

Greening the Danish Tax System

Thomas LARSEN (*)

Head of Division, the Danish Ministry of Taxation

ABSTRACT

The aim of this short article is to give an overview of the development of the use of green taxes in the Danish tax system. The conclusions are that green taxes do play an important role in supplementing taxation of labour and capital. But it is very difficult to make very large shifts in taxation from for instance labour to green taxes due to the nature of most green taxes. Furthermore, green taxes can and do play an important role in reaching various environmental objectives in an efficient way. But green taxes should be used with care as they too distort economic behaviour.

Keywords: Environmental Tax, Tax Shifting, Pigouvian Tax, Externality

JEL Classification Code: H23

(*) The views expressed in this article are those of the author and do not necessarily correspond with the official views of The Danish Ministry of Taxation.



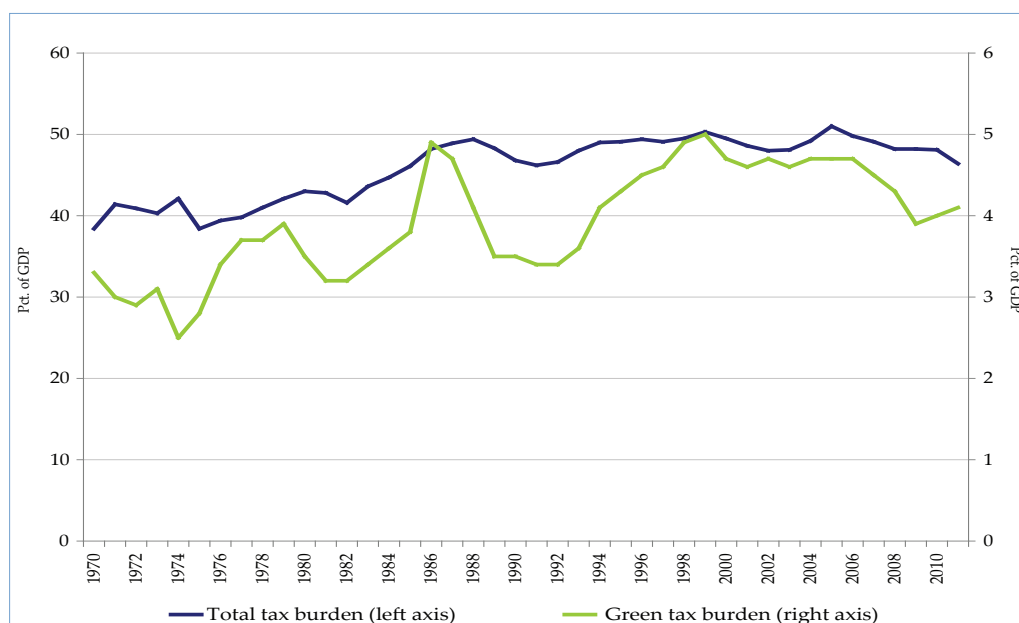
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1 The Green Tax Burden

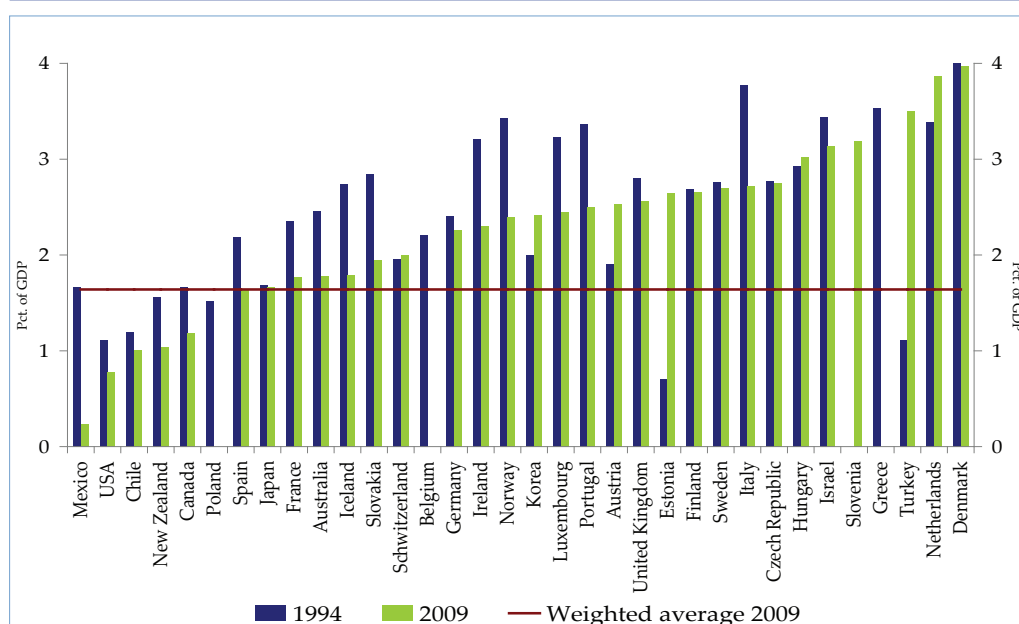
During the last three decades Denmark has consistently been one of the countries making most widespread use of green taxes. The green tax to GDP ratio is varying around 4 % as a product of continuous shifts in taxation from labour to environment during several tax reforms. In the same period the total tax to GDP ratio has been around 40-50 % meaning that the share of green taxes to total taxes has been around 8-10 %, see fig. 1.a and 1.b.

