy-efficient equipment	Promote investments in energy-efficient equipment.
Israel	Accelerated depreciation for solar facilities	Accelerated depreciation for photo-voltaic/ solar-thermal technologies & solar boilers	Tax reduction in order to encourage the use of renewable source energy.
Italy	Reduced rate in the municipal tax on real estate (ICI)	Some municipalities apply rebates in case of eco-building interventions	Some municipalities apply rebates in case of eco-building interventions.
Italy	Subsidies to promote energy efficiency	Energy requalification for existing buildings	Energy saving.
Italy	Subsidies to promote energy efficiency	Replacement of covers, windows and shutters	Energy saving.
Italy	Subsidies to promote energy efficiency	Installation of solar panels	Energy saving.
Italy	Subsidies to promote energy efficiency	Replacement of winter heating systems	Energy saving.
Italy	Tax credit for biomass heating systems	Tax credit for biomass heating systems	To promote biomass heating systems
Italy	Tax reduction for investment in capital goods	Tax reduction for investment in capital goods	Tax reduction for investment in capital goods (appliances and equipment): while the law does not specify energy performance thresholds for the equipment, the measure aims to encourage the replacement of existing equipment with newer, more efficient technology.
Japan	Accelerated depreciation for investments in recycling equipment	Investments in recycling equipment	To support use of equipment for recycling or for using recycled materials.
Japan	Accelerated depriciation for investment in pollution control equipment	Investments in pollution control equipment	To support use of pollution control equipment with a minimum performance of 70% emission reduction.
Japan	Eco car tax breaks from the automobile acquisition tax	Tax exemption for new-generation cars	To increase the purchase of "new generation" cars and cars with high fuel efficiency. Additional purpose is to support the Japanese car industry.
Japan	Eco car tax breaks from the automobile acquisition tax	Tax exemption for fuel-efficient petrol-driven cars	To increase the purchase of "new generation" cars and cars with high fuel efficiency. Additional purpose is to support the Japanese car industry.
Japan	Eco car tax breaks from the automobile acquisition tax	Tax reduction for fuel-efficient petrol-driven and hybrid	To increase the purchase of "new generation" cars and cars with high fuel

		cars	efficiency. Additional purpose is to support the Japanese car industry.
Korea	Tax credit for investments in environmental facilities and equipments	Income tax & corporation tax reduction for foreign companies' investment in special appliances and technology	To encourage investment in pollution abatement and energy saving facilities and equipment.
Korea	Tax credit for investments in environmental facilities and equipments	Customs reduction for imported pollution protection and waste disposal appliances	To encourage investment in pollution abatement and energy saving facilities and equipment.
Mexico	100% deducibility in the income tax for investments for the generation of energy of renewable sources or efficient electricity cogeneration systems	100% deducibility in the income tax for investments for the generation of energy of renewable sources or efficient electricity cogeneration systems	To promote the renovation of energy-related equipment to support the increase of productivity and to save energy consumption.
Mexico	Income tax credit for the buyers of the new trucks, buses, platforms and chassis, to promote the substitution of buses and trucks for road transportation of cargo and passengers.	New trucks, buses, platforms and chassis for road transportation of cargo and passengers.	Income tax credit for buyers of new vehicles, as long as they give their used vehicle to manufacturers, assemblers or authorised distributors. The tax credit for buyers of new vehicles is equivalent to the income tax derived from the taxable income for the sale of the used vehicle.
Mexico	Income tax deductibility of donations given to authorised environmental donees.	A. Donees dedicated to the prevention and control of the water, air and soil pollution, environmental protection, and preservation and restoration of the ecological balance.	Foster the non-profit activities of the authorised donees.
Mexico	Income tax deductibility of donations given to authorised environmental donees.	B. Donees commited to the reproduction of protected and endangered species and their habitat conservation.	Foster the non-profit activities of the authorised donees.
Mexico	Income tax exemption of income recieved by environmental donees	Income tax exemption of income recieved by environmental donees	
Mexico	Income tax exemption of the income from the sale of goods, interests and awards received by authorised environmental donees.	A. Donees dedicated to the prevention and control of the water, air and soil pollution, environmental protection, and preservation and restoration of the ecological balance.	Foster the non-profit activities of the authorized donees.
Mexico	Income tax exemption of the income from the sale of goods, interests and awards received by authorised environmental donees.	B. Donees commited to the reproduction of protected and endangered species and their habitat conservation.	Foster the non-profit activities of the authorized donees.
Mexico	Tax credit against the income tax or the VAT for promoting the substitution of buses and trucks	A. Tractocamiones tipo quinta rueda	Promoting the substitution of buses and trucks (road transportation of cargo and passengers).
Mexico	Tax credit against the income tax or the VAT for promoting the substitution of buses and trucks	B. Camiones utilitarios	Promoting the substitution of buses and trucks (road transportation of cargo and passengers).
Mexico	Tax credit against the income tax or the VAT for promoting the substitution of buses and trucks	C. Camiones unitarios	Promoting the substitution of buses and trucks (road transportation of cargo and passengers).
Mexico	Tax credit against the income tax or the VAT for promoting the substitution of buses and trucks	D. Autobuses integrales	Promoting the substitution of buses and trucks (road transportation of cargo and passengers).
Mexico	Tax credit against the income tax or the VAT for promoting the substitution of buses and trucks	E. Autobuses convencionales	Promoting the substitution of buses and trucks (road transportation of cargo and passengers).
Mexico	Tax credit against the income tax or the VAT for promoting the substitution of buses and trucks	F. Plataforma o chasis	Promoting the substitution of buses and trucks (road transportation of cargo and passengers).
Mexico	Tax credit against the income tax or the VAT for promoting the substitution of buses and trucks	G. Plataforma o chasis 2	Promoting the substitution of buses and trucks (road transportation of cargo and passengers).
Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	A. Fifth wheel trucks.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.

Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	B. Trucks with three axes and a minimum gross weight of 14,500 kg.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.
Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	C. Trucks with two axes and a minimum gross weight of 11,794 kg.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.
Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	D. Integral buses with a capacity of more than 30 factory seats.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.
Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	E. Conventional buses with a capacity of more than 30 factory seats.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.
Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	F. Platforms or chassis for integral buses in which can be installed more than 30 factory seats.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.
Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	G. Platforms or chassis for conventional buses in which can be installed more than 30 factory seats.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.
Mexico	Tax credit against the income tax, own or withheld to third parties, or the VAT to promote the substitution of buses and trucks for road transportation of cargo and passengers.	H. New buses for transportation of 15 passengers or more and their platforms and chassis.	Tax credit to promote the substitution of buses and trucks for road transportation of cargo and passengers.
Netherlands	Energy investment allowance	Energy investment allowance	Stimulation of investments in energy-efficient systems.
Netherlands	Green Fund scheme	Income tax exemption for dividends from Green Funds.	To promote green projects.
Netherlands	Tax relief for investments in environmentally friendly technology	Tax relief for investments in environmentally friendly technology	Promoting investments in environmentally friendly technology
Netherlands	Tax relief for investments in environmentally friendly technology	Accellerated depreciation for machinery on the MIA/VAMIL list	Promoting investments in environmentally friendly technology
New Zealand	Electric vehicle exemption from road-user charges	Exemption from road-user charges	To recognise the role that new technology will play in assisting with the reduction of greenhouse gas emissions from the transport sector, and to encourage the uptake of electric vehicles.
New Zealand	Farming tax expenditures	Enhancements to land	Promotion of good environmental practices.
New Zealand	Farming tax expenditures	Erosion and shelter plantings	Promotion of good environmental practices.
New Zealand	Tax deduction for expenses to avoid, remedy or mitigate effects of discharge of contaminant	Tax deduction for expenses to avoid, remedy or mitigate effects of discharge of contaminant	Promote pollution prevention and mitigation.
New Zealand	Tax deduction for some expenditures associated with forestry	Tax deduction for some expenditures associated with forestry	Promote good management practices
Norway	Favourable income tax treatment of business use of electrical vehicles	Favourable income tax treatment of business use of electrical vehicles	Promote the use of electrical vehicles, in order to reduce CO2 emissions and air pollution
Norway	Favourable income tax treatment related to private use of company-owned electrical vehicles	Favourable income tax treatment related to private use of company-owned electrical vehicles	Promote the diffusion of electrical vehicles -- in order to reduce CO2 emissions and air pollution
Norway	VAT exemption for electrical vehicles	VAT exemption for electrical vehicles	Promote the diffusion of electrical vehicles -- in order to limit CO2 emissions and air pollution.
Spain	Exemption in the tax on hydrocarbons for biofuels	Exemption in the tax on hydrocarbons for biofuels	Promote cleaner fuels.

Spain	Non-taxation of employer-paid public transport	Non-taxation of employer-paid public transport	Promote the use of public transport.
Spain	Reduction in vehicle taxes for vehicles with low environmental impacts	Reduction in vehicle taxes for vehicles with low environmental impacts	Promote the use of environmentally friendly motors and fuels.
Spain	Tax deduction for works in homes that improve their energy efficiency	Tax deduction for works in homes that improve their energy efficiency	Promote energy efficiency in homes.
Spain	Tax relief for enviromental investments	Tax deduction for environmental investments: air quality, water quality, industrial waste	Promote enviromental investments by companies.
Spain	Tax relief for enviromental investments	Tax deduction for environmental investments: land-based means of transportation	Promote enviromental investments by companies.
Spain	Tax relief for enviromental investments	Tax deduction for environmental investments: renewable energy sources	Promote enviromental investments by companies.
Sweden	Return of taxes on fertilizer and pesticides	Return of taxes on fertilizer and pesticides	To recycle collected taxes on pesticides and nitrogen in fertilizers to the agricultural industry. The main purpose is to reduce plant nutrient losses from the agriculture and reduce the environmental risks in this area.
Switzerland	Personal income tax deduction for expenditure related to energy-efficiency and the use of renewable energies in connection with privately owned real estate.	Tax relief for environmental protection investments in private properties	Environmentally motivated tax relief
United Kingdom	Enhanced capital allowance for water-saving investments	Enhanced capital allowance for water-saving investments	Promote water-savings.
United Kingdom	Enhanced capital allowances for energy-saving technologies	Enhanced capital allowances for energy-saving technologies	To provide a fiscal incentive for business to invest in energy-efficient plant and machinery.
United Kingdom	Landlord's energy-saving allowance	Landlord's energy-saving allowance	Promote energy-saving measures in rented buildings.
United Kingdom	Reduced VAT-rate for energy-saving materials permanently installed in residential or charity premises	Reduced VAT-rate for energy-saving materials permanently installed in residential or charity premises	Promotion of energy savings.
United Kingdom	VAT exemption for sewerage services supplied to domestic or industrial customers	VAT exemption for sewerage services supplied to domestic or industrial customers	Promotion of sewerage services.
United States	Energy investment credit	Investment credit for renewable and alternative energy	Provide an incentive for the production of renewable and alternative energy.
United States	Accelerated cost recovery for certain energy property	Accelerated cost recovery for certain energy property	To encourage renewable and alternative energy.
United States	Advanced energy property credit	Advanced energy property credit	Promote renewable and alternative energy as well as energy efficiency.
United States	Carbon dioxide sequestration credit	Carbon dioxide sequestration credit	To promote carbon sequestration.
United States	Energy production credit	Tax credit for renewable and alternative energy sources	Provide incentives for the production of renewable and alternative energy.
United States	Energy production credit	Refined coal credit	Provide incentives for the production of renewable and alternative energy.
United States	Energy production credit	Indian coal	Provide incentives for the production of renewable and alternative energy.
United States	Exclusion of interest on state and local private-activity bonds issued to support water, sewer, and hazardous-waste facilities	Exclusion of interest on state and local private-activity bonds issued to support water, sewer, and hazardous-waste facilities	Promote the financing of water, sewer, and hazardous-waste facilities.
United States	Exclusion of utility conservation subsidies	Federal -- Exclusion of utility conservation subsidies	Promote energy efficiency

United States	Manufacturer credit for energy efficient appliances	Manufacturer credit for energy efficient appliances	Promote energy efficiency
United States	Manufacturer credit for new energy efficient homes	Manufacturer credit for new energy efficient homes	Promoste energy efficiency
United States	Qualified Energy Conservation Bonds	Qualified energy conservation bonds	Promote energy efficiency and renewable energy
United States	Tax credit for alternative motor vehicles and refuelling property	Plug-in electric drive motor vehicles	Provide incentive for fuel efficient alternative fuel vehicles.
United States	Tax credit for alternative motor vehicles and refuelling property	Fuel-cell vehicles	Provide incentive for fuel efficient alternative fuel vehicles.
United States	Tax credit for alternative motor vehicles and refuelling property	Electric-drive low speed, motorcycle, and three-wheeled vehicles	Provide incentive for fuel efficient alternative fuel vehicles.
United States	Tax credit for alternative motor vehicles and refuelling property	Converted plug-in electric-drive vehicle credit	Provide incentive for fuel efficient alternative fuel vehicles.
United States	Tax credit for alternative motor vehicles and refuelling property	Alternative fuel refuelling property credit	Provide incentive for fuel efficient alternative fuel vehicles.
United States	Tax reduction for pollution control facilities	Tax reduction for pollution control facilities	Provide incentives for pollution control expenditures.

APPENDIX B – COMPARISON OF TAX PREFERENCES IN THE UNITED STATES AND IN OTHER OECD COUNTRIES

119. A large number of the environmentally motivated tax preferences covered by the OECD's database are applied in the United States. This appendix investigates whether or not this 'bias' has any influence on the composition of combinations of characteristics that was described in Section 3 of the main text. The graphs in this annex split in two some of the information from the graphs presented in Section 3, showing results for the United States and other OECD countries separately. In order to keep the graphs as readable as possible, combinations with few occurrences have been excluded.

