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A COMPARISON OF CARBON TAXES IN SELECTED OECD COUNTRIES

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TABLE OF CONTENTS

INTRODUCTION AND SUMMARY

In recent years, many countries have become concerned about growth in emissions of "greenhouse gases" [specifically, carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs and HCFCs) and nitrous oxides (NO_x)]. The high costs likely to be associated with reducing these emissions is focusing political attention on instruments that can achieve abatement as cheaply as possible. For a variety of reasons discussed elsewhere [see OECD (1992)], emission taxes are one of these instruments.

Since CO_2 represents roughly half of all greenhouse gas emissions, and since taxation according to the carbon content of fuels is technically more feasible than taxing other greenhouse gases, most of the policy emphasis so far has focused on so-called "carbon taxes".

Several OECD countries have already implemented some form of carbon tax, and several others are actively considering this possibility. This paper provides an overview of the current situation in OECD countries with regard to carbon taxes. It also presents some rudimentary comparisons between some of these tax systems.

When interpreting the contents of this report, the reader's attention is drawn to the following important observations:

(i) It is not only taxes that are specifically labelled as "carbon taxes" that can affect emissions of carbon dioxide. As Hoeller and Coppel (1992) point out, many taxes which already exist in OECD countries affect carbon dioxide emissions, even though this may not be their stated intention. The distinction between carbon taxes and other energy taxes is necessarily an arbitrary one, and boundary definition problems will inevitably arise. Therefore, it is only really appropriate to discuss carbon taxes within the broader context of overall energy taxes. This is the approach that has been adopted in this paper.

(ii) It is important to recognise that the mere existence of a carbon tax in a particular country does not necessarily reflect a higher level of commitment to reducing CO_2 emissions in that country than in others. Carbon taxes by themselves are not the only indicators of such a commitment.

(iii) Given the complexity of existing tax systems in all countries, only the highlights of these systems can be discussed in an overview report such as this. Similarly, only a rudimentary level of inter-country comparisons can be made. This report has been designed to provide inter-country comparisons on a broad level, rather than to present detailed taxation data. No attempt is made here to be comprehensive.

(iv) At a more technical level, the data that form the basis for this report have been compiled from various national publications and from statistics published by the International

Energy Agency (IEA). Officials from national administrations have also been consulted on technical aspects of the individual tax systems.

The report distinguishes between two measures of carbon tax rates: the nominal rate and the effective carbon tax rate. The former is the general rate as initially defined by the political authorities. The latter is the average carbon tax rate for a sector or a fuel, after adjusting for any tax exemptions that may apply. At the national level, the effective rate will be lower than the nominal rate, either because emissions are partly exempted from the carbon tax, or because a lower rate than the nominal rate actually applies in practice. Taxes on fossil fuels other than those denoted as "carbon taxes" are referred to in this report as "energy taxes". For technical reasons, sulphur taxes are not discussed here. However, sulphur taxes represent only a small part of average tax levels. Nor are Value Added Taxes (VAT) included in the term "energy taxes", as used in this report.

(v) In those sections of the report that describe already-existing energy and carbon taxes in individual OECD countries, the tax rates are presented in the respective national currencies, and the are expressed in terms of litres or metric tons for the individual fuels. "Average" factors have been used to convert from litres to tons of carbon for the different products in order to to facilitate inter-country comparisons. These average tax rates are expressed in tons of emitted CO_2, since this is the unit used most often in national publications.

(vi) In the "comparative analysis" section at the end of the paper, tax rates are expressed in US dollars, using average exchange rates from 1991. Also in this latter section of the paper, tax rates are presented in terms of "per ton of carbon" and not in terms of "tons of CO_2" ($1/ton CO_2 = $3.66/ton C), since the former is the unit most frequently used in the international literature.

(vii) All data pertaining to 1993 presented in the report reflect conditions that existed up to the end of *March*.

The main conclusions of the report are:

- All of the Nordic countries have imposed new and (partly) additional taxes on fossil fuels, denoted as "carbon taxes". Finland was the first country to introduce a carbon tax in 1990, albeit at a low rate of 6.5 US$/ton carbon. The nominal carbon tax rates imposed in Norway and Sweden in 1991 were significantly higher (155 and 150 US$/ton carbon respectively). The carbon tax in Denmark, which came into force in mid-1992, was set at a rate of 57 US$/ton carbon.

- For all Nordic countries except Finland, there are extensive exemptions and tax reliefs which make the effective carbon tax rate (average carbon tax paid on all emissions) considerably lower than the nominal rates. Furthermore, revisions to the original carbon tax systems have been implemented in Norway, Sweden, and Finland since 1991. The 1993 effective carbon tax rates are: 120 US$/ton carbon in Sweden; 74 US$/ton carbon in Norway; 25 US$/ton carbon in Denmark; and 13 US$/ton carbon in Finland. This can be compared with the EC combined energy/carbon tax proposal of about 90 US$/ton carbon by the year 2000.

- In order to obtain a clear picture of the increased tax burden that followed the introduction of these carbon taxes, it is also necessary to review the adjustments that were made to other energy taxes. In Sweden, for example, energy taxes were substantially lowered in 1991, resulting in a net increase in (combined) energy and carbon taxes of only 33 US$/ton carbon, compared with an effective carbon tax rate of 120, and the nominal rate of 194, US$/ton carbon respectively. In Norway, the (1991) net tax increase was 85 US$/ton carbon (i.e. 11 US$/ton carbon higher than the effective tax rate). This is explained by the combination of an increase in gasoline taxes, and no offsetting changes to other energy taxes. In Denmark, the net tax increase was 15 US$/ton carbon, compared with tax levels prior to the introduction of the carbon tax.

- From 1991 to 1993, Norway had the largest net increase in total (energy and carbon) taxes. However, Sweden is still the country with the highest combined energy and carbon tax level: 365 US$/ton carbon compared with 232, 132, 146 US$/ton carbon in Norway, Denmark, and Finland respectively.

- On average, Norway has the highest tax level for industry, with a rate of 45 US$/ton carbon in 1993. In Sweden, the rate is 27 US$/ton carbon, after a drastic reduction from a 1991 level of 155 US$/ton carbon.

- In principle, carbon tax rates should be applied uniformly across fuels. Except for Finland, this is not the case, due to differences in both nominal rates and to various exemptions. In Denmark, natural gas is entirely exempted from the carbon tax and the rate is lower for oil than for coal, because of exemptions related to transport fuels. In Norway, a major part of coal use is exempted. For oil, there are differentiated rates, with the highest rate applying to natural gas consumption (the least carbon-intensive fuel). In Sweden, the rates are lower for coal and natural gas than for oil, because a relatively high proportion of coal and natural gas are used in manufacturing industries (for which tax relief is granted).

EXISTING CARBON TAXES IN OECD COUNTRIES

Denmark

Energy and carbon tax rates

On 15th May 1992, Denmark introduced a carbon tax on energy products. The objective of this tax was to reduce both energy consumption and CO_2 emissions.

The tax is DKK 100 per ton of CO_2 emitted (equivalent to about 57 US$/ton of carbon). Initially, the tax only applied to households and small enterprises which are not VAT-registered. However, as of 1st January 1993, the tax is also being levied on the energy use of VAT-registered enterprises, albeit at the lower rate of 50 DKK/ton CO_2.

The tax is levied on all fossil fuels except gasoline and natural gas. Gasoline was exempted on the grounds that the tax was not intended to increase the tax overall burden on households.

Although the carbon tax does not apply to natural gas, end-use prices on natural gas are affected, since gas prices are pegged to fuel oil prices. However, the impacts on both natural gas prices and revenues for the gas industry are minor since there is no net increase in taxes on fuel oil for households, and only rather moderate increases for industry (see below).

The nominal carbon tax rates for selected energy products are shown in Table 1. For comparison purposes, the table also illustrates other energy taxes and end-use prices.

Table 1. **Danish taxes and end-use prices for households for selected products (third quarter 1992).**

	Unit	Energy Tax (a)	Carbon Tax (b)	End-Use Price (c)	Carbon Tax Share (%) (100* b/c) (d)
Coal	DKK/ton	690	242	2496	9.7
Gasoline (leaded premium)	DKK/litre	2.90	0	5.77	0
Gasoline (unleaded premium)	DKK/litre	2.25	0	5.24	0
Light fuel oil (households)	DKK/litre	1.49	0.27	4.02	6.7
Heavy fuel oil (industry)	DKK/litre	0	0.32	0.78	41.0
Electricity	DKK/kWh	0.27	0.10	1.16	8.6

In addition to the energy products shown in Table 1, the Danish carbon tax also covers other fossil fuels such as liquified natural petroleum and petroleum coke. The same tax rate (i.e. 100 DKK/ton CO_2) is levied on these latter products.

Column (d) of Table 1 indicates the carbon taxes as a percentage of end-use prices. These figures should not, however, be interpreted as a measure of the real impact of the carbon tax on actual energy prices. In fact, the average price increase resulting from the carbon tax has been considerably lower than the percentages in this table suggest. There are two major reasons for this:

- When the carbon tax was introduced, other energy taxes were adjusted in a way which partly or entirely neutralised the impact of the carbon tax on end-use prices.

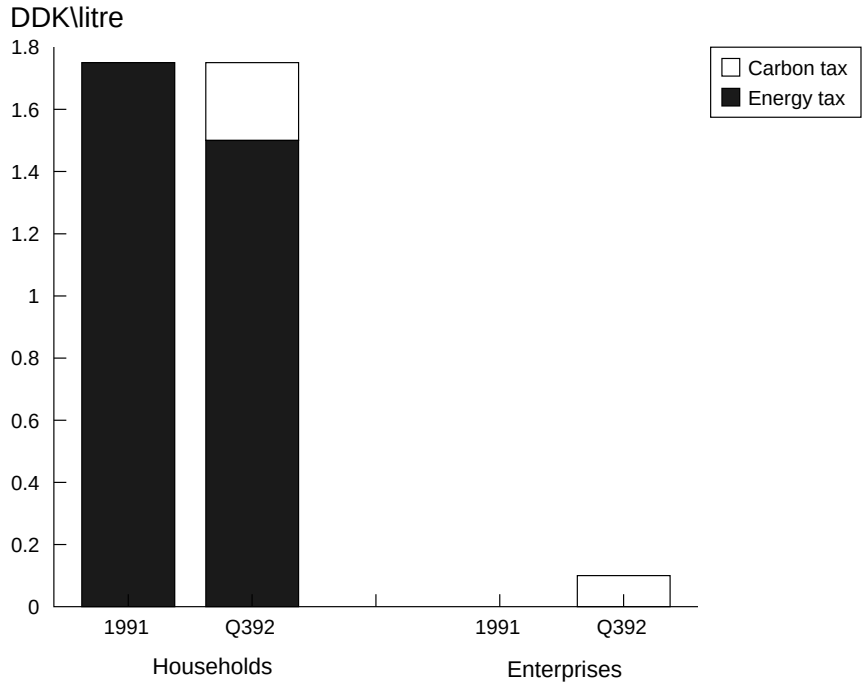
- Some sectors are exempted from the carbon tax and others are eligible for tax refunds.

These two points are examined in more detail below.