Figure 1.a: Green Tax Burden 1970-2011, per cent of GDP



Source: The Danish Ministry of Taxation and OECD Environmental Tax Database.

Figure 1.b: Green Tax Burden in OECD 1994 and 2009, per cent of GDP



Source: The Danish Ministry of Taxation and OECD Environmental Tax Database.

In fig. 1.b. the green tax to GDP ratio is shown for OECD countries for the two years 1994 and 2009. In both 1994 and 2009 Denmark was the country with the highest ratio.

Keeping the ratio of green taxes to GDP relatively constant during three decades is relatively difficult. This is due to the fact that most green taxes are expressed as a rate per litre, kg, m³ etc. meaning that the real rates are gradually reduced as prices and incomes increase. Furthermore the very nature of green taxes is to reduce their base. Thus, the permanent revenue of most green taxes is far below the immediate direct revenue effects at the time of the introduction. And for fiscal policy to be sustainable, most new green taxes will not be able to finance cuts in for instance labour taxes at the same magnitude as the immediate direct revenue of the green tax.

Or put in another way. To keep the ratio of green tax to GDP constant it is necessary that the combined increase in tax rates and tax bases exceed that of nominal GDP growth.

Box 1. The permanent revenue effect of a green tax

The difference between the permanent revenue effect of a green tax and a personal income tax can easily be shown looking at simple example. The revenue from a personal income tax will normally follow the general pattern of economic growth that is the nominal rate of growth of GDP that is for instance 4 % a year.

This means that revenue from a personal income tax will be 100 in the year of introduction, 104 the second year, 108.16 the third year and so forth.

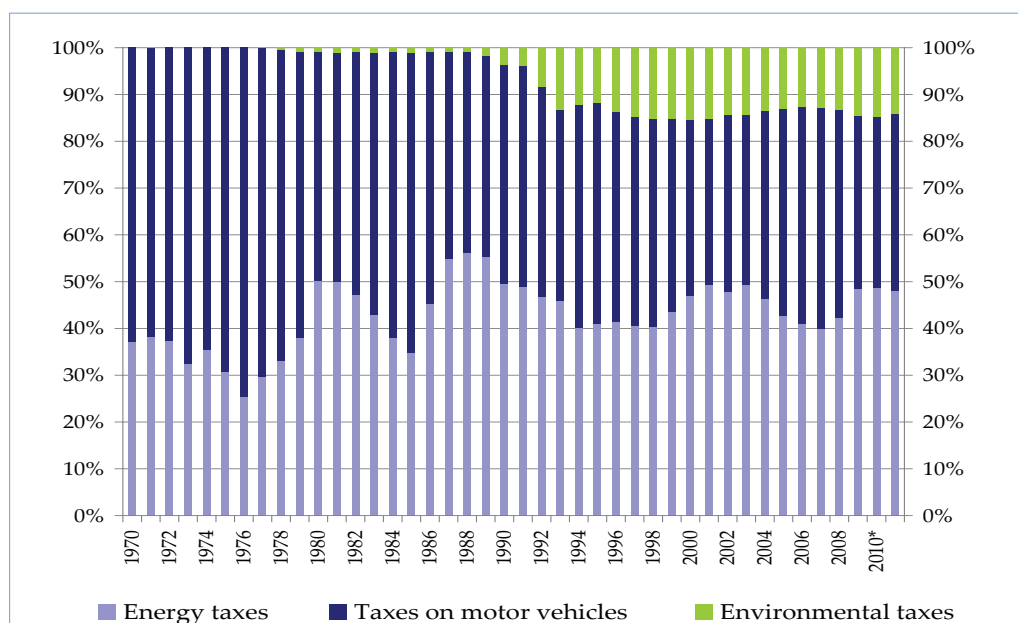
A green tax will normally be either fixed in nominal terms or indexed according to price increases. If prices increase by 2 % per year and the tax rate is indexed then the green tax revenue will be 100 in the year of introduction, 102 the second year, 104.04 the third year and so forth.

This means that a green tax will normally not be able to finance a similar cut in personal income taxation or a similar public expenditure on a permanent basis. In this example the possible effect on the base of the green tax is not taken into consideration.

A traditional pigouvian approach to green taxation would prevent just increasing tax rates by more than nominal GDP growth as it is very unlikely that externalities would increase by such a high rate. Instead one has to broaden green tax bases by introducing pigouvian taxes where feasible.