3.1 Figures B.1 and B.2 show such information regarding environmental domains and target groups. For each environmental domain, the column to the left represents the United States, while the column to the right (where each of the colours is shown with a pattern) represents the other OECD countries. The figures indicate that there are several important differences in the composition of the combinations between the United States and the other OECD countries. For example, while there are more than twice as many combinations linked to "climate change", "waste management" and "natural resource management" in the United States as in all other OECD countries taxes together, the reverse is the case in relation to tax preferences linked (specifically) to "transport". Also regarding "energy efficiency", the total number of occurrences is larger outside the United States.

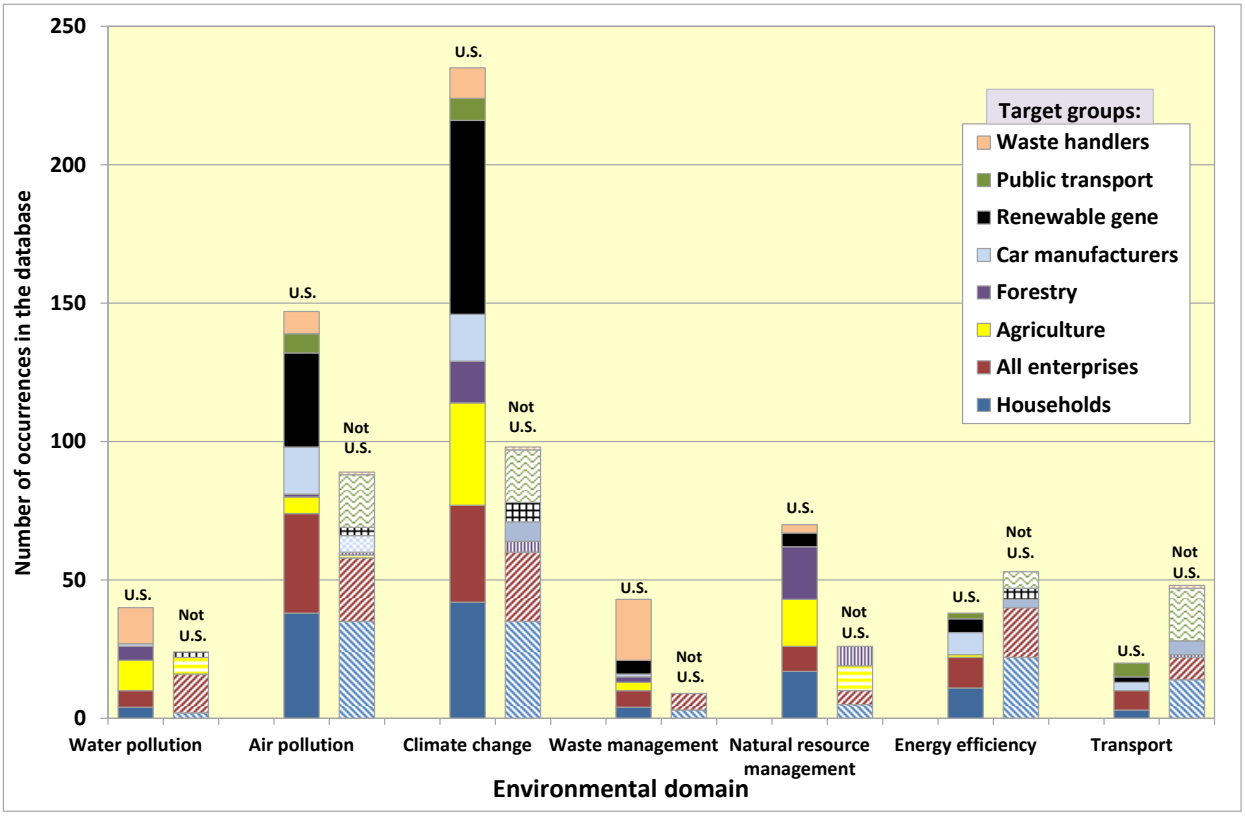
3.2 The distribution of target groups that the different environmental domains are linked to also differ, with – for example – "households" and "all enterprises" being targets of tax preferences linked to "climate change" in more than 60% of the cases outside the United States, but less than 35% in the United States.[11] Tax preferences targeting "renewable energy generators" are more common in relation to several different environmental domains in the United States than in other OECD countries – in part due to tax preferences addressing biofuels generation in agriculture.

120. Figures B.3 and B.4 describe combinations of environmental domains and supported activities. For each environmental domain, the column to the left represents the United States, while the column to the right shows information regarding the other OECD countries. Again, while there are much more occurrences of such combinations in the United States than in the rest of the OECD in relation to "air pollution" and "climate change", there are more occurrences in relation to "energy efficiency" and "transport" outside of the United States.

121. While there certainly are some variations, the differences between the United States and the rest of the OECD countries with respect to which activities are given tax preferences in relation to which environmental domains are not *very* large. One can, however, not that "R&D" is not given any tax preferences in the United States in relation to "water pollution", "waste management" and "energy efficiency". On the other side, "market penetration of clean products" is more frequently given tax preferences in the United in relation to "air pollution" and "climate change" than elsewhere in the OECD – probably again to a large extent due to support provided to biofuels cultivation.