Adjustments in other energy taxes

Before the Danish carbon tax was introduced, energy taxes were paid only by households. VAT-registered enterprises had their entire tax payment refunded. As previously indicated, this is no longer the case, so the carbon tax of 50 DKK/ton CO_2 for enterprises implies a net increase in taxation for these economic units. For households, however, energy taxes were simultaneously reduced by an amount equivalent to the new carbon tax [i.e. the total tax rate (including both energy and carbon taxes) did not change]. The evolution of these taxes in the specific case of light fuel oil is illustrated in Figure 1.

Figure 1. **Evolution of energy and carbon taxes for light fuel oil -- Denmark.**



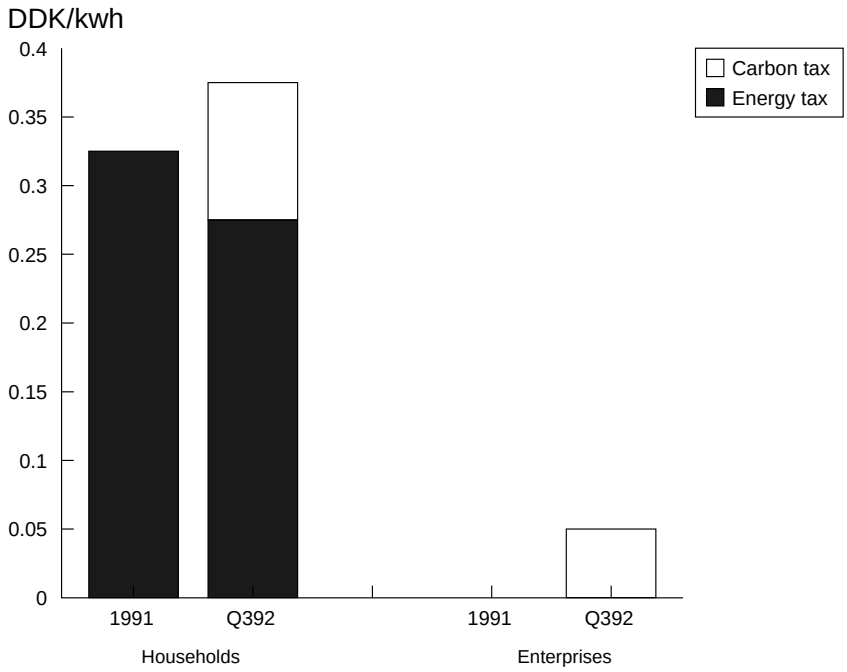
This figure indicates that the total nominal taxes on enterprises use of light fuel oil has increased from zero to 0.135 DKK/litre. However, energy and carbon taxes for households are still more than 10 times greater than the new rates for enterprises.

The Danish carbon tax is also levied on end-uses of coal and coal products in households and enterprises (except for consumption in electricity and district heating plants). In this case, existing taxes were *not* reduced. That is, the carbon tax resulted in a net price increase for all sectors (disregarding the specific tax exemptions that were granted to some consumers -- see below). However, the direct burning

of coal other than in electric power and district heating plants is modest. It only represents 2.5 per cent of total Danish emissions, so this particular tax increase will have a negligible effect on total CO_2 emissions.

On the other hand, fossil fuel use in electricity generation and district heating contribute some 40 per cent of total Danish emissions. In this sector, the carbon tax is levied not on the fuel input, but on deliveries of electricity to end-use consumers. The tax is levied on all electricity, regardless of how it is generated. The tax (0.10 DKK/kWh) is calculated as the increase in generating costs of coal-fired plants (assuming a thermal efficiency of 35 per cent), following a carbon tax of 100 DKK/ton CO_2 on coal inputs. The tax rate for enterprises is set at 0.05 DKK/kWh. For households, the existing tax on electricity has been reduced, but only by 0.05 DKK/kWh. This implies that both households and enterprises will be faced with a net tax increase of 0.05 DKK/kWh (see Figure 2).

Figure 2. **Evolution of carbon and energy taxes on electricity for households and enterprises -- Denmark.**



The carbon tax on electricity does not provide any incentive for fuel substitution within the electricity industry. To compensate for this, the Danish government passed a law which will provide electricity producers with a grant (subsidy) of 0.10 DKK/kWh for electricity generated from renewable fuels, and from combined heat and power generated from natural gas. A grant of 0.17 DKK/kWh is also provided for certain other renewables (notably wind power). The total impact on end-use prices on electricity will therefore be somewhat less than that shown in Figure 2. And finally, it should be noted that the electricity tax is also being levied on imported electricity. As a result, the new system will not give any price advantage for carbon-free electricity imported, especially from nearby Norway and Sweden.

Tax exemptions

In addition to the 50 per cent reduction in the carbon tax rate granted to enterprises (compared to households), energy-intensive companies in Denmark are eligible for tax relief according to the following rules:

- 50 per cent of the tax representing more than 1 per cent and less than 2 per cent of sales is refunded.
- 75 per cent of the tax representing between 2 and 3 per cent of sales is refunded.
- 90 per cent of the tax beyond 3 per cent of sales is refunded.
- Further refunding can then be granted on the basis of an energy audit which demonstrates that appropriate measures are being taken to reduce energy consumption.
- Energy deliveries to international air and marine bunkers, as well as energy consumption in refineries, are entirely exempted from the carbon tax.

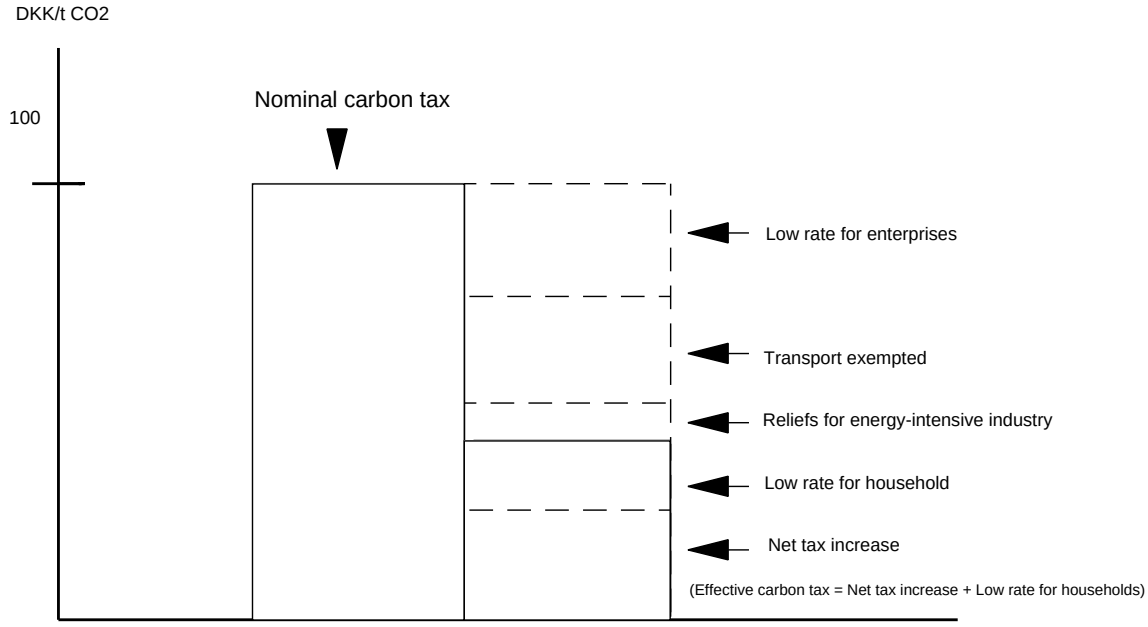
Net tax increase

Figure 3 indicates the nominal, effective, and net increases in taxes that followed introduction of the Danish carbon tax. The left-hand column in this figure shows the nominal rate for CO_2 emissions -- 100 DKK/ton CO_2. In the right-hand column, the factors that explain the difference between the nominal and effective carbon tax rates and the net tax increase following the introduction of the carbon tax are both illustrated. The figure reveals that the net tax increase in Denmark is about 25 DKK/ton CO_2.

The following factors contribute to the divergence from the nominal rate:

- **Lower rate for enterprises.** Enterprises pay 50 DKK/ton CO_2 and contribute 50 per cent to emissions. Consequently the "rebate" represents a reduction of 25 DKK/ton CO_2 from the nominal tax of 100 DKK/ton CO_2.
- **Transport fuels exempted.** Gasoline, air bunkers, and diesel oil contribute 24.5 per cent to emissions and no carbon tax is levied. Hence the reduction is 24.5 DKK/ton CO_2.
- **Tax relief granted to energy-intensive companies (industry and horticulture).** It is not possible on the basis of the information available to make an accurate estimate of the magnitude of these tax refunds. It has been estimated here to represent a 50 per cent reduction from the nominal carbon tax paid by manufacturing industry. This translates to a reduction of about 5.5 DKK/ton CO_2.
- **Low rate for households.** For petroleum use, there has been no tax increase. For electricity, there is a net increase of 0.05 DKK/kWh. About 26.5 per cent of emissions originate from households energy consumption. Taking account of these factors results in a reduction of 20 DKK/ton CO_2 from the nominal rate.

Figure 3. **Nominal and effective carbon tax rates (1993) -- Denmark.**

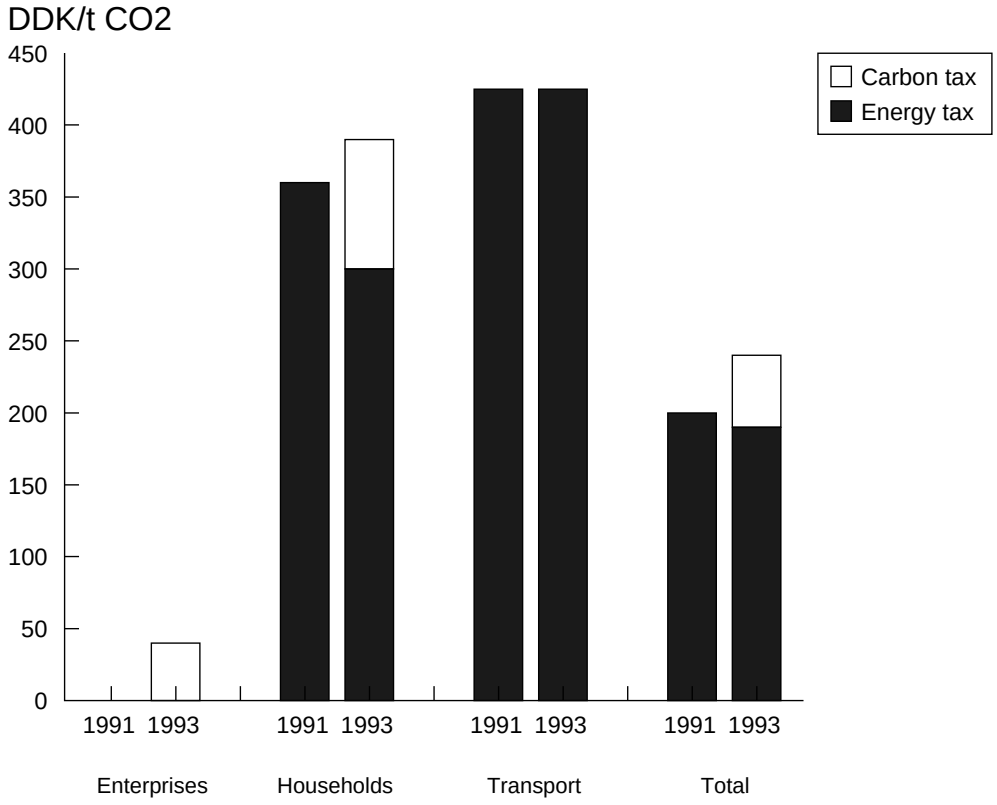


Average tax per ton of emissions

Figure 4 shows the sum of energy and carbon taxes per ton of emitted CO_2 for three sectors: enterprises, households and transport. The taxation of energy products in Denmark is rather different from common practice in most other OECD countries, insofar as energy taxes were not levied on VAT-registered enterprises (neither manufacturing industries nor other enterprises) before the carbon tax was introduced in 1992. Moreover, the current tax burden of some 25 DKK/ton CO_2 on energy used by commercial enterprises is still modest, compared with other OECD countries.