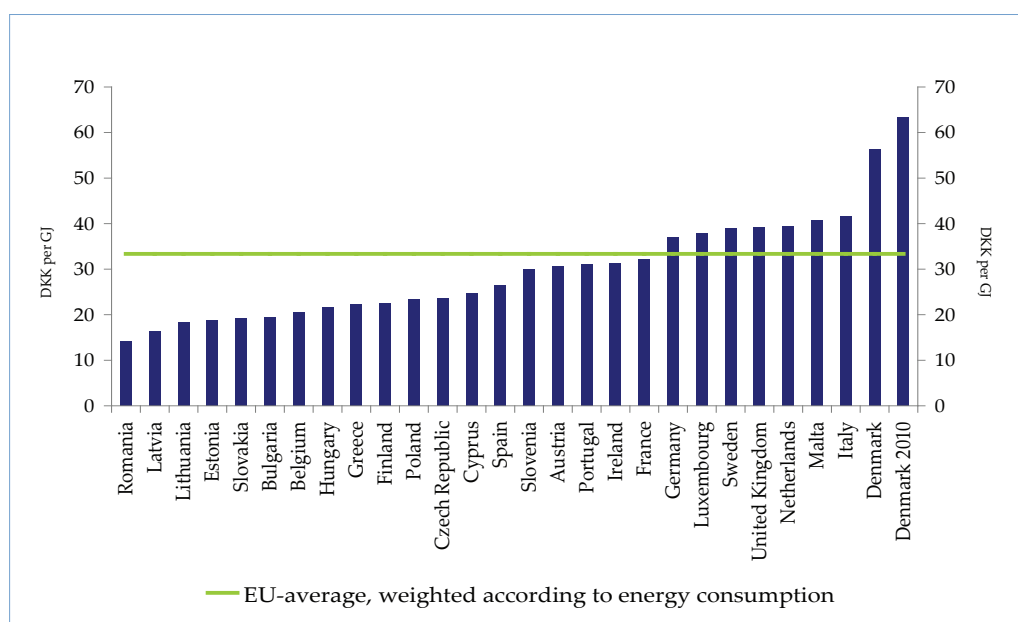
This has led to the use of a wide range of green taxes in the Danish tax system with an increasing weight put on environmental taxes gradually introduced since the mid 1980s as a supplement to the traditional taxes on energy and transportation, see fig. 2.a. Environmental taxes now make up around 15 % of green tax revenue.

Figure 2.a: Green Tax structure, 1970-2011, per cent of Green Taxes



Source: Taxation trends in the European Union (2010 edition) and The Danish Ministry of Taxation.

Figure 2.b: Energy Tax Revenue in relation to final energy consumption, 2008



Source: Taxation trends in the European Union (2010 edition) and The Danish Ministry of Taxation..

One further observation from fig 2.a. is that the share of revenue from the taxation of vehicles is quite volatile. This is due to the by international standards rather high Danish registration tax on new cars which follows the business cycle. At the moment the share of taxes on vehicles is around 35 % of green taxes.

Since the early 1980s energy taxes has been the most important part of green taxes rising around 50 % of green taxes. This is the result of the most comprehensive taxation of energy in the EU. Fig 2.b. shows that the total energy tax revenue measured as DKK per GJ of final energy consumption is 30 % higher than the country with the second highest energy taxation and 70 % above the EU average. The energy taxes were increased further by 1 January 2010.

2 A History of Green Tax Reform

In the next paragraph a brief description of the development of the use of green taxes in Denmark is offered. It is not intended to give a detailed description of each individual green tax but rather to offer a first glance at the Danish approach to green tax reform. As might be seen from the descriptions, the use of green taxes is not completely trivial and might involve quite a lot of legislation to keep tax rules effective and revenues constant.

2.1 1970-1980s: Energy crises and environmental awareness

The first green taxes in modern history were the taxes on transportation; the annual circulation tax and the registration tax on motor vehicles and the tax on petrol. These taxes were introduced in the period around WWI to reduce imports and restrict the use of foreign currency.

In the 1970s and 1980s increasing environmental awareness led to the introduction of the first real environmental taxes on waste, retail packaging, disposable tableware, pesticides and CFC's. Also the first differentiations of the petrol tax according to the lead content were implemented.

At the same time the energy crises led to the use of energy taxes as one of several ways reduce Danish dependence on imported fossil fuels. Taxes on electricity, mineral oils, gas and coal was introduced in the late 1970s and early 1980s.

The early use of green taxes was not part of a tax reform or tax shift agenda, but the solutions to specific regulatory challenges. That changes in the early 1990s.

2.2 The 1990s: Broadening the base

In 1993 the Danish parliament adopted a green tax reform that should gradually shift taxation from labour to environment and energy during 1994-1998. The reform involved new green taxes on water, waste water and packaging as well as increased taxes on petrol, diesel, electricity, coal, waste and motor vehicles.

In total around 1 % of GDP was shifted from labour taxes to green taxes with the majority of green taxes immediately burdening households. The aim was to increase the incentives to supply labour and at the same time reduce environmentally harmful behaviour – that is a so-called double dividend.

The idea of a double dividend however suffers from the fact that also green taxes are taxes on labour. This means that it is not possible to reduce the taxation of labour by increasing green taxes unless it is possible to shift taxes to groups outside the labour market or to reduce the total degree of progression in the tax system. The 1993 tax reform did increase labour supply and environmental performance but it did so at the cost of a limited increase in inequality.

To reduce the distributional effects of the increased green taxes some special provisions were build into the tax reform. For instance the child benefits were increased to modify the effect of the green taxes on families.

The 1993 tax reform was predominantly changing household taxation. But the principle of shifting taxes from labour to environment should also be implemented with respect to the business sector.

In 1995 the Danish parliament adopted a major change and increase in the taxation of business CO₂ emissions and energy consumption. The reform included a gradual increase in the CO₂ tax (which was introduced in 1992) and energy taxation, the introduction of a new tax on sulphur emissions as well as the broadening of the base of the energy taxes.