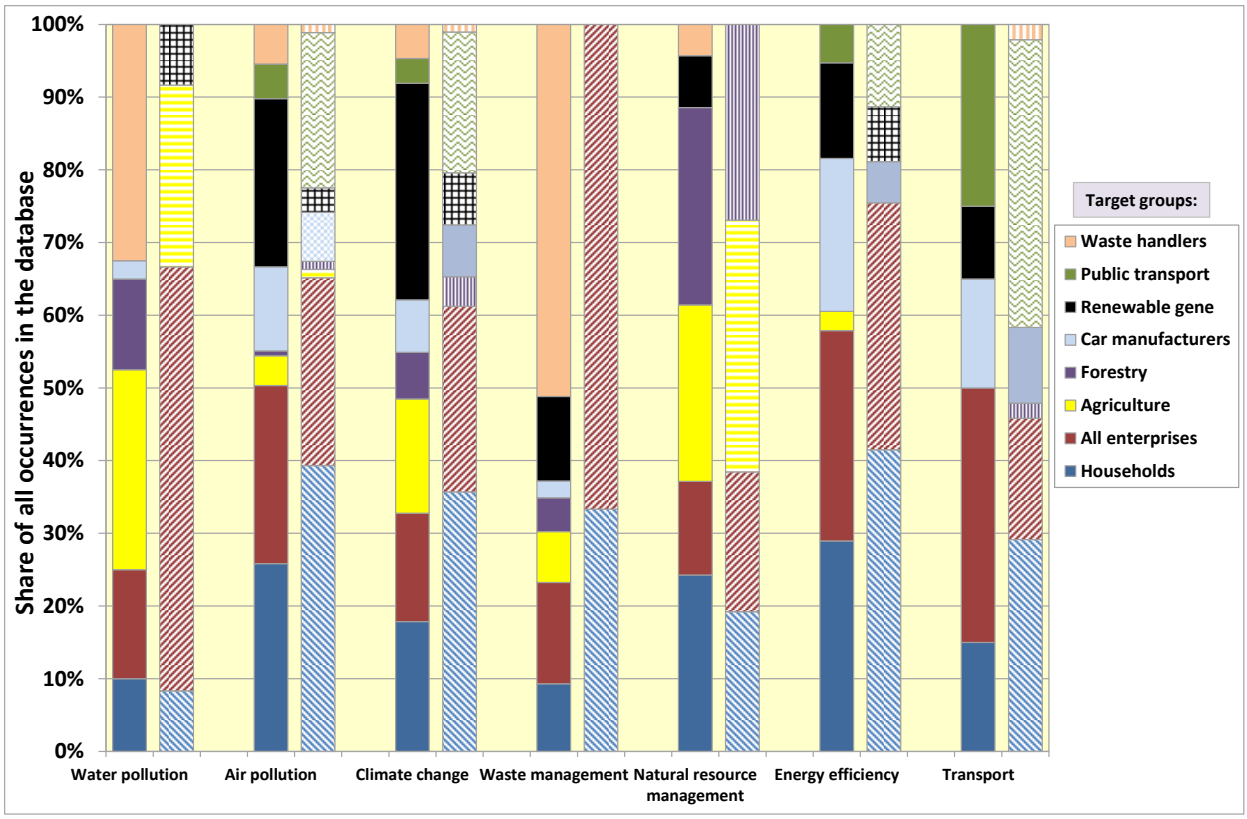
[11] In relation to "water pollution", the similar numbers are 65% and 25% – but for this environmental domain, the total number of occurrences is much lower than for "climate change", making any assessment of the distribution of the occurrences less robust.

Figure B.1 Environmental domains and target groups, United States vs. other OECD, absolute figures



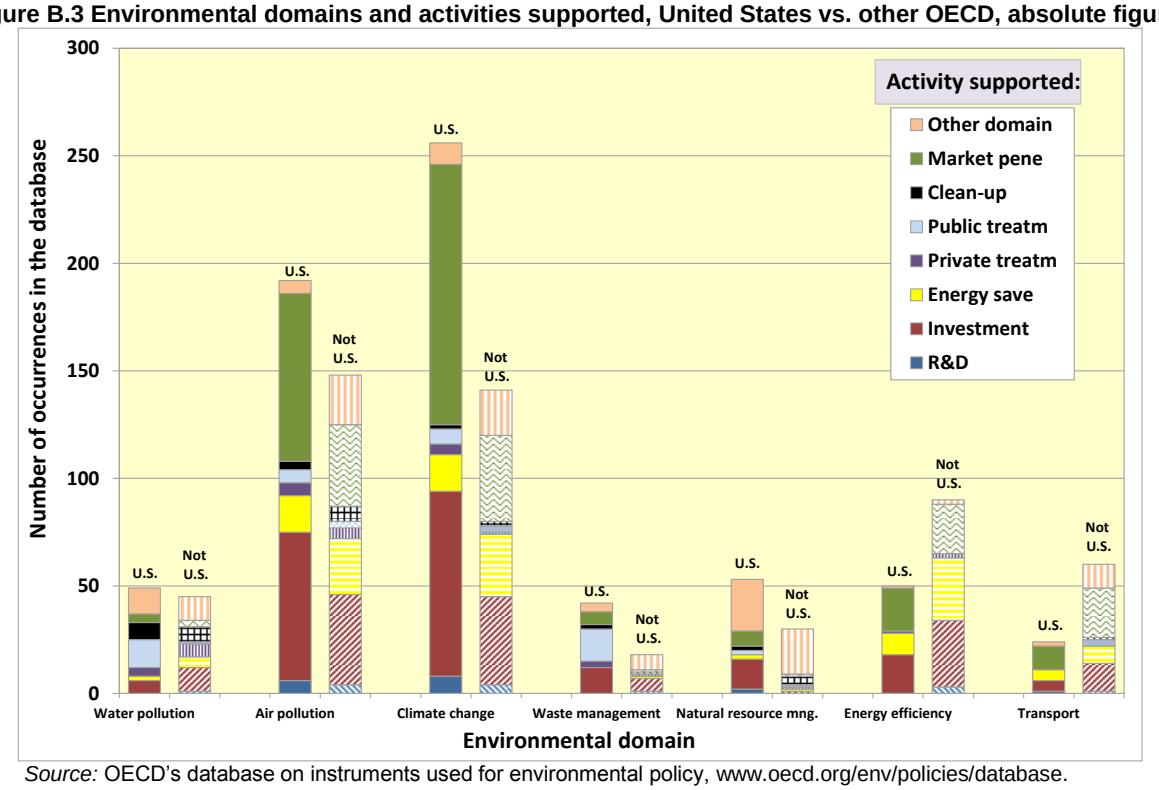
Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure B.2 Environmental domains and target groups, United States vs. other OECD, relative figures



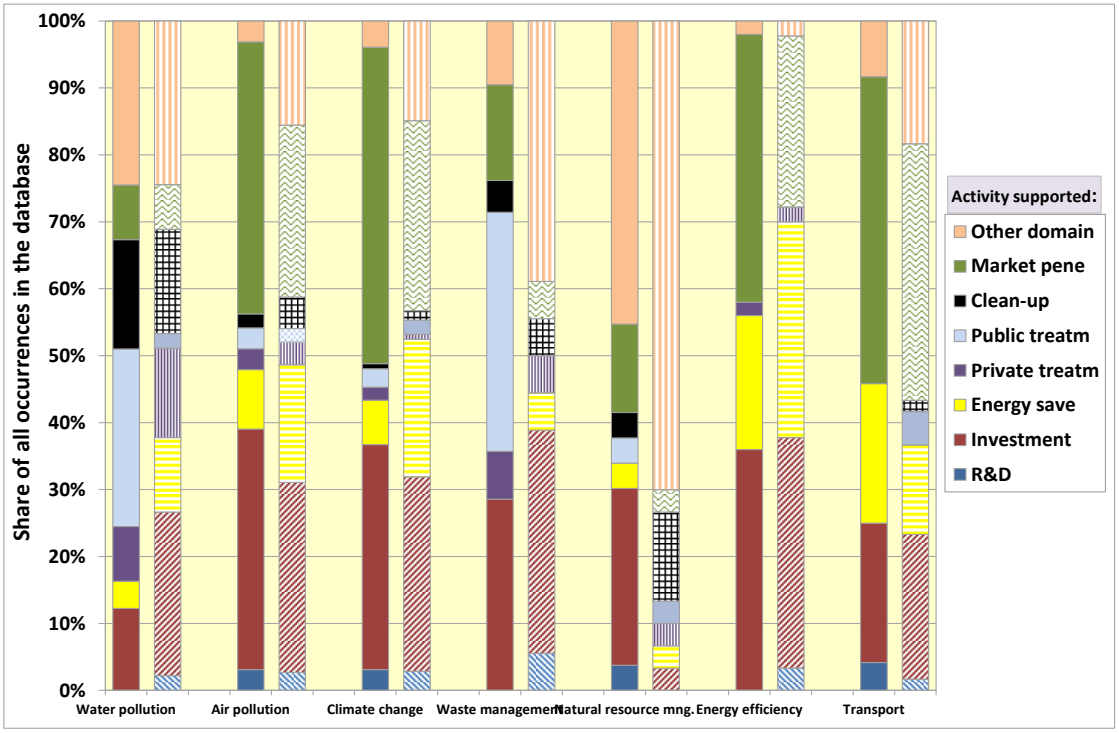
Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure B.3 Environmental domains and activities supported, United States vs. other OECD, absolute figures