For households, on the other hand, the average tax level is relatively high, due both to high energy taxes on light fuel oil and to relatively high electricity taxes. This is quite evident from Figure 4, which shows that taxes on stationary energy use in households are nearly as high as tax levels for transport. As a result of the composition of the carbon tax, there is a net increase of 20 DKK/ton CO_2 in the average tax level for households, caused mainly by the increase in electricity taxes. As previously noted, there is no net increase in taxes on light fuel oil for households. The average carbon tax in 1993 represent some 20 per cent of the total tax level in 1993.

Figure 4. **Average energy and carbon taxes by sector (1991 and 1993) -- Denmark.**



Finland

Energy and carbon tax rates

Finland introduced a "carbon-related" tax on fossil fuels in January 1990. The rate was initially set at FIM 7 per ton CO_2 (equivalent to about 6.5 US$/ton of carbon). The tax base for all but traffic fuels (gasoline and diesel oil) was the carbon content of the fuel. At the same time, other environmental taxes were introduced on transport fuels, in order to take account of other pollutants as well. These other taxes were substantially larger than the carbon tax, implicitly recognising the greater environmental externalities associated with these particular fuels. For example, the "1990 environmental damage tax" for leaded gasoline was set at 0.27 FIM/litre, of which only 0.02 FIM/litre was the "carbon tax-related" component.

Table 2. **Energy[a] and carbon tax rates (1990-1993) -- Finland.**

	Unit	1990	1991	1992/I	1992/II	1993
Coal	FIM/ton					
Carbon tax		16.00	16.80	16.80	16.80	33.38
Milled peat	FIM/MWh					
Carbon tax		2.00	2.10	2.10	2.10	4.17
Gasoline/unleaded	FIM/litre					
Energy tax		1.30	1.60	1.70	1.90	2.40
Carbon tax		0.02	0.02	0.02	0.02	0.04
Total tax		1.32	1.62	1.72	1.92	2.44
Diesel oil	FIM/litre					
Energy tax		1.00	1.04	1.04	1.04	1.12
Carbon tax		0.02	0.02	0.02	0.02	0.04
Total tax		1.02	1.06	1.06	1.06	1.16
Light fuel oil	FIM/litre					
Energy tax		0.02	0.02	0.02	0.02	0.07
Carbon tax		0.02	0.02	0.02	0.02	0.04
Total tax		0.04	0.04	0.04	0.04	0.11
Heavy fuel oil	FIM/kg					
Energy tax		0.02	0.02	0.02	0.02	0.05
Carbon tax		0.02	0.02	0.02	0.02	0.04
Total tax		0.04	0.04	0.04	0.04	0.09
Natural gas	FIM/Sm^3					
Carbon tax		10.00	10.50	10.50	10.50	20.90
Electricity	FIM/MWh	0	0	0	0	15-21

a. Excise tax; "environmental damage" tax; precautionary stock fee; and oil pollution fee.

Since 1990, taxes on energy products have been increased on several occasions (Table 2). In 1991, taxes were increased in line with the rate of inflation (5 per cent). Gasoline taxes were also increased in 1991 and 1992, and the tax difference between leaded and unleaded gasoline was widened. A more general increase in tax rates was then implemented on 1st January 1993. At that time, the carbon tax rate was doubled from 7 FIM/ton CO_2 to 14 FIM/ton CO_2. Other energy taxes were also increased, especially the taxes on transport fuels. Further differentials on gasoline and diesel oil qualities were also introduced. In total, the revenues from fossil fuel taxes are expected to reach some FIM 8000 million in 1993, as a result of these changes. The "carbon-related" element of these revenues will be about FIM 700 million, or approximately 9 per cent of the total.

The new tax rates are indicated in Table 3, together with end-use prices. The carbon tax rates illustrated in Table 3 are consistent with the general rate of 14 FIM/ton CO_2 for all products. For coal, milled peat and natural gas, the only tax applied is the carbon tax. Prior to the imposition of the carbon tax, no taxes were levied on these products (except VAT for households). The energy taxes for petroleum products in Finland now consist of an excise tax; an "environmental damage" tax; precautionary stock fees; and oil pollution fees. The "environmental damage" tax (excluding the carbon tax) applies only to transport fuels, while the excise tax, the precautionary stock fees and oil pollution fees are levied on all petroleum products. The latter fees are "earmarked" for the financing of emergency stocks and to provide funds for the cleanup of oil spills.

Table 3. **Energy and carbon tax rates and end-use prices for selected products in 1993 -- Finland.**

	Unit	Energy tax (a)	Carbon tax (b)	End-use price[1] (c)	Carbon tax share (%) d=100*(b/c)
Coal	(FIM/ton)	0	33.38	280	12.0
Milled Peat	(FIM/MWh)	0	4.17	50	8.3
Gasoline (un-leaded)	(FIM/litre)	2.40	0.04	4.59	0.9
Diesel oil	(FIM/litre)	1.12	0.04	3.18	1.3
Light fuel oil (industry)	(FIM/litre)	0.067	0.042	1.30	3.2
Light fuel oil (households)	(FIM/litre)	0.067	0.042	1.59	2.6
Heavy fuel oil	(FIM/kg)	0.046	0.042	0.76	5.5
Natural gas (industry)	(FIM/Sm^3)	0	20.9	510	4.1
Electricity	(FIM/MWh)	15-21	0	20.9	

1. Prices estimated are end-use prices for January 1993, including VAT (22 per cent), except for industry.

Column (d) in Table 3 (i.e. "carbon tax as a share of end-use price") gives a fairly good indication of the impact of the carbon tax on end-use price levels. Since there are only insignificant tax exemptions or other reliefs for specific sectors or consumers, and since the carbon tax had little or no impact on pre-tax price levels, the percentages shown in column (d) measure the average price increase which followed from the tax. The impact is greatest for coal, where the end-use price is low and the carbon content is high. For gasoline, where energy taxes were already high, the relative impact of the carbon tax was minor (less than 1 per cent).

In addition to the above-mentioned fuels taxes, a new excise tax on electricity was also introduced in 1993. This tax will be applied at a base rate of FIM 15 per MWh, except for electricity produced from nuclear or for imported electricity (which will be taxed at the higher rate of FIM 21.2 per MWh). Exported electricity will be exempt from all taxes, as will many energy-intensive industries be exempted from the "base" tax of FIM 15 per MWh. Total 1993 revenues are expected to amount to about FIM 750 million. By implementing the "carbon-related" tax in conjunction with a new electricity tax, Finland has actually introduced a package of measures that is similar to the current proposal by the European Commission for a CO_2/energy tax.

Nominal and effective carbon tax rates

There is only a minor difference between nominal and effective carbon tax rates in Finland. The only part of emissions (and fuel use) exempted from the carbon tax are refinery use, and air and marine bunkers. These sectors account for only about 4 per cent of emissions. Hence, the effective carbon tax rate (13.4 FIM/ton CO_2) is very close to the nominal rate (14 FIM/ton CO_2).

Average tax per ton of emissions

Increases in the energy and carbon tax rates from 1990 to 1993 are shown in Table 4.

Table 4 displays the low level of the carbon tax, compared to the level of energy taxes on transport fuels. Furthermore, the increases in energy taxes have been much greater than the value of the "carbon-related" tax. This conclusion also applies, even when we take account of the fact that the carbon tax applies to nearly all emissions (fuel and end-use sector), while the energy tax is more limited in scope. Figure 5 illustrates this point. The average carbon tax increased from 7 to 14 FIM/ton CO_2 between 1990 and 1993, while the average energy tax increased from 106 to 165 FIM/ton CO_2. Hence, the energy tax increase was about five times as large as the carbon tax increase (measured on a carbon basis).

Figure 6 reveals the large differences in average tax levels between transport, on the one hand, and industry and other sectors, on the other. For transport, the average tax per ton of emitted CO_2 increased from 422 FIM/ton CO_2 in 1990 to 648 FIM/ton CO_2 in 1993. For industry, this increase was from 8 to 18 FIM/ton CO_2. Similarly, for other sectors, the increase was only from 13 to 33 FIM/ton CO_2.

Table 4. **Energy and carbon tax rates (1990 and 1993) -- Finland (in FIM/ton CO_2).**

	Energy Taxes		Carbon taxes[1]	
	1990	1993	1990	1993
Coal	-	-	7	14
Milled peat	-	-	7 (6)	14 (12)
Gasoline[2]	550	1000	7	14
Diesel oil	390	440	7	14
Light fuel oil	9	25	7 (8)	14 (16)
Heavy fuel oil	7	15	7 (6)	14 (13)
Natural gas	-	-	7 (5)	14 (11)

1. To be precise, the carbon tax rate (in parentheses) varies according to energy source. The variations noted here are due to roundings in the original (1990) tax schedule.