The revenue from the increased green taxes on business was recycled through four channels. First, the employer labour market contribution was reduced. Second, the employer contribution to the labour market pension fund was reduced. Third, special funds were reserved to reduce costs to small business owners who do not benefit from the reductions in labour costs. Finally, special funds were reserved to subsidize investments in energy savings.

The major obstacle in the implementation of increased taxes on CO₂ and energy was – and still is – that energy consumption and CO₂ emissions are distributed very uneven across sectors and firms. To avoid carbon leakage from firms closing production in Denmark a system with differentiated tax rates according to the use of energy was introduced. This rate system combined with the different channels for recycling revenue was intended to prevent large effects on the competitiveness of Danish companies.

Three other green tax changes were also implemented in 1996. The most important was the change of the tax on pesticides to include agricultural use. The revenue was recycled through a reduction in the property tax on agricultural land. Furthermore, a tax on NiCd batteries and a tax on chlorinated solvents were introduced.

In 1997 the annual tax on cars – the circulation tax – was changed for all new cars sold for the first time from 1 July 1997. In the old system the tax was levied according to the weight of the car. The new system instead taxes cars according to the EU norm for fuel efficiency. Thus, a light car with a relatively low km per litre norm would face an increase in taxation etc.

Then in 1998 the government wanted to continue the green tax shift that began in 1994 and at the same time there was a need to slow down economic growth through a fiscal contraction.

The 1998 green tax shift involved gradual increased taxes on petrol, mineral oils, coal, natural gas and electricity and the introduction of a new tax on heating produced by waste incineration.

Part of the green tax revenue was used to lower the bottom personal income tax rate. But the green taxes were also used as part of the fiscal contraction.

At the turn of the millennium the following new green taxes was also introduced; PVC and phthalates, nitrogen fertilizers, refrigerants and growth inhibitors.

2.3 The 2000s: Exhausting the possibilities?

Tax policy in the early 2000s was characterized by the tax freeze which is a political commitment to keep all tax rates from rising. In the area of energy, climate and environment it is however allowed to increase or introduce taxes provided that the entire revenue is recycled through corresponding tax cuts. From a fiscal perspective the changes to green taxation during first years of the decade were relative modest. But they did contribute to solving some current environmental issues.

In 2005 a new tax on phosphor in animal feed was introduced as part of the plan for improving the aquatic environment.

During the two years 2006 and 2007 the excise duty on airline passengers were abolished.

In June 2007 a relatively large reform of the registration tax on cars and vans (less than 4 tonne) were implemented. The major element were to align the taxation of vans thereby increasing the tax on larger vans and especially SUV's

and MPV's which were used increasingly as vans due to the preferential registration tax treatment. At the same time a differentiation according to fuel efficiency was introduced into the registration tax on cars. Cars driving more than 16/18 km per litre (petrol/diesel) receive a tax credit per additional km the car drives, while cars driving less than 16/18 km per litre receive a penalty per km. The change of the registration tax did increase the energy and CO₂ saving incentive in the taxation of cars. Though, it is at a rather high level corresponding to around 7,000 DKK per tonne of CO₂.

In 2007 a smaller fully financed tax reform was adopted by parliament. The reform included cuts in personal income taxation corresponding to 0.5 % of GDP. Around 40 % of the tax cut was financed through a yearly price indexation of the taxes on energy during the period 2008-2015. The permanent revenue effect of the gradual increase in the taxes on energy is thus used to finance a sustainable small green tax shift. It might be discussed whether the increase in the taxes on energy is efficient given the already high level of the tax rates.

In 2008 a new tax on NO_x emissions from energy consumption was adopted. It came into force in 2010 and will contribute to meet the Danish goals and obligations in this area. The NO_x tax was part of a restructuring of the CO₂ tax that involved an increase in the CO₂ tax to the expected level of the price of the CO₂ quotas in the European ETS. This means that the economic incentives now will be the same on the margin independent on whether a company is covered by the ETS or by the CO₂ tax. The revenue is recycled through the introduction of a tax free allowance resembling the free quotas grandfathered under the ETS and through reductions in the energy taxes.

At the end of May 2009 the Danish parliament adopted a major tax reform. The legislation will gradually come into force during the years 2010-2019. The reform involves tax cuts and financing of around 30 billion DKK corresponding to around 1.7 % of GDP.

The aims of the reform is to increase labour supply in the medium to long term and at same time contribute to soften the effects of the global economic crises in the short run. Furthermore net savings should be increased and goals in the areas of energy, climate, environment and health are supported. The reform is thus in part a continuation of the reforms of the 1990s.

In total energy taxes will be increased by around 0.2 % of GDP through a number of different measures:

- ▶ Increased energy taxation of businesses and households. In general energy taxes – except petrol and diesel – will be increased with around 15 % and energy taxes will be levied on business and industry at a rate of 8-9 DKK per GJ.

- ▶ Continued yearly price indexation of energy taxes from 2015.
- ▶ Uniform taxation of all heating from combined heat and power production.
- ▶ Introduced tax on air conditioning, energy tax on road lighting, tax on lubricants and certain other greenhouse gasses.
- ▶ Reduction of thresholds in CO₂ tax.
- ▶ Revenue from sale of CO₂ quotas (ETS).

The energy tax system is differentiated between space heating (space heating in businesses and households) and energy used in production processes. The energy taxes are balanced according to the energy content in the different fuels.