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure B.4 Environmental domains and activities supported, United States vs. other OECD, relative figures

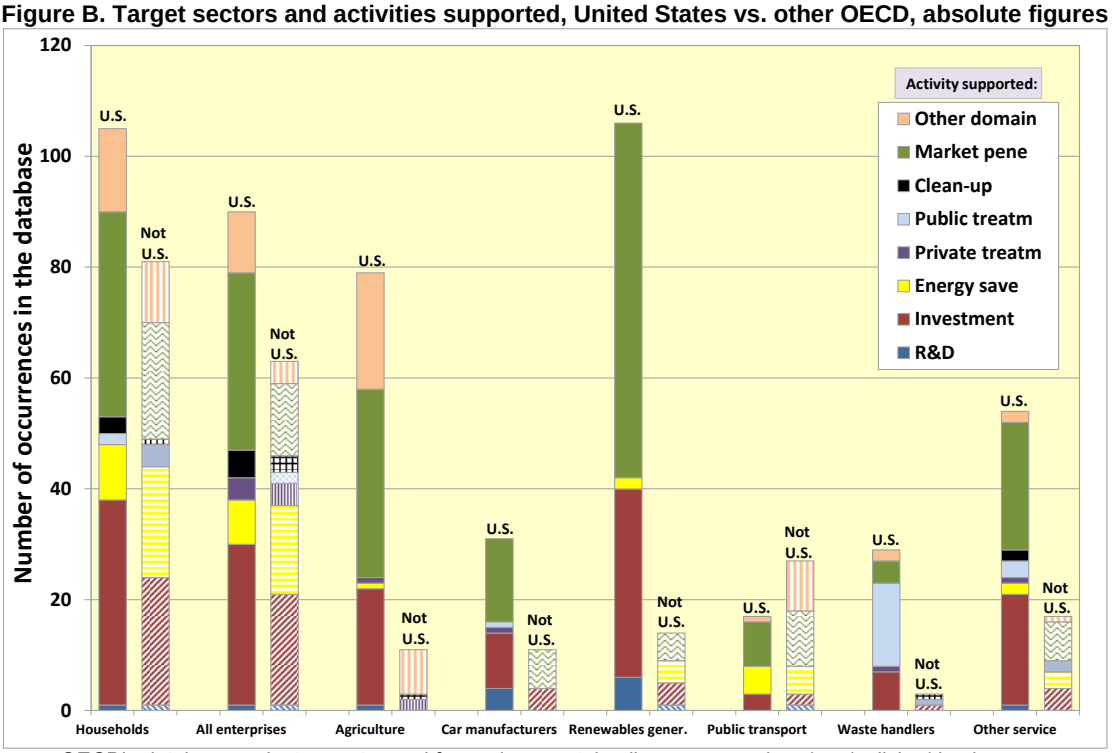


Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

122. Figures B.5 and B.6 illustrate difference in combinations of target groups and activities supported by tax preferences in the United States and other OECD countries. With the exception of public transport, there are much more such combinations for all the target groups show here in the United States than elsewhere in the OECD – with particularly large differences in relation to "agriculture" and "renewable energy generators". This is to a high extent driven by tax preferences to biofuels producers in the United

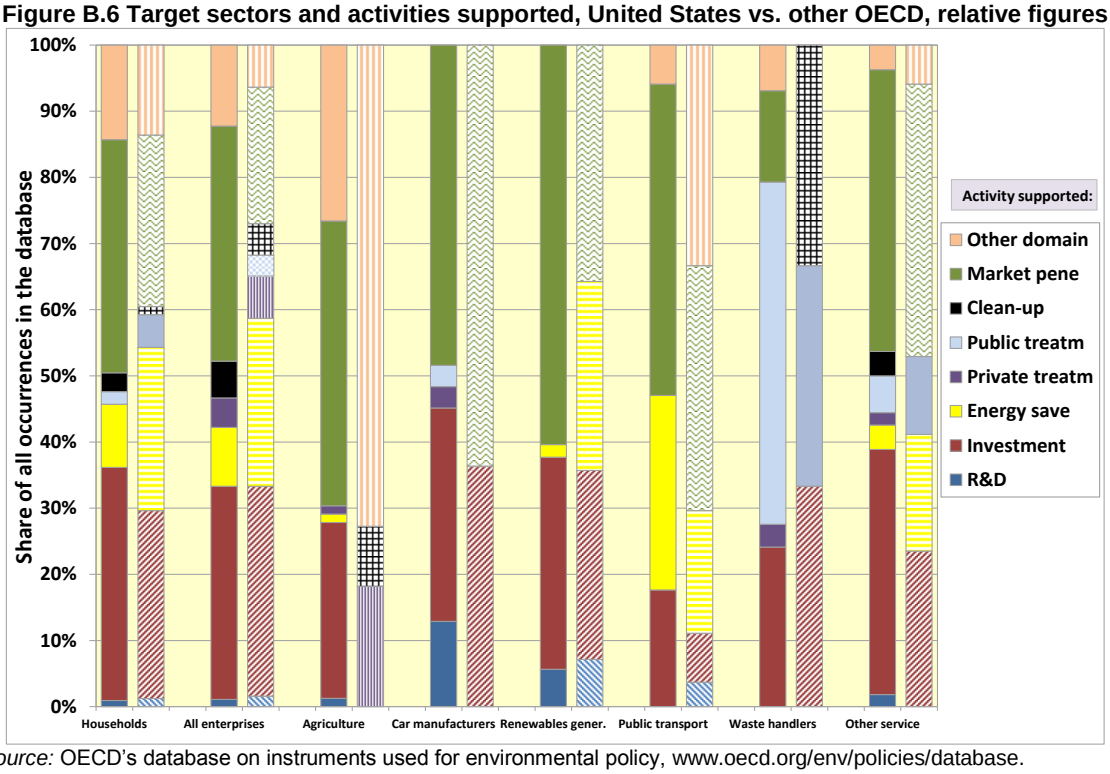
States – which also contributes to a significant share of tax preferences being classified as given for "market penetration of clean products".