2. Data presented here are a weighted average of all gasoline qualities.

Figure 5. **Average carbon and energy taxes in 1990 and 1993 -- Finland.**

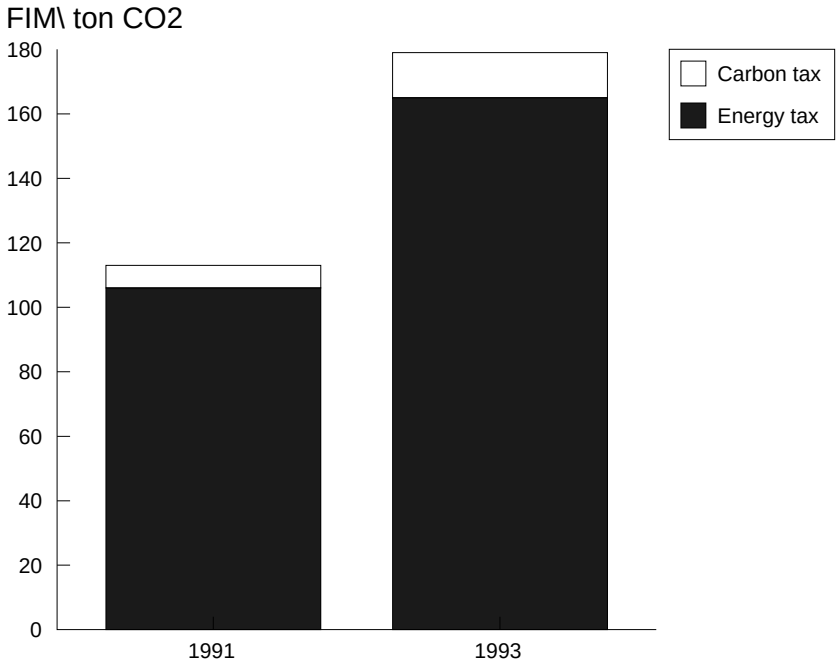
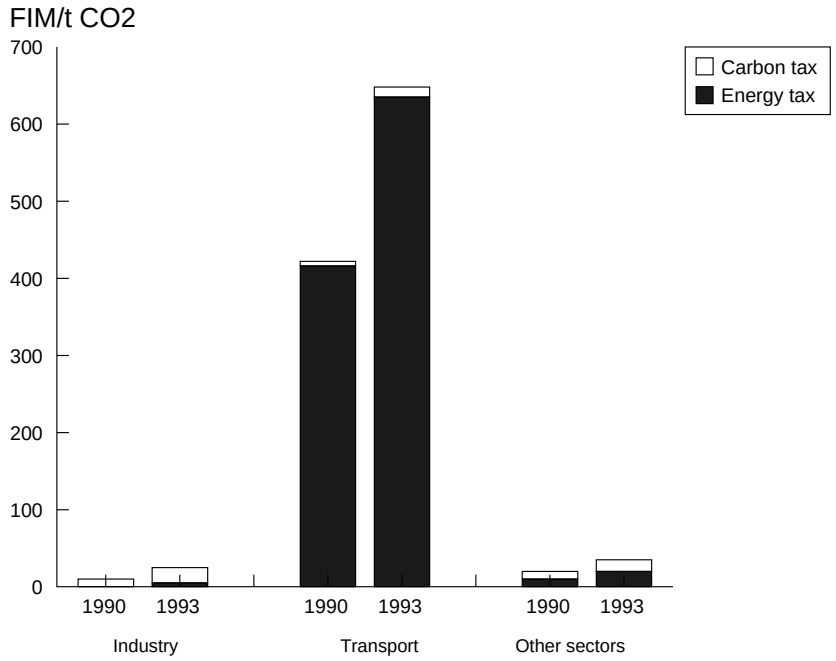


Figure 6. **Average carbon and energy taxes by sector (1990 and 1993) -- Finland.**



Norway

Energy and carbon taxes

Norway introduced a carbon tax in January 1991. The tax rates, however, were not set strictly in accordance with the carbon content of fuels. The original rates were 0.60 NOK/litre for gasoline and 0.60 NOK/Sm^3 for natural gas. These rates are equivalent to about 275 NOK/ton CO_2 for both fuels (155 US$/ton carbon). For other petroleum products, the rate was 0.30 NOK/litre [approximately 110 NOK/ton CO_2 (62 US$/ton carbon)].

Since 1991, there have been several revisions both to the carbon taxes and to other energy taxes. Table 5 indicates the evolution of the tax rates for the most important fuels. Overall, carbon tax rates increased by 33 per cent from 1991 to 1993, while the energy tax on gasoline has increased by 27 per cent. The differential between leaded and unleaded gasoline has also increased; hence the excise tax for unleaded gasoline increased somewhat less than is shown in Table 5.

Table 5. **Energy and carbon tax rates (1990 - 1993) -- Norway.**

	Unit	1990	1991	Q1/92	Q2/92	1993
Coal	(NOK/ton)					
Carbon tax		0	0	300	300	400
Gasoline	(NOK/litre)					
Energy tax		2.92	3.21	3.42	3.72	3.72
Carbon tax		0	0.6	0.8	0.8	0.8
Total tax		2.92	3.81	5.22	4.52	4.52
Fuel oils [1]	(NOK/litre)					
Energy tax		0.31	0.31	0.32	0.17	0
Carbon tax		0	0.30	0.30	0.30	0.40
Total tax		0.31	0.61	0.62	0.47	0.40
Natural gas	(NOK/Sm^3					
Carbon tax		0	0.60	0.70	0.70	0.70

1. Light and heavy fuel oil.

The carbon tax on fuel oils (light and heavy) remained constant in 1991 and 1992, but an increase from 0.30 to 0.40 NOK/litre was implemented in 1993. At the same time, the general energy tax on fuel oil was abolished after having been reduced from 0.32 to 0.17 NOK/litre in mid-1992. This resulted in a 35 per cent reduction in total fuel oil taxes (energy and carbon), compared with the 1991 level. However, the carbon tax on fuel oils is still some 30 per cent higher than the energy tax had been in 1990, prior to the introduction of the carbon tax. The carbon tax of 0.30 NOK/kg on coke and coal was not introduced until January 1992. For 1993, the rate is set at 0.40 NOK/kg.

Tax exemptions

The carbon tax on coal and coke only applies to only a small part of total coal consumption. Coal and petroleum coke used in metallurgical industries (95 per cent of total coal consumption) are completely exempted from the tax. These sources account for more than 10 per cent of Norwegian CO_2 emissions.

In total, some 25 per cent of Norwegian CO_2 emissions are totally exempted from carbon taxation. In addition to the metallurgical industry, no carbon tax is levied on refinery gas consumption; air bunkers and bunkers for fishing vessels; and coastal shipping.

In 1993, two industrial sectors (pulp and paper and fish meal industries) were also granted a 50 per cent reduction in the carbon tax rate applied to fuel oils. These two sectors comprise about 7 per cent of total industrial fuel oil consumption in Norway, and their share of Norway's total CO_2 emissions is about 1 per cent. As a result, the effect of tax exemption on the overall taxation of emissions is relatively small. No other tax relief is provided to manufacturing industry.

Nominal and effective tax rates

Starting from the nominal carbon tax rates of 366 NOK/ton CO_2 that apply for gasoline and natural gas in 1993, Figure 7 illustrates the relative contribution of various factors to the difference between the nominal and effective rates in Norway.

Figure 7. **Nominal and effective carbon tax rates (1993) -- Norway.**

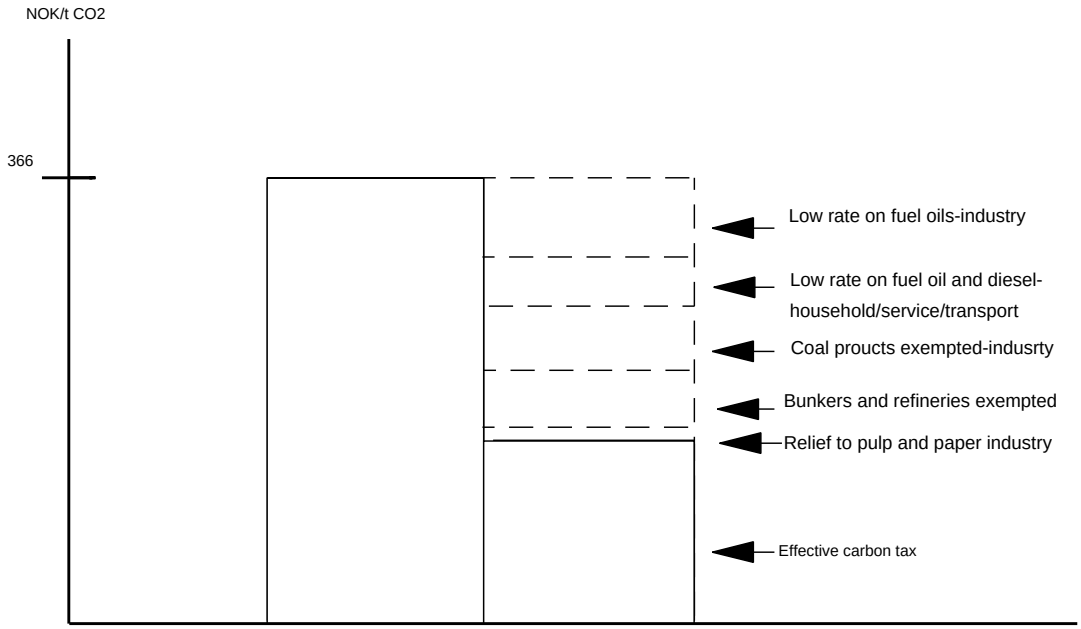
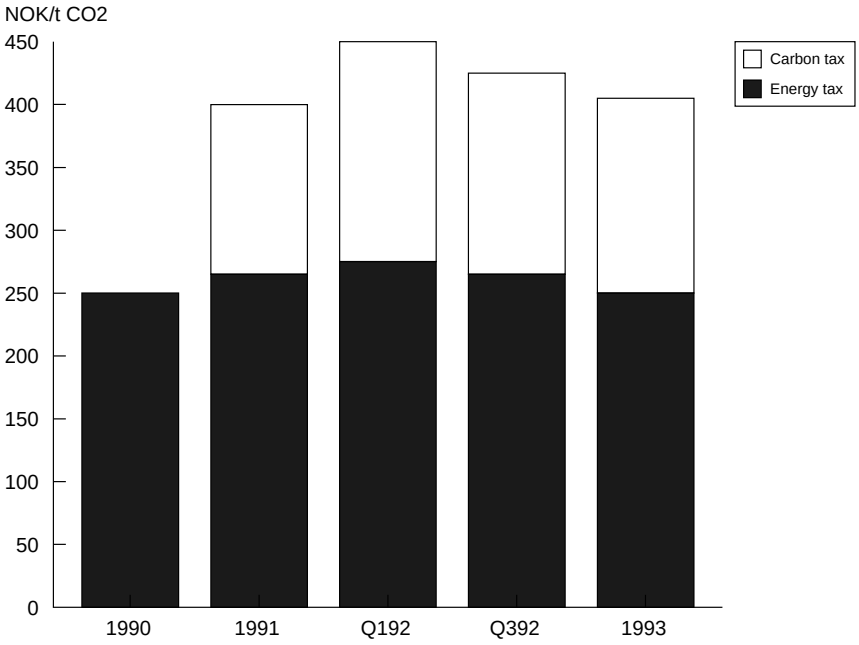


Figure 8 illustrates that the total tax per ton CO_2 increased markedly (75 per cent) from 1990 to the first quarter 1992. In addition to the carbon tax, higher gasoline taxes also contributed to this increase. After the first quarter of 1992, the average tax rate declined by 8 per cent as a result of lower energy taxes. However, the average tax level in 1993 per ton CO_2 will be some 60 per cent above 1990 levels.

Figure 8. **Average carbon and energy taxes (1990-1993) -- Norway.**



Average taxes on emissions

Taking account of the exemptions and other tax relief mechanisms described above and the tax rates shown in Table 5, the average energy and carbon tax per ton of CO_2 emissions in Norway have been calculated. The net reductions in the energy tax in 1992 and 1993 have been partly offset by increases in the carbon tax. The average carbon tax rose by 15 NOK/ton CO_2 from 1992 to 1993, compared with the 48 NOK/ton CO_2 reduction in energy taxes.