The energy taxes on fuels for space heating are increased by 7.5 DKK per GJ and approx 25 DKK per GJ of electricity. This is equivalent to increases of 15 %. Businesses (production processes) will no longer obtain a full refund of the energy tax and will, with some exemptions, be levied energy taxes on electricity and fuels at approx 8-9 DKK per GJ. The energy tax burden levied on businesses will then be approximately 1/6 of the energy taxes levied on households.

Due to cross-border shopping and the overall very high taxation of cars taxes on petrol and diesel are not increased.

The energy taxes on businesses will be fully implemented in 2013, which gives some time to adjust to the increased taxes. The increased energy taxation may also be differentiated in order to moderate effects on competitiveness.

From 2008-2015 the energy taxes are indexed with inflation. The indexation of energy taxes is continued from 2016 and onwards. The permanent revenue corresponding to 0.9 % of GDP from this element is used outside of the tax reform to contribute to the overall long run budget balance ⁽¹⁾.

Also a number of tax expenditures and special arrangements are abolished or reduced contributing to the financing of the tax reform; i.e. reduction of thresholds in the CO₂ tax for energy-intensive companies in parallel with the reduction in grandfathering of emission permits, tax on air conditioning, lubricants, uniform taxation of different kinds of CHP etc.

¹ In the calculations of fiscal sustainability it has been a basic assumption that excise duty rates are following the general price increases. Thus, the indexation adopted in the tax reform does not produce any additional fiscal room.

From 2013 allocation of CO₂ emission permits will no longer be free of charge, but the majority of permits will be sold on auctions and other green house gasses than CO₂ are included in the CO₂ tax base. The revenue from the auctioning of the permits will be used to finance the tax reform.

The green check compensates on average households for the increased taxation on energy and environmental related goods as well as the increased health related taxes.

As part of the tax reform a number of environment taxes is introduced or increased. In total the revenue from these taxes are estimated to be 0.1 % of GDP.

- ▶ Introduced road pricing for trucks.
- ▶ Increased tax on cars without “particle filter”.
- ▶ Increased registration tax for taxies.
- ▶ Increased tax on company cars.
- ▶ Introduced annual tax on vans depending on fuel consumption standards.
- ▶ Increased waste water tax by 50 %.
- ▶ Increased tax on waste.
- ▶ Reduced tax on retail packaging.
- ▶ Increased tax on CFC gasses.

Besides increased taxation related to energy and CO₂-emissions, the tax reform also consists of environmentally related taxes. The majority of the environment taxes are related to transportation.

The introduction of road pricing for trucks and tax on vans depending on fuel consumption standards generates the largest share of revenue related to transportation. The initiatives aim to reduce transportation and give an incentive to purchase more energy efficient vans.

The registration tax on a new taxi is low compared to a normal car. This gives a subsidy to the taxi business, as the taxi can be sold at market price after it has been used for two to three years. The registration tax on taxies is increased from 20 % to 70 % of market price exclusive of taxes and the threshold is increased

from 12,100 DKK to 230,000 DKK. This reduces the subsidy for expensive taxies and gives an incentive to purchase less expensive taxies which tend to be correlated with more energy efficient cars.

Diesel cars without particle filters will be subject to an extra yearly tax of 1,000 DKK.

Company cars will be subject to an extra environment tax that is based on the fuel consumption norm. The tax will be 3,000 DKK per year for an average company car.

The waste water tax is balanced after the content of phosphorus and nitrogen in the waste water after cleansing. The environmental tax on waste water is increased by 50 % which gives an incentive to discharge less polluted water.

The tax on waste with a content of hydrocarbon used as fuel is increased to the same level as coal, oil etc. and the tax on disposal of waste is increased to keep up with the inflation.

The tax on retail packaging is reduced by 50 %. This will reduce an indirect subsidy to businesses that clean and export empty bottles etc. as tax on retail packaging is refunded when exported.

3 A few Green Tax Design Issues

Green taxes should only be implemented where externalities exist and a social economic gain could be obtained by reducing that externality. In general the use of green taxes can be advantageous where environmentally harmful behaviour is of a general character and the environmental costs are relatively independent on where the emission or pollution takes place. If this is not the case, direct regulation will often be preferable. Most environmental taxes are therefore structured as traditional excise duties like the harmonized excise duties on alcohol, tobacco and energy.

It is not the objective of this article to give detailed information how to structure a green tax. Instead we will point to three of the more difficult issues.

Although green taxes typically will be designed as a traditional excise duty, the calculation of the tax base might often be quite costly compared to an excise duty that is simply levied on the amount sold by a registered company. For instance the base of a green tax could involve the installation of meters to measure emissions or the splitting of end products into taxed and non-taxed parts. Here it will be important to weigh possible extra environmental gains against the extra administrative costs of trying to be very accurate in the calculation of the tax base. The same sort of considerations should be carried out when analyzing whether to levy the green tax on for instance the (many) end users or instead the (few) suppliers.

However, in most cases it would probably not be fair to require the same low level of administrative costs as in the case of traditional excise duties. This is because the green taxes is an alternative to other environmental regulation that would also involve administrative costs. Therefore, it will in many cases be acceptable to imply higher administrative costs in the case of a green tax than for a traditional excise duty levied for purely fiscal reasons.