Figure B. Target sectors and activities supported, United States vs. other OECD, absolute figures



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure B.6 Target sectors and activities supported, United States vs. other OECD, relative figures



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

APPENDIX C – COMPARISON OF ENVIRONMENTALLY MOTIVATED TAX PREFERENCES AND GRANTS

123. This appendix presents some comparisons of the combinations of environmental domains, target groups and supported activities via environmentally motivated *tax preferences* (as described in the main part of this paper) and various environmentally motivated *grants* in OECD countries as a whole.

124. Figures C.1 and C.2 illustrate combinations of selected environmental domains and target groups. For each environmental domain, the column to the left show such combinations regarding grants (1616 combinations of the selected environmental domains and target groups), while the column to the right shows information regarding tax preferences (1006 combinations). A first observation is that while there are roughly equally many tax preference and grant combinations in relation to "air pollution" and "climate change", for "water pollution", "waste management", "natural resource management" and "energy efficiency", there are much more grant combinations than tax preference combinations. The opposite is the case regarding "transport".

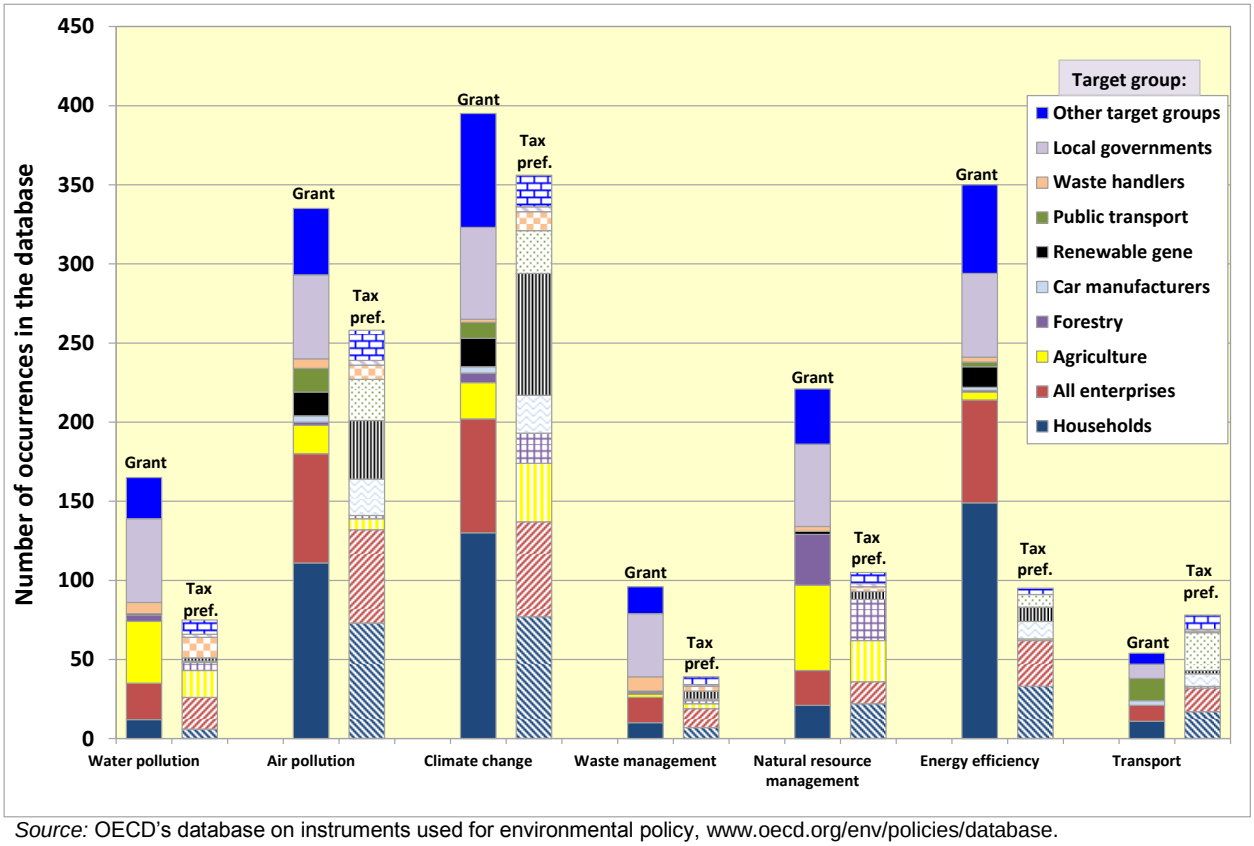
125. In spite of a number of variations, the groups targeted by tax preferences and grants are not *radically* different, all in all. But one can e.g. notice that "renewable energy generators" are more frequently addressed by tax preferences than by grants in relation to "air pollution" and "climate change". Understandably, "local governments" are much more often addressed by grants than by tax preferences, across all the environmental domains covered here. There are also generally more grants than tax preferences addressing "other target groups"[12] – but not so markedly as regarding "local governments".

126. Figures C.3 and C.4 show combinations of target groups and activities supported for grants and tax preferences. For each target group, the column to the left show such combinations regarding grants (1323 combinations of the selected target groups), while the column to the right shows information regarding tax preferences (795 combinations).[13] One can see that while grants for such combinations are (much) more frequent in relation to "households", "local governments" and "other target groups", tax preferences are more common for such combinations in respect of "renewable energy generators" and "car manufacturers". Regarding the composition of the combinations, it is i.a. noticeable that it (perhaps understandably) is more common to support "R&D" via grants than via tax preferences in relation most of the target groups included in the graph. One exception is "car manufacturers", another is "public transport".

[12] "Other target groups" is a specific item in the list of target groups in the database and does *not* here include *all* target groups not shown elsewhere in the graph. Among target groups not included in the graph are "fisheries" and "environmental NGOs".