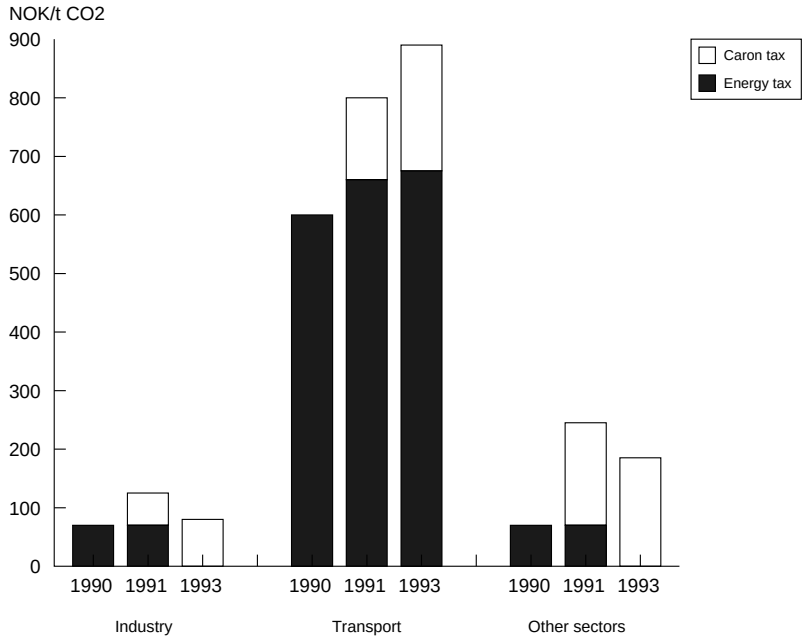
The average taxes by sector are indicated in Figure 9.

The tax level for industry doubled from 1990 to 1991. It was then gradually reduced from its peak level of 122 to reach 80 NOK/ton CO_2 in 1993, to coincide with the abolishment of the energy tax. However, due to the increase in the carbon tax, the average tax level for industry is still 20 NOK/ton CO_2 above 1990 levels. The specific reduction in carbon taxes for the pulp and paper and fish meal industries contributed to a modest reduction in the average tax for the industrial sector of 3 NOK/ton CO_2.

The energy taxes on transport fuels have increased from 600 NOK/ton CO_2 in 1990 to 680 NOK/ton CO_2 in 1993. The tax rate for gasoline is about 1400 NOK/ton CO_2, but the average rate for the transport sector as a whole is lower, due to lower rates being applied to diesel fuels. In addition, coastal shipping and fisheries, which account for 20 per cent of transport fuel consumption, are totally exempted from taxation. Taxes on gasoline were not changed in January 1993, while the carbon tax on diesel oil

increased in parallel with increases in fuel oil rates. A further increase of diesel oil taxes will take place later in 1993. (This change is not reflected in Figure 9.) Changes to the taxation of diesel fuels will be "revenue-neutral", in the sense that a reduction in the "kilometer tax" on diesel vehicles is to be implemented.

Figure 9. **Average energy and carbon taxes by sector (1990, 1991 and 1993) -- Norway.**



Other sectors (consisting of households, commercial and public services, agriculture and the offshore oil and gas industries) have experienced the largest increases in taxes per ton CO_2, moving from 54 NOK/ton CO_2 in 1990 to 263 NOK/ton CO_2. About 50 per cent of emissions in these other sectors originate from natural gas consumption in off-shore installations. A tax rate of 366 NOK/ton CO_2 applies to these emissions. For petroleum consumption in households and services, the rate is about 150 NOK/ton CO_2.

Sweden

Energy and carbon tax rates

In January 1991, Sweden introduced a carbon tax of 250 SEK/ton CO_2 (150 US$/ton carbon). At the same time, other environmental taxes were levied on petroleum products, among them a sulphur tax and special charges on emissions of NO_X. These taxes were part of a broader tax reform which had started in 1990. An important part of these reforms was the broadening of the VAT tax base. Before 1990, VAT was not levied on energy products. As part of the 1990 reforms, *all* energy products were subject to a VAT rate of 25 per cent. Both the carbon tax and the VAT rate contributed to major increases in energy end-use

prices. For example, gasoline prices rose by 40 per cent between 1989 and 1991, and fuel oil prices increased between 10 and 35 per cent [Haugland, Lunde and Roland (1991)].

Table 6. **Energy and carbon taxes for selected products (1990-1993) -- Sweden.**

	Unit	1990	1991	1992	1993
Coal	(SEK/ton)				
Energy tax		460	230	230	230
Carbon tax		0	620	620	800
Total tax		460	850	850	1030
Gasoline	(SEK/litre)				
Energy tax		3.16	2.64	2.68	3.65
Carbon tax		0	0.58	0.58	0.74
Total tax		3.16	3.22	3.26	4.39
Fuel oils (light)	(SEK/litre)				
Energy tax		0.96	0.54	0.54	0.54
Carbon tax		0	0.72	0.72	0.92
Total tax		0.96	1.26	1.26	1.46
Fuel oils (light)	(SEK/litre)				
Energy tax		1.08	0.54	0.54	0
Carbon tax		0	0.72	0.72	0.23
Total tax		1.08	1.26	1.26	0.23
Natural gas	(SEK/Sm^3)				
Energy tax		350	175	175	175
Carbon tax		0	535	535	680
Total tax		350	710	710	855

Through 1991 and 1992, both energy and carbon taxes remained more or less constant. As of 1st January 1993, however, some revisions were made to the tax rates. Developments between 1990 and 1993 for the main products are indicated in Table 6.

Table 6 illustrates that the energy taxes applicable to all products were reduced when the carbon tax was introduced in 1991. For example, in the case of gasoline the carbon tax of 0.58 SEK/litre was

largely offset by a 0.52 SEK/litre reduction in the energy tax. Hence, the net tax increase was only 0.06 SEK/litre. However, a large net increase in total gasoline taxes was then made effective as of 1st January 1993 (+1.13 SEK/litre), partly as a result of a general increase in the carbon tax rate from 250 to 320 SEK/ton CO_2, but mainly due to an increase in the gasoline tax as part of the Swedish "crisis package", passed by the parliament in the fall of 1992.

For other fossil fuels, the net increase in the total tax burden from 1990 to 1991 was somewhat larger than that for gasoline. For example, the carbon tax increase of 620 SEK/ton on coal was offset by a reduction of only 230 SEK/ton in the energy tax. A similar situation existed in the case of fuel oils.

Tax exemptions

Metallurgical industries in Sweden have traditionally been exempted from all energy taxation. This exemption applies both to fuels used for energy purposes and to coal and oil used as feedstock in industrial processes (non-energy use). As of 1993, this exemption will now apply only to non-energy uses. About 90 per cent of fuels purchased by these industries are for non-energy use. International marine and air bunkers are also exempted from energy and carbon taxes in Sweden. However, the consumption of jet paraffin for domestic use is now being taxed (at about 1 SEK/kg fuel). In the other Nordic countries, *all* air bunkers are exempted from tax.

There has been a system in place in Sweden for many years that gives energy-intensive industries some tax relief for part of their energy consumption. Consequently, until the end of 1991, energy and carbon taxes exceeding 1.7 per cent of the value of sales were refunded. This rule contributed to total refunds of about 1 billion SEK, compared with gross energy and carbon tax revenues from industrial enterprises of about 5 billion SEK. In 1992, the 1.7 per cent threshold for refunds was lowered to 1.2 per cent of sales; hence, the amount of refunded tax increased. For 1993, these refunds will be substantially reduced (to less than 50 million SEK), because the tax rates for manufacturing industry and horticulture were reduced. Energy taxes in these sectors have been totally abolished for all products and the carbon tax rate has been lowered to 80 SEK/ton CO_2, i.e. to 25 per cent of the new general carbon tax rate applicable to energy consumption in other sectors.

Nominal and effective carbon tax rates

Figure 10 shows that most of the difference between the nominal and the effective carbon tax rates in Sweden is caused by tax reductions granted to industry and horticulture.

Average tax per ton of emissions

On the basis of the tax rates shown in Table 6 and the tax reliefs mentioned above, the average energy and carbon taxes have been calculated and are shown in Figure 11. In 1990, prior to the introduction of the carbon tax, energy taxes averaged 515 SEK/ton CO_2. The introduction of a 250 SEK/ton CO_2 carbon tax (effective rate of 196 SEK/ton CO_2) was accompanied by a reduction in energy taxes of 141 SEK/ton CO_2. This resulted in a net tax increase of 55 SEK/ton CO_2 (equivalent to 22 per cent of nominal carbon tax rate of 250 SEK/ton CO_2). These tax rates remained largely unchanged in 1992. The only exception was a slightly larger scale of the refunds granted for industry. Therefore, the average 1992 tax level was somewhat below the 1991 level.

Figure 10. **Nominal and effective carbon tax rates (1993) -- Sweden.**

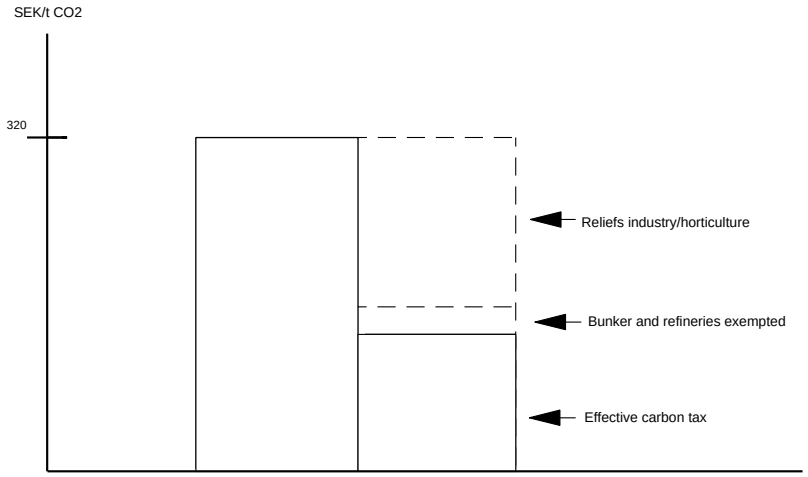
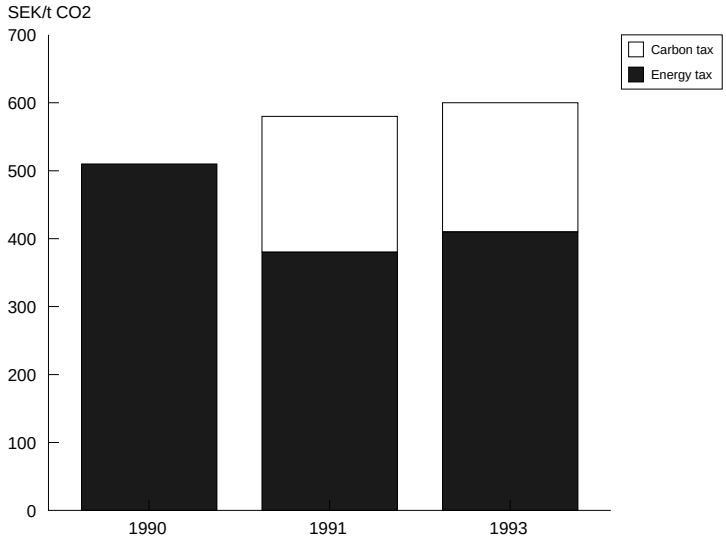