Green taxes also burden the consumers just like other excise duties. Except for some green taxes on cars almost all the Danish green taxes tend to be constant or even regressive with increasing (disposable) income. If the negative distributional effects of the green taxes are to be countered, this means increasing the personal allowance in the personal income tax system and increasing social benefits like child payments and pensions. Through such measures it will be possible to reduce the negative distributional effects of green taxes. But this will be at the costs of reduced labour supply.

Where green taxes are levied on input into production of goods and services green taxes might also have effects on the international competitiveness of companies. Companies competing on the home market without foreign competition

might in typically be able to shift the taxes to the consumers. This is however, not possible for companies facing international competition from companies based in countries without similar environmental regulation. Such competitiveness effects can be reduced to some degree by recycling revenue from green taxes in a way that affects marginal costs in the same way as green taxes. But often the green tax burden is not distributed very even, and then it will not be possible to fully compensate the companies most severely hit by green taxes.

The taxes on energy and CO₂ emissions are good examples of taxes that affect different companies very different. The Danish approach to this problem has been to levy differentiated tax rates to obtain at least some environmental effect without having excessive adjustment costs.

Again, however, it is important to remember, that also the alternative to green taxes – direct regulation – will have effects on distribution and competitiveness. But they are not as visible as the effects of green taxes.

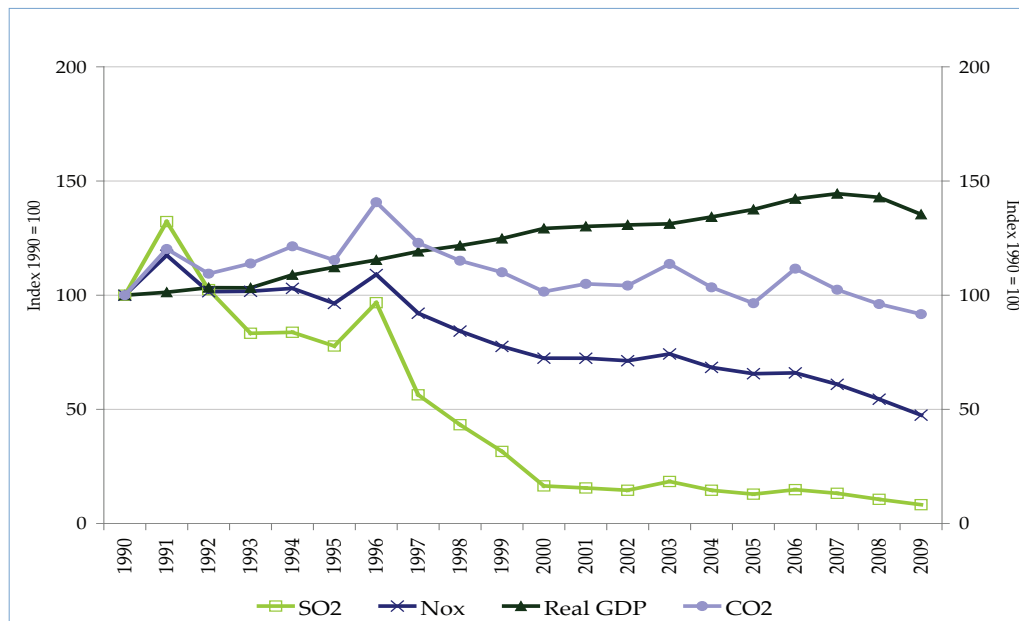
4 Did Denmark become greener?

There is probably not much doubt that Denmark has become much greener during the last two or three decades. Most environmental indicators support this conclusion. The environmental improvements are of course the results of various kinds of regulations. During the last three decades the polluter pays principle has been implemented widely in the Danish economy. In a Danish context this means that consumers or polluters pay not only the direct costs connected to supplying for instance water and energy, disposing of waste and waste water etc. They also pay the externalities connected to this consumption through the wide range of green taxes shortly described above.

Green taxes have thus played an important role in fully implementing the polluter pays principle. In figures 3 and 4 the evolution in a number of key environmental indicators is shown. Almost all the underlying emissions behind the indicators have been subject to taxation as explained above.

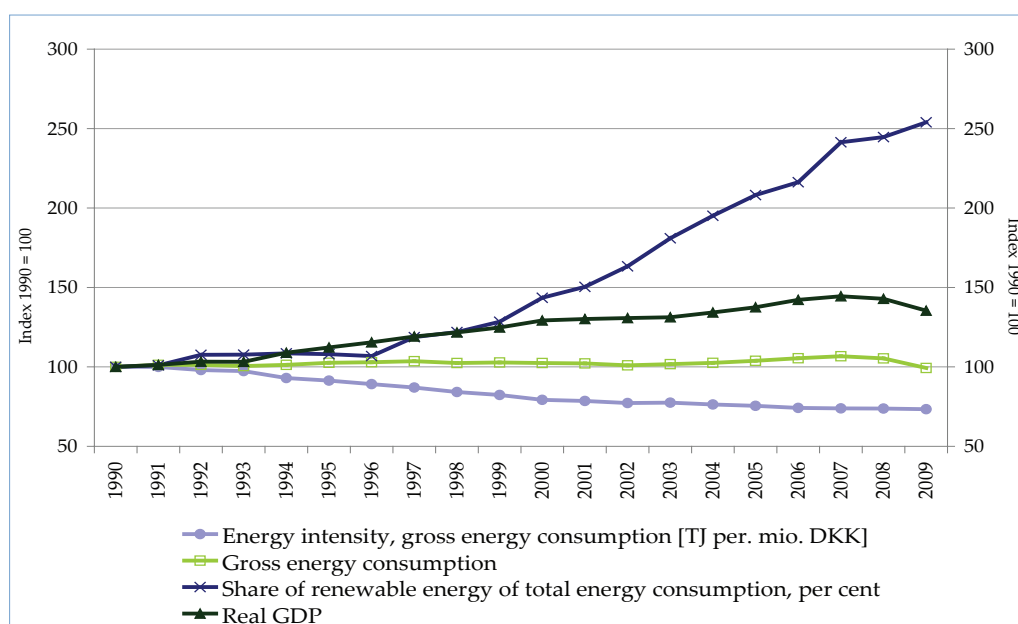
In figure 3.a. and 3.b. the evolution of CO₂, NO_x and SO₂ emissions as well as energy intensity, gross energy consumption and share of renewable energy consumption is shown.