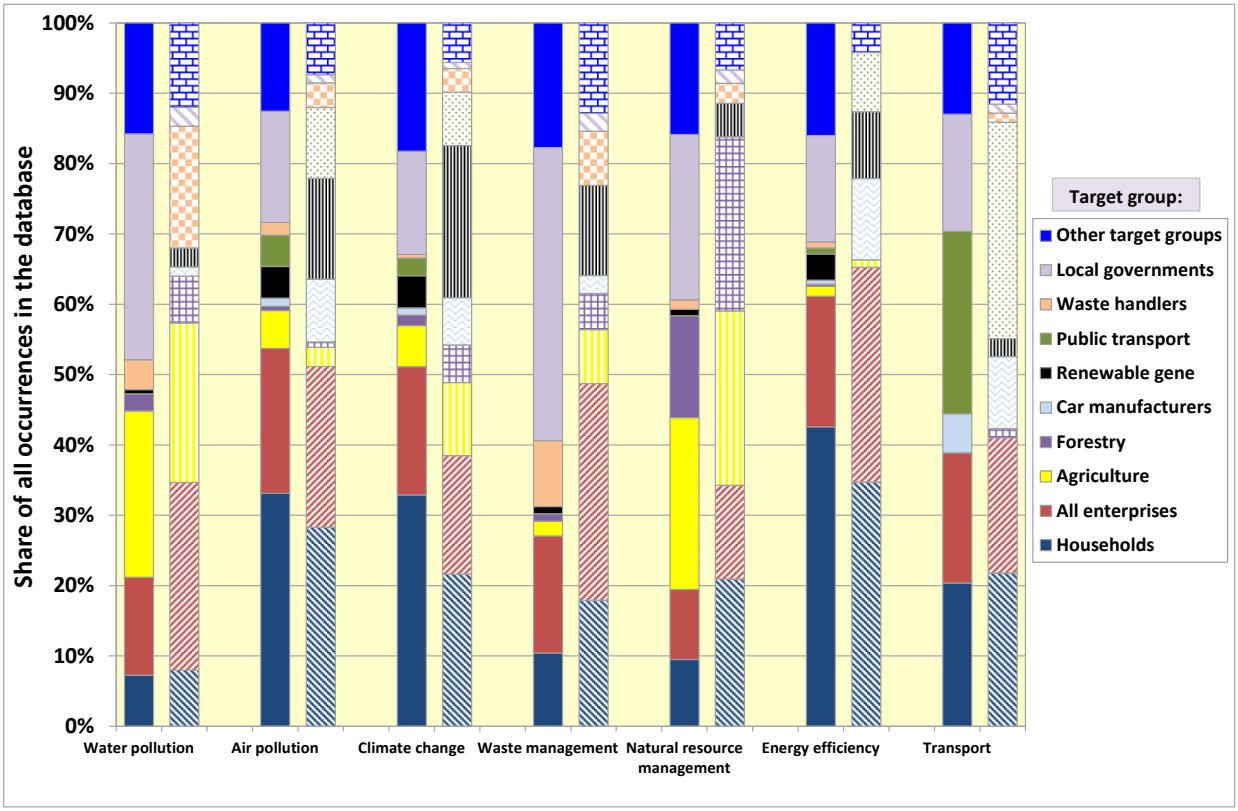
[13] While the list of target groups, like in the previous two graphs, is incomplete, the list of activities supported includes all activities defined in the database.

Figure C.1 Environmental domains and target groups, grants vs. tax preferences, absolute figures



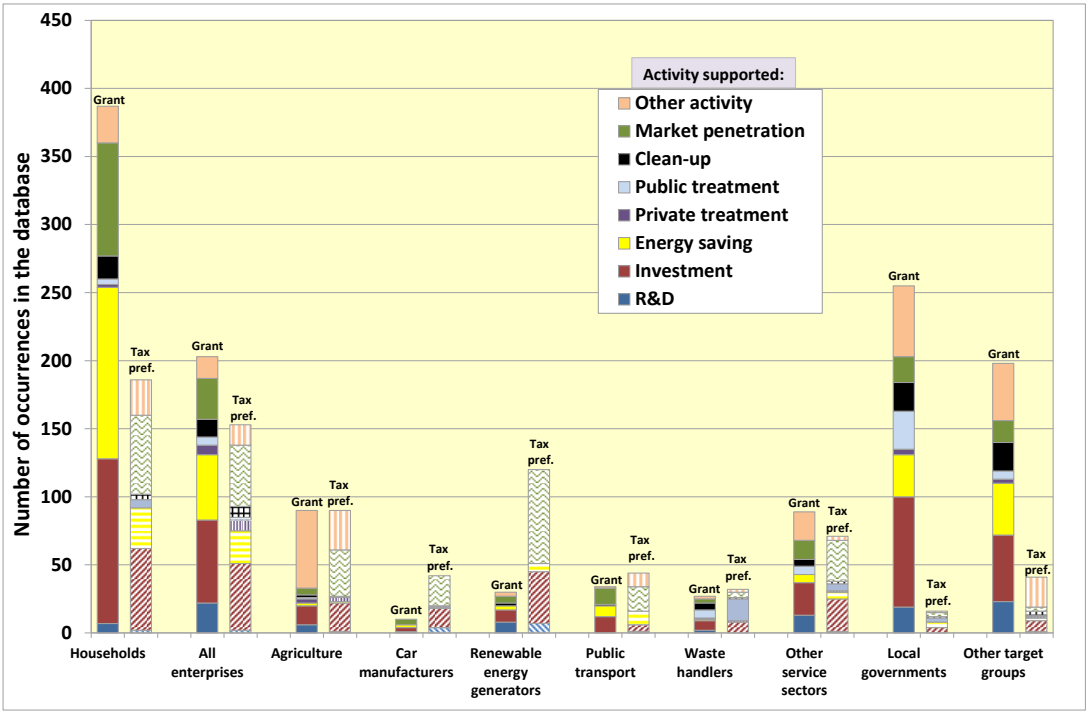
Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure C.2 Environmental domains and target groups, grants vs. tax preferences, relative figures



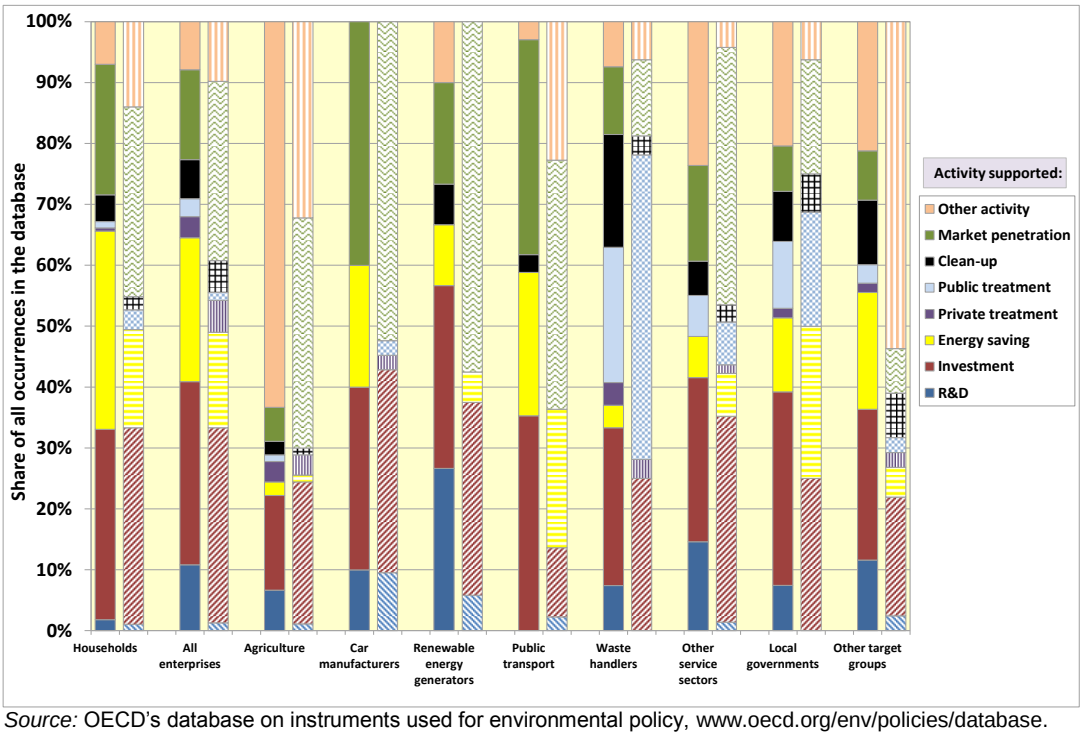
Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure C.3 Target groups and activities supported, grants vs. tax preferences, absolute figures