Figure 11. **Average carbon and energy taxes (1990, 1991 and 1993) -- Sweden.**



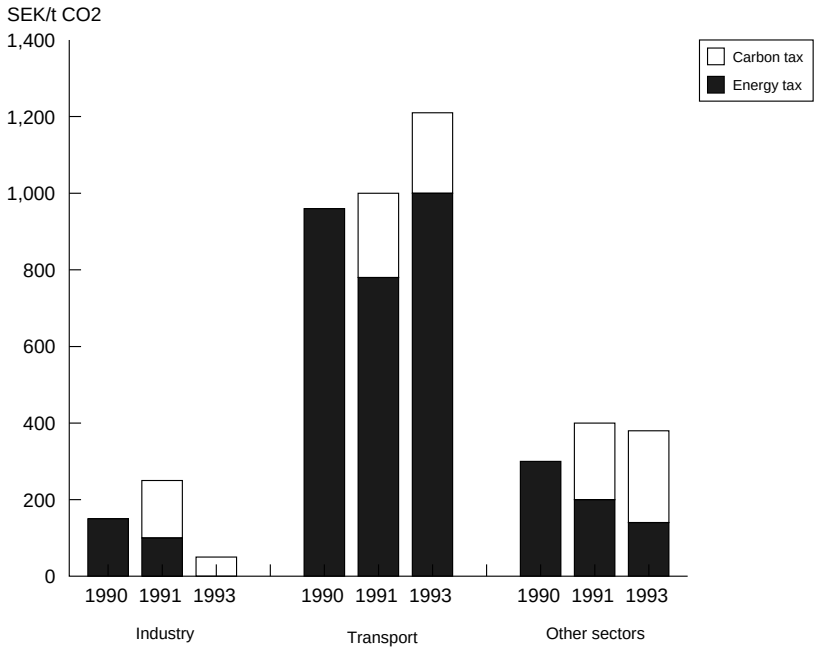
In 1993, the average tax level increased by 35 SEK/ton CO_2, to 604 SEK/ton CO_2. The increase in the gasoline tax more than outweighs the effect of the elimination of energy taxes for manufacturing, industry and horticulture. The effective carbon tax (nominal rate minus tax exemptions) remains constant

at 196 SEK/ton CO_2, despite the increase in the nominal rate from 250 SEK/ton CO_2 to 320 SEK/ton CO_2. The reason for this is that the rate for industry and commercial horticulture has been lowered to 80 SEK/ton CO_2.

Figure 12 indicates the average energy and carbon taxes broken down by sector. The tax level for industry prior to the introduction of the carbon tax was relatively high (193 SEK/ton CO_2). It was increased further in 1991, when the carbon tax was introduced. However, from 1991 to 1993, the average tax level was then drastically reduced -- from 255 SEK/ton CO_2 to 45 SEK/ton CO_2. This implies that Swedish industry will pay less than 25 per cent in 1993 of the tax paid in 1990 (i.e. before the carbon tax was imposed).

Turning to transport fuels, the most notable development has been the major increase in gasoline taxes in 1993. As noted above, the energy tax on gasoline was lowered in 1991, by nearly the same amount as the carbon tax was increased. In 1993, however, the gasoline tax has been returned to the same level as in 1990. Thus, the net increase in the tax level on transport fuels from 1990 to 1993 equals the nominal amount of the carbon tax.

Figure 12. **Average carbon and energy taxes by sector (1990, 1991, 1993) -- Sweden.**



Taxes on energy use in other sectors are also relatively high. These increases originated between 1990 and 1991. The 1993 increase in the carbon tax has been offset by the elimination of energy taxes for commercial enterprises (private and public services). However, in 1993, the carbon tax represents some 65 per cent of all taxes on energy use in these sectors.

The Netherlands

Since 1988, the Netherlands has had an environmental charge on fuel consumption. A portion of these charges has related to the CO_2 content of the fuels since 1990. The total expected revenue from these charges in 1991 was DFL 9 26 million, of which the CO_2 charge was expected to yield DFL 150 million.

In July 1992, an energy-CO_2 (50-50) user tax came into effect. Some exemptions are provided in this tax for energy-intensive industry. This tax replaced the environmental charge on fuels. Total 1993 revenues from this tax are expected to be about DFL 1 500 million. The yield of the tax accrues entirely to the general budget (i.e. no "earmarking".)

CARBON TAX PROPOSALS IN OTHER OECD COUNTRIES

European Community

As part of the European Community's strategy for combating CO_2 emissions and the greenhouse effect, the European Commission has made a proposal for a Directive that would introduce a CO_2/energy tax, coupled with tax incentives for investments in energy savings or CO_2 abatement.

The tax would be determined and established at the Community level, but arrangements for charging and collecting it would be left to the Member States, with the tax receipts accruing to the latter.

The tax would apply to all sources of energy except some renewables (solar energy, wind power, biomass, biofuels, etc.), as well as to feedstocks for industry (e.g. hydrocarbons in the petrochemicals energy). In other words, the specific sources of energy to be taxed include fossil fuels (coal, gas, oil and their derivatives); electricity generated by hydroelectric installations with capacities of over 10 MW; and nuclear power stations. The tax base would be a composite one, with 50 per cent being accounted for by the carbon content of the energy source, and 50 per cent by its energy content.

The tax would be phased in gradually, starting at $3 per barrel of oil equivalent (17.75 ECU per ton of equivalent oil) in January 1993, and rising by $1 a barrel per year of oil equivalent until the year 2000. The tax rate is viewed as a minimum one, so that Member States would be free to adopt higher rates, if they wished.

To maintain the competitiveness of Community industry, application of the tax would be made conditional on the introduction of "similar measures" by the EC's main competitors.

Graduated tax reductions would be granted to energy-intensive firms (firms whose energy costs, inclusive of all taxes except VAT, expressed as a percentage of the value added to the products obtained using the energy concerned, exceed 8 per cent). The scale indicated in Table 7 would apply:

Table 7. **Graduated tax reductions for energy-intensive firms (percentage of value added).**

Energy costs	Reduction
8-12%	25%
12-17%	50%
17-30%	75%
30% and above	90%

Member states may also entirely exempt firms (on a temporary basis) from paying the tax due, provided that these firms have embarked upon substantial energy-saving or CO_2 reduction measures.

All firms investing in energy-saving or CO_2 abatement will be able to deduct the amount of any new expenditure on such investment from its tax bill. Where that amount exceeds the tax payable, a tax credit will also be granted.

And finally, the tax should be implemented according to the general principle of "revenue neutrality", which means that the carbon/energy tax will be compensated by equivalent reductions in other taxes payable.

Germany

In late 1989, the German government announced plans for the introduction of a carbon tax. In early 1991, the Minister of Environment indicated that the charge would be 10 DM per ton of CO_2. This would tax electricity generated from hard coal at 0.01 DM per kWh (a rise of about 3 to 10 per cent, depending on the customer group), and fuel oil at about 0.02 DM per litre. However, no concrete action has yet been taken to implement such a tax. Since December 1991, the federal government has also supported the proposal of the EC Commission for a mixed energy/CO_2 tax.

The government is also presently working on a reform of the motor vehicle tax. The aim is to base the tax on emissions, instead of on cylinder capacity. The basic idea is to create an index composed of the major pollutants (hydrocarbons, carbon monoxide, nitrogen dioxide); particulates; and noise. For each type of car, the corresponding emissions would be measured and used to calculate an emission index for that type of car. It was originally intended to include a carbon dioxide emissions component in this tax, but, due to measurement problems, the tax will more likely be based on the power of the car (a closely correlated substitute for CO_2 emissions).

Switzerland

In 1990, Switzerland proposed a CO_2 charge on fossil fuels. Presently, a charge on combustibles and fuels of SFR 34.70 (20.06 ECU) and SFR 81.40 (47.05 ECU) respectively per ton of CO_2 emitted is

being considered. This would raise the price of gasoline by 17 per cent; heating oil extra-light by 27 per cent; heating oil heavy quality by 53 per cent; gas by 14-23 per cent; and coal by 41-99 per cent. The total revenue from the proposed tax in the year 2000 is estimated to be about 2 billion SFR (about 1.16 billion ECU) per year.

A compensation system (not yet defined) is foreseen, in order to refund companies in sectors with higher energy intensities than a certain level (e.g. 10 per cent), who would not be required to pay any additional tax.

COMPARATIVE ANALYSIS

Nominal and effective carbon tax rates

In the following analysis, the evolution of nominal and effective carbon tax rates is compared for the four Nordic OECD countries. As discussed earlier, nominal rates are those which have been decided by political authorities (e.g. the Danish rate of 100 DKK/ton CO_2). Effective rates are the nominal rates, adjusted for tax exemptions and tax reductions. The effective rates, therefore, are always smaller than (or equal to) the nominal rates.

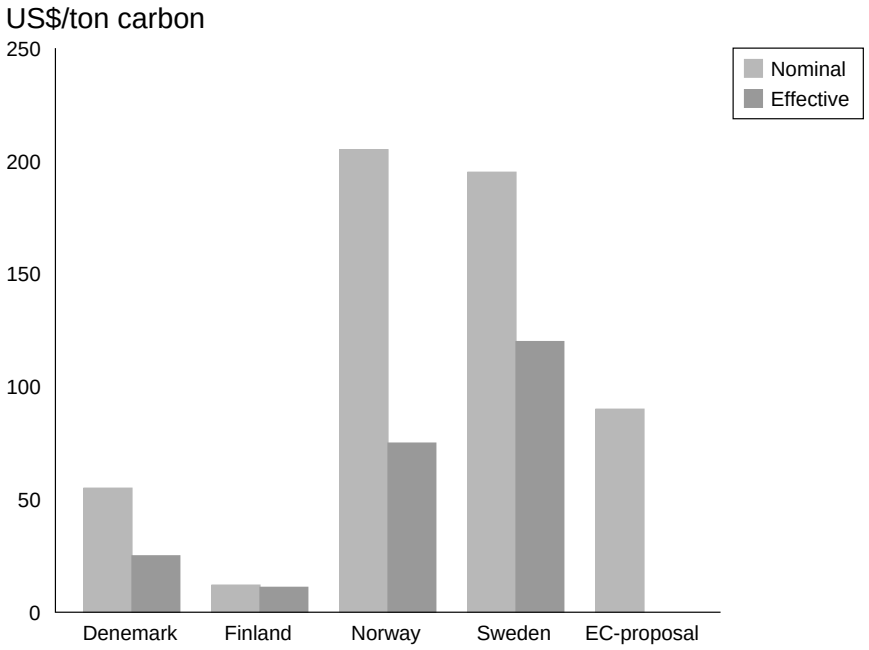
For Denmark, Norway and Sweden, the effective carbon taxes paid vary by fuel and by sector. Some sectors are entirely exempted from the tax (e.g. international air and ocean transport). For other sectors, partial exemptions and/or tax refunds are in effect. It is necessary to take these exemptions and tax reductions into account in order to get an overview of the true size of the carbon taxes in effect -- i.e. the effective carbon tax.

Figure 13 compares the nominal and effective *carbon* tax rates for the four Nordic countries discussed in this report, as well as for the EC *combined* energy/carbon tax proposal (nominal rate only). Average exchange rates from 1991 have been used in preparing this figure.

The nominal rates are highest in Norway and Sweden, being more than twice as high as the energy/carbon tax proposal put forward by the EC Commission (for the year 2000). The effective tax rate in Sweden is 120 US$/ton carbon, i.e. some 30 per cent above the EC proposal, but 40 per cent below the nominal rate. As previously discussed, the difference between the nominal and effective rates in Sweden can be explained by the lower rates paid by industry and commercial horticulture.

In Norway, the effective carbon tax rate is 74 US$/ton carbon. The nominal carbon tax rate is set at 205 US$/ton carbon. This corresponds to the rate applied on gasoline and natural gas. The rates for fuel oils and coal are less than 50 per cent of that rate. The lower rate for fuel oils and coal, together with a relatively large share of national emissions being exempted from carbon taxation, contribute to the relatively low effective tax rate in the Norwegian case.