Figure 3.a: Emissions to air, 1990-2009



Source: National Environmental Research Institute and the Danish Energy Agency, Annual Energy Statistics..

Figure 3.b: Energy consumption, 1990-2009



Source: National Environmental Research Institute and the Danish Energy Agency, Annual Energy Statistics..

Emissions of CO₂, NO_x and SO₂ have been falling since the mid 1990 where carbon, energy and sulphur taxes were introduced and increased. This can be compared to the increase in real GDP over the same period. Especially it is obvious that the introduction of the tax on SO₂ emissions in 1996 were quite effective. Almost overnight consumers were able to shift from fuels with high sulphur content to fuels with a lower content. Such a shift could be from one quality of oil to another or from for instance coal to natural gas. Furthermore large energy users can reduce SO₂ emissions by different technical changes to their installations and the way the combustion is implemented.

On the contrary the tax levied directly on NO_x emissions has only just been introduced on 1 January 2010.

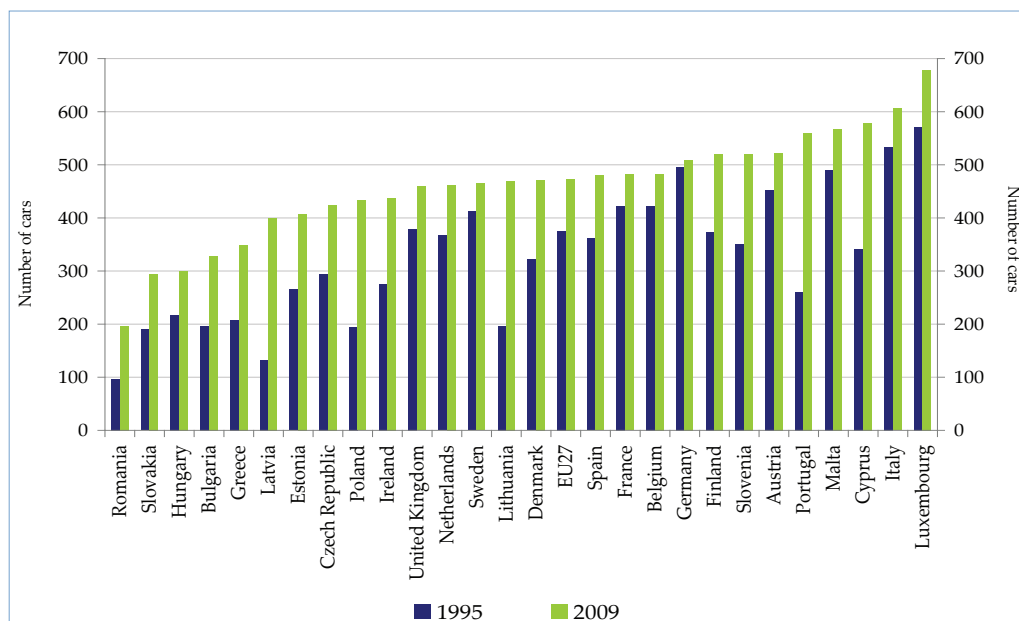
Gross energy consumption has been constant during the period and energy intensity measured as gross energy consumption per million DKK has been reduced by 25 %. The share of renewable energy out of gross energy consumption has increased by more than 150 %. Renewable energy has also been the objective of various subsidies ranging from direct support and price support to tax expenditures due to the exemptions from the often very high Danish energy taxes.

Denmark has also used differentiations of the taxes on petrol and diesel to obtain specific environmental goals with success. The petrol tax has been differentiated according to lead content, benzene content and according to whether

the petrol stations had special equipment to recover vapours. The diesel tax has been differentiated according to sulphur content.

The first “green” taxes that were introduced in Denmark, were the taxes on cars and other motor vehicles. These taxes have been increased gradually for various often fiscal reasons since their introduction. This has led to a quite substantial tax burden on normal cars compared to most other countries. In fig. 4.a. the number of cars per 1,000 inhabitants in the EU countries is shown. In 2009 Denmark is around average in EU. There is no doubt that the very high taxes on cars historically have been very effective in limiting the number of cars in Denmark and this has had positive effects on externalities like energy consumption, noise, congestion and environment. However, now the number of cars is only 5 % below the level of EU15. Most mainstream estimates show that Danish cars pay more than their share of externalities.