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure C.4 Target groups and activities supported, grants vs. tax preferences, relative figures

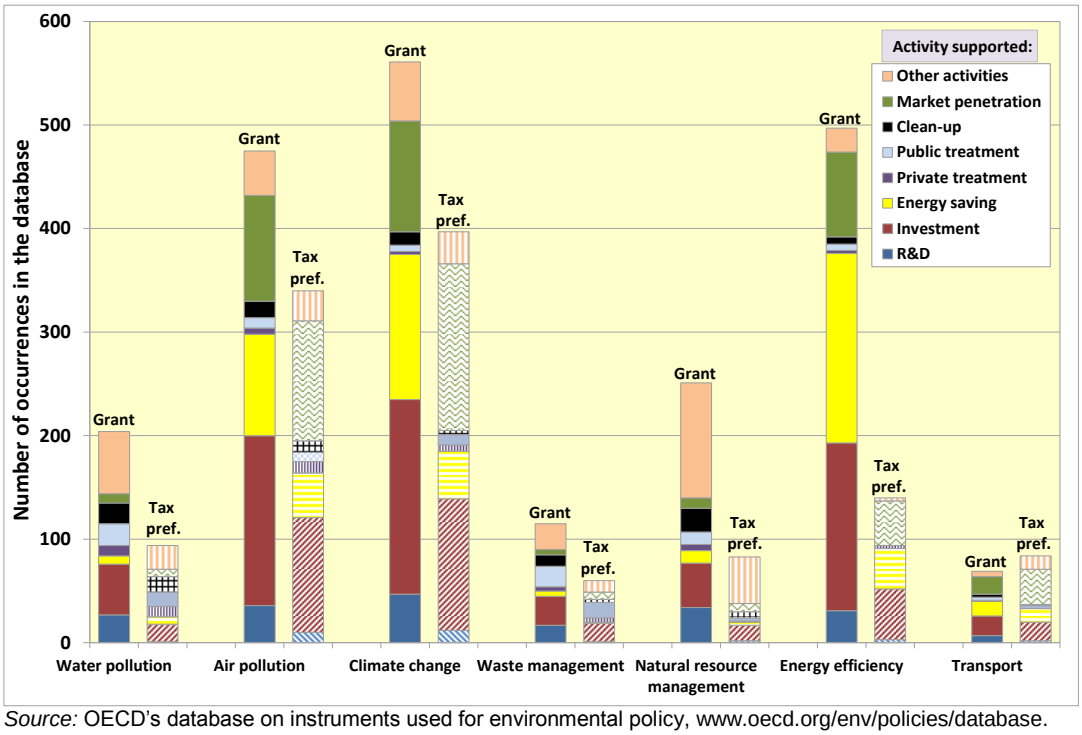


Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

127. Figures C.5 and C.6 show combinations of environmental domains and activities supported for grants and tax preferences. For each environmental domain, the column to the left show such combinations regarding grants (2172 combinations of the selected environmental domain), while the column to the right shows information regarding tax preferences (1198 combinations). For all the selected environmental domains, with the exception of "transport", there are more grants than tax preferences for such

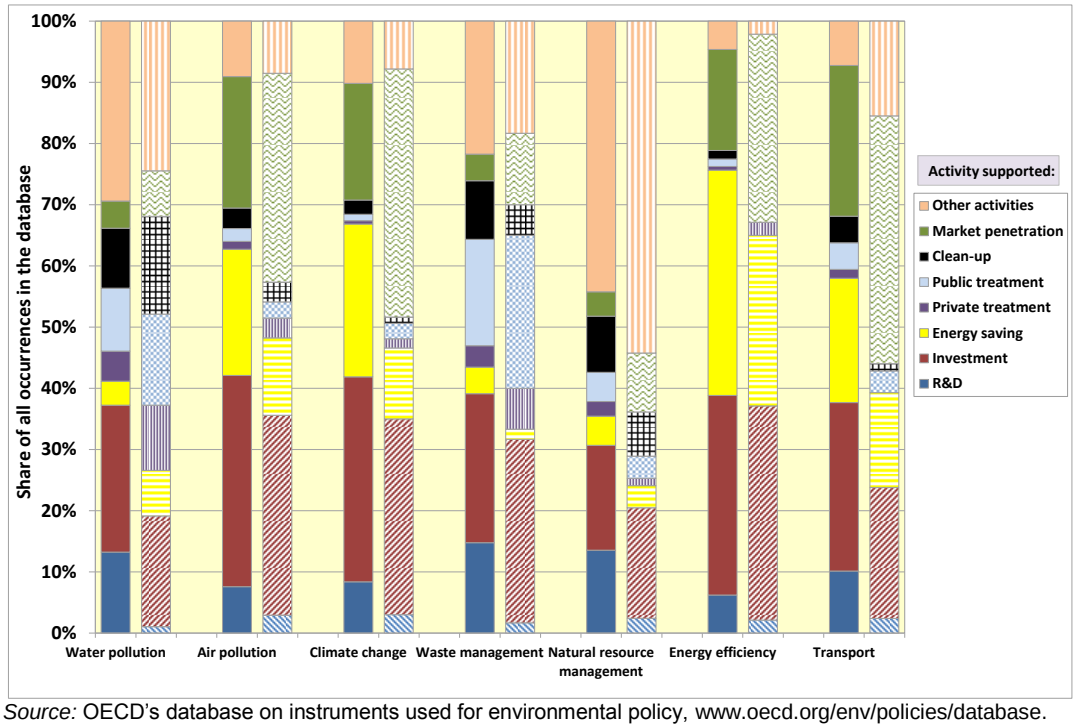
combinations.[14] Like in relation to target groups in the two preceding graphs, grants are more commonly used than tax preferences in order to support "R&D" in relation to all the selected environmental domains. In relation to "investment" (in physical capital), the two policy tools are used more or less equally frequently across all the environmental domains.

Figure C.5 Environmental domains and supported activities, grants tax vs. preferences, absolute figures



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

Figure C.6 Environmental domains and supported activities, grants vs. tax preferences, relative figures



Source: OECD's database on instruments used for environmental policy, www.oecd.org/env/policies/database.

[14] The coverage of environmental domains is incomplete, but the list of activities supported includes all those covered by the database.