Figure 13. **Nominal and effective carbon tax rates (1993) -- selected OECD countries.**



In Denmark, the effective tax rate is 25 US$/ton carbon -- in other words, slightly less than half the nominal rate. As previously discussed, three factors help explain why the effective rate is lower than the nominal rate: low rates paid by commercial enterprises; tax relief granted to energy-intensive industry; and transport fuels being exempted from the tax.

In Finland, there is little difference between the nominal and effective rates. No sectors are exempted from taxation, except for international marine and air bunkers, which constitute only a small part of total emissions in any event.

Net tax increases

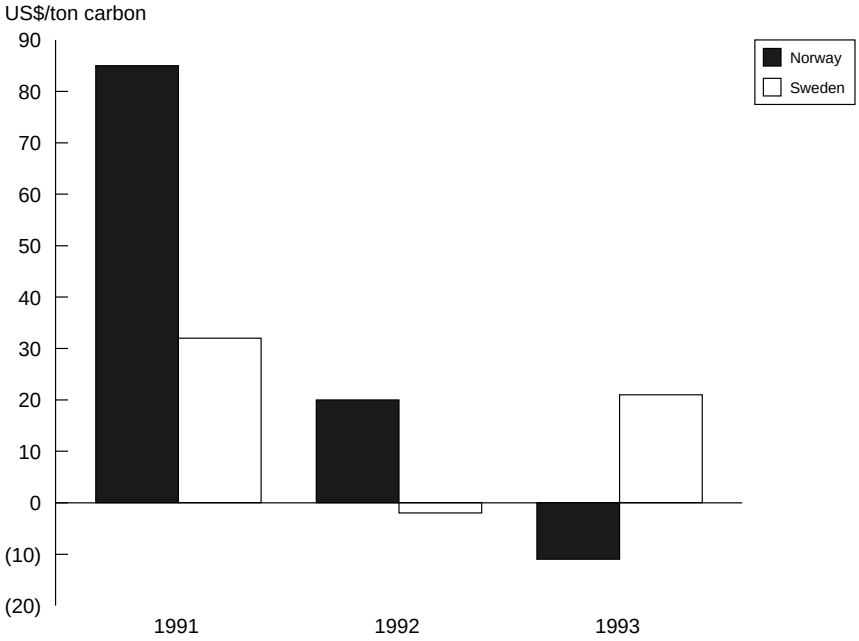
Analysis presented earlier in this report has revealed that energy taxes are often modified (generally reduced) when carbon taxes are introduced. For example, we saw earlier that the Danish energy taxes on fuel oils for households were reduced by an amount equivalent to the new carbon tax. In total, such modifications resulted in a net tax increase in Denmark of only 15 US$/ton carbon, compared with an effective carbon tax rate of 25 US$/ton carbon.

For Norway and Sweden, it is possible to review changes to carbon and energy taxes over a few years. In Figure 14, the net tax changes from 1991 to 1993 are summarised for these two countries and presented in a comparable format.

When Norway introduced its carbon tax, the net tax increase from the year before was larger than the effective carbon tax rate (i.e. a net tax increase of 85 US$/ton carbon compared with an effective carbon tax rate of 74 US$/ton carbon). The larger net increase can be explained by the increase in the gasoline tax. Moreover, none of the other energy taxes were reduced in Norway at that time, contrary to what happened in Denmark and Sweden.

In Sweden, energy taxes were substantially reduced when the carbon tax was imposed. Therefore, the difference between the effective carbon tax rate and the net tax increase in 1991 was quite large. More specifically, the net increase was 33 US$/ton carbon -- i.e., only one third of the effective carbon tax rate, and only 13 per cent of the nominal rate.

Figure 14. **Net increase (energy and carbon) in taxes from 1991 to 1993 -- Norway and Sweden.**



In 1992, total (carbon and energy) tax levels in Norway increased further as a result of higher carbon taxes, but declined somewhat in 1993, when energy taxes on fuel oils were abolished. In Sweden, there was a modest reduction in total taxes in 1992 as more tax reductions were offered to industry. Tax reductions for industry were scaled up in 1993 (see Figure 12), but this was more than compensated for by the higher gasoline tax that was simultaneously imposed.

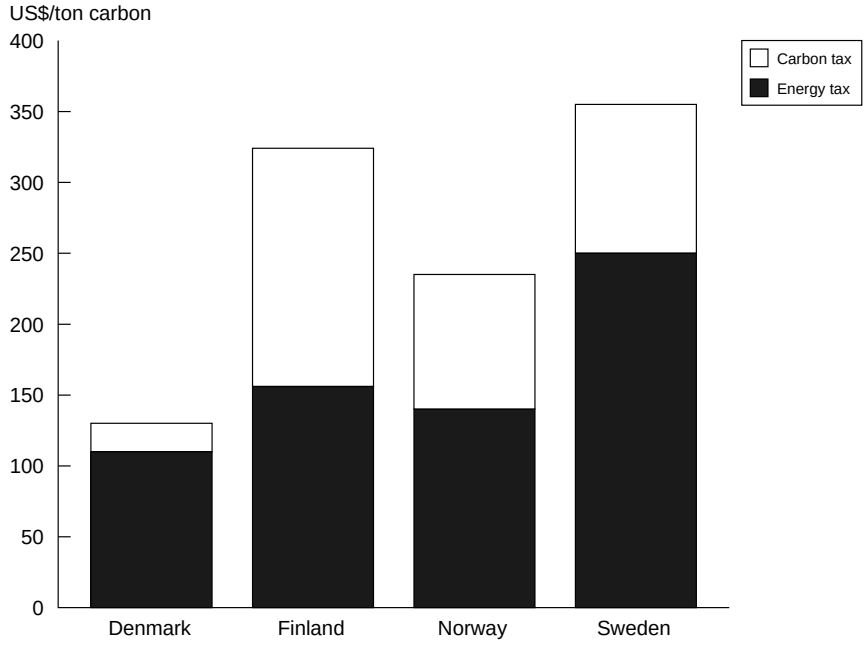
Adding up the total tax changes from 1991 to 1993, Norway has seen an increase in energy and carbon taxes equivalent to 92 US$/ton carbon, and Sweden has seen an increase of 53 US$/ton carbon.

In Finland, there have been no reductions in either carbon or energy taxes during the period 1990-1993. Therefore, the total tax increases experienced during that period have been consistent with increases in both nominal and effective tax rates.

Tax levels

Despite the net increase in energy and carbon taxes in Norway, the average tax level is still considerably higher in Sweden (Figure 15). Nominal tax rates are, in general, somewhat higher in Sweden, but the main reason for the difference is structural differences in CO_2 emissions between the two countries. In Sweden, some 25 per cent of CO_2 emissions originate from gasoline use, while the share in Norway is only 17 per cent. Gasoline consumption has a major impact on the average tax levels indicated in Figure 15, since the (carbon + energy) taxes are much higher on gasoline than on other products (refer to Figures 9 and 12). Furthermore, the sectors that are exempted from taxation (air and marine bunkers, non-energy use in metallurgical industry) comprise a larger share of emissions in Norway than in Sweden; they contribute to the lower average tax levels accordingly.

Figure 15. **Average energy and carbon taxes -- selected OECD countries (1993).**



The average tax levels in Denmark and Finland are only about 40 per cent of Swedish levels and 60 per cent of Norwegian levels. In Finland, taxes on transport fuels are high, whereas Denmark has a broader tax base (when both energy and carbon tax components are considered) and higher carbon taxes than exist in Finland.

Figure 16. **Average energy and carbon tax in industry (1993) -- selected OECD countries.**

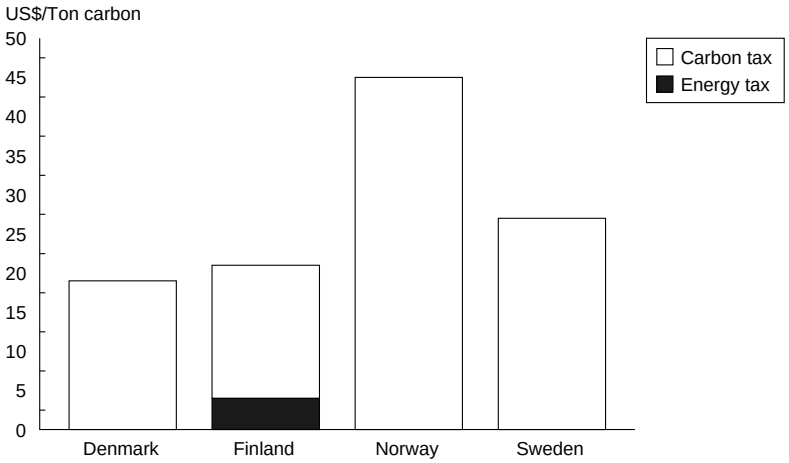
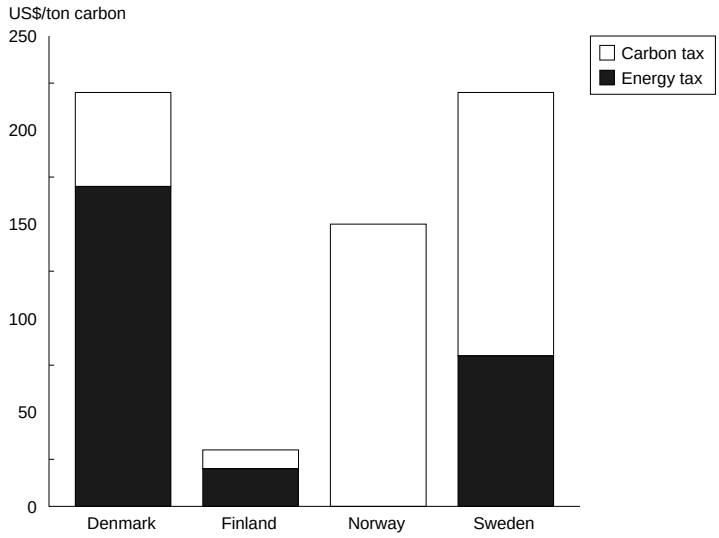


Figure 17. **Average energy and carbon tax in other sectors (1993) -- selected OECD countries.**

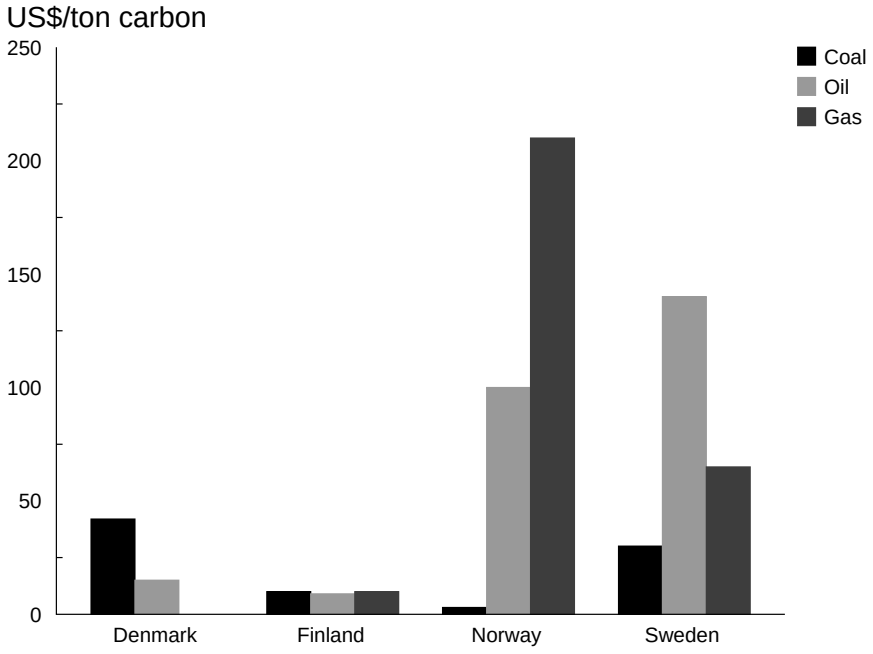


Figures 16 and 17 provide more details on tax levels for industry and other sectors. Norway has the highest tax level for industry in 1993, although Sweden was at the same level until the taxes on manufacturing industry were lowered in January 1993. For other sectors, Sweden and Denmark have the

highest rates. However, in the case of Denmark, this sector only includes households, while "services" are included for the other countries. For Norway, taxes on natural gas use at offshore installations are included in the "other sector" category. Excluding these from the calculation would yield a tax on households and services for Norway of about 85 US$/ton carbon (i.e. about one third of the levels in Sweden and Denmark).