Figure 4.a: Number of cars per 1,000 inhabitants, 1995 and 2009

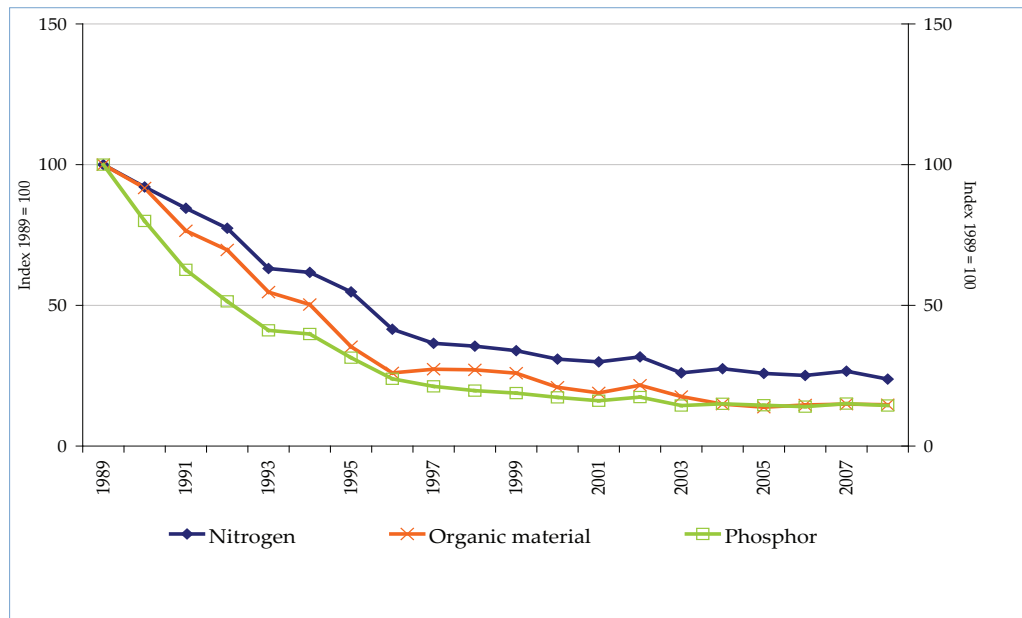


Source: Eurostat, Statistics Denmark and The Danish Environmental Protection Agency.

Finally, fig. 4.b. shows some indicators of environmental performance concerning water, waste and pesticides all of which are subject to green taxes. Following the introduction of the tax on pesticides used by agriculture in 1996 the consumption has fallen by 40 %. Likewise the introduction of the tax on drinking water has contributed to reduce the consumption of water by 25 %. A reduction in the water consumption has the added effect of reducing the emissions of nutrients to the water environment from sewage treatment plants and industry. The tax levied directly on the waste water has had the same effect. And together with the direct regulation of sewage treatment the waste tax levied on phosphor, nitrogen and organic material has reduced the emissions of these substances by 75-85 % from 1989 to 2008, see fig. 5.

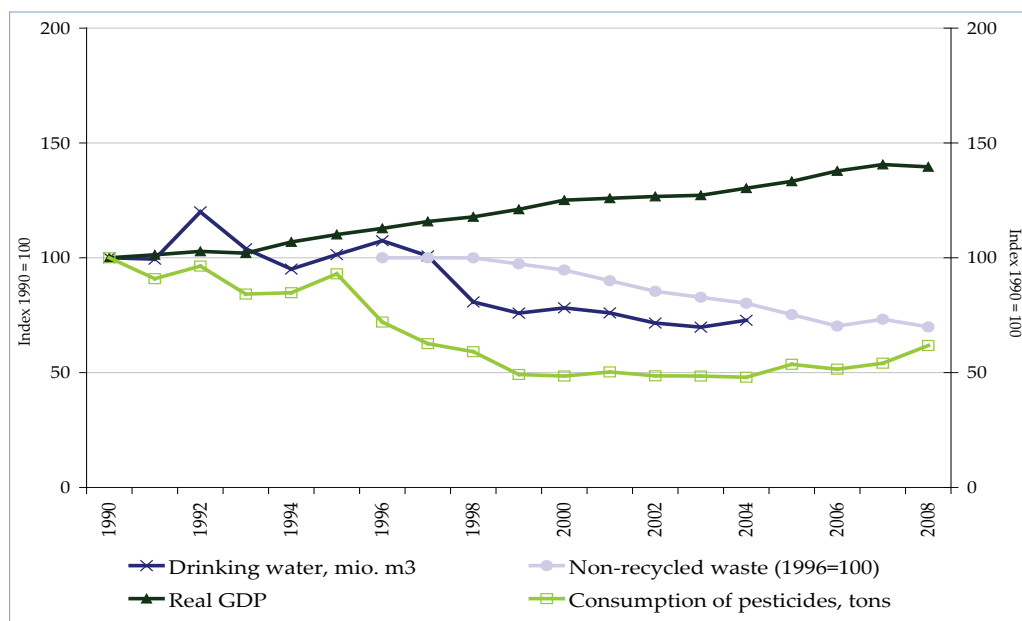
The increasing waste taxes have also contributed to reduce the amounts of waste that is not recycled or reused.

Figure 4.b: Environmental performance, 1990-2008



Source: Eurostat, Statistics Denmark and The Danish Environmental Protection Agency.

Figure 5: Emissions of nutrients to water environment, 1989-2008.



Source: The Danish Nature Agency.