Figure 18 compares the effective carbon tax rates for coal, oil and gas. Only Finland has the same effective carbon tax rate for all fuels, i.e. the tax rates for all fuels are fixed in accordance with the carbon content of the fuels, and no tax exemptions or refunds are permitted. In Denmark, the tax does not apply to natural gas and the effective rate for oil is lower than for coal, because gasoline is exempted from the carbon tax.

Figure 18. **Effective carbon tax rates by fuel (1993) -- selected OECD countries.**



In Norway, a major part of coal use is exempted from the tax. Furthermore, there are differentiated rates for oil products. This results in a lower effective rate for total oil than for natural gas (on which the highest rate applies). In Sweden, the rates are lower for coal and natural gas than for oil, because a relatively large share of coal and natural gas are used in manufacturing industry, where tax reductions apply.

Figure 19 illustrates the evolution of gasoline taxes in Finland, Norway, Sweden and Denmark in recent years. The carbon taxes are placed in the context of other excise taxes on gasoline in each country. Finland, Norway, and Sweden have experienced substantial increases in their gasoline taxes since

1990. However, in none of these countries can these increases be ascribed to carbon taxes alone. In both Norway and Sweden, about two-thirds of the increase stemmed from the carbon taxes, but the remainder was due to increases in other energy taxes. In Finland, the carbon tax on gasoline is negligible, so all price increases were due to increases in other energy taxes. Denmark actually reduced its gasoline tax in 1991 and, as explained earlier, the carbon tax introduced in 1992 does not apply to gasoline.

Figure 20 shows the gasoline tax situation at one point in time (third quarter of 1992) for a larger group of OECD countries. From this figure, it is apparent that the two countries with the highest visible carbon taxes on gasoline (Norway and Sweden) are also among the countries with the highest total tax levels on gasoline. Italy is the country with the highest tax levels in this figure (measured in $US at third-quarter 1992 tax rates and exchange levels), and several countries have higher energy taxes than Norway and Sweden, when carbon taxes are excluded. On the other hand, it should be noted that Sweden and Finland have raised their energy taxes on gasoline significantly, beginning in 1993.

Figure 19. **Evolution of gasoline (leaded premium) taxes -- selected OECD countries.**

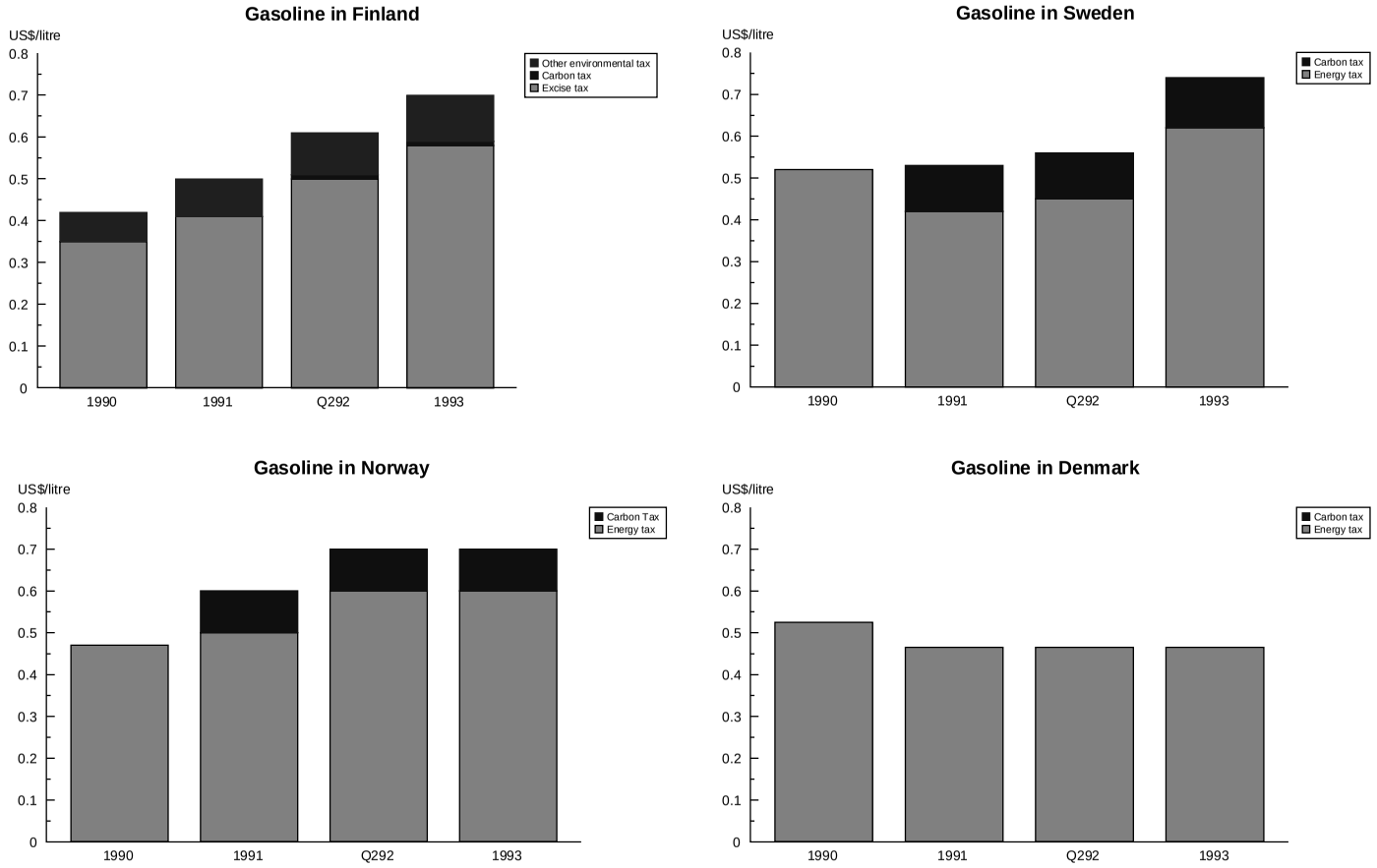
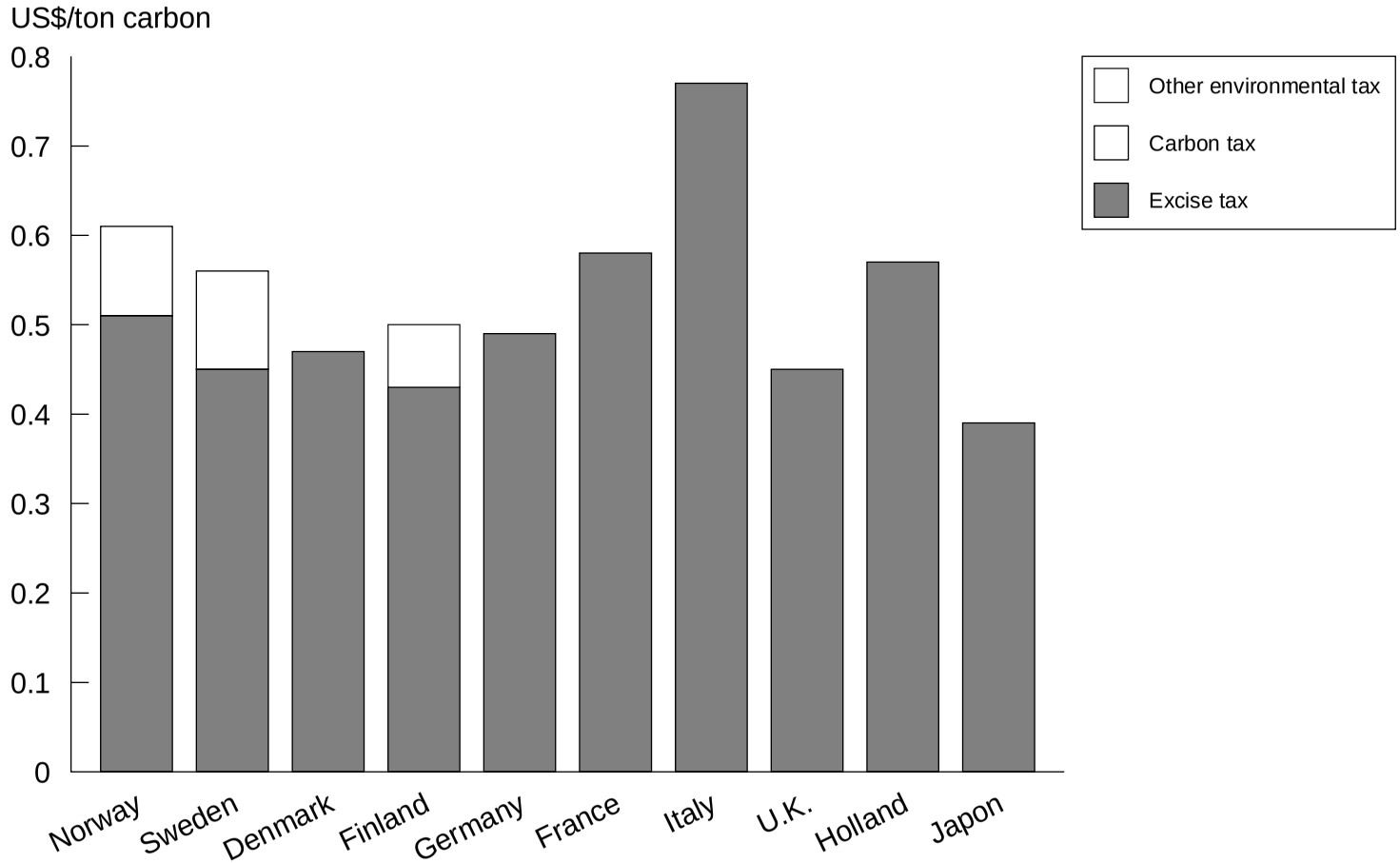


Figure 20. **Gasoline (leaded premium) taxes in 1991 -- selected OECD countries.**



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