Special session, Altermotive

"*Taxation on passenger cars in the Nordic countries - behavioral impact of car taxation and the promotion of electrical cars through tax policy in Denmark*"

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Overview

In 2008 The Danish Ecological Council, Naturskyddsföreningen (Sweden) and Naturvernforbundet (Norway) - together with organizations from Iceland and Finland- published a comparative study for the Nordic Council of Ministers on the use of economic incentives as instruments to limit the CO_2 emission from cars within the Nordic countries. The study indicates that economic measures are really important tools in directing consumption. But can it even be said to guide consumption into more environmentally wise consumption and promote the sale of more energy efficient cars?

Method

The survey on traffic related taxes, referred to in the following, can be downloaded from: http://www.norden.org/pub/sk/showpub.asp?pubnr=2008:587. The data for this survey has been collected in cooperation with Denmark's Road Safety and Transport Agency.

Form

The first part of this presentation deals with the behavioral impact of car taxation on passenger cars in Denmark, Norway, Sweden and Finland with focus on some specific policy developments in Denmark. The second describes how car taxation (and the exemption from taxes) are currently actively used to kickstart a market for electrical cars in Denmark.

Part 1

The behavioral impact of car taxation on passenger cars within the Nordic Countries

Taxes and behavior goes hand in hand

Taxes and customer behavior goes hand in hand. This is at least how it seems, when one looks into the different traffic related taxes on passenger cars within the Nordic countries. The objective of this presentation lies with identifying the impact of the most relevant traffic related taxes within the Nordic countries – i.e. 1) Taxes related to registration of the passenger car 2) Taxes related to owning the car 3) Fuel related taxes.

Taxes related to registration

Among other things, our study revealed that cars are more expensive in Denmark and Norway as compared to other Nordic countries, such as e.g. Finland and Sweden. Compared to e.g. Denmark there are more and bigger cars in Sweden – which corresponds to the fact that buying a car in Sweden is cheaper, and as there is no registration tax, this can not be differentiated according to CO_2-emission. However, the total emission of CO_2 from the transport sector is not bigger in Sweden, compared to other Nordic countries. In fact Sweden (area wise, the biggest of the Nordic countries) has the lowest CO_2 emission pr. 1000 inhabitants (TABLE 1). But this also includes the railways, which are electric, based on mainly water power and nuclear power. Besides, Swedish cities have electric trams, and Sweden is leading on bio fuels in the transport sector.

CO_2 emission 1.000 t. year equivalent. Annually	**1990**	**2005/06**	**Increase 1990-05/06**	**2005/06 Level pr. 1000 inhabitants**	**2020**	**Increase 2005/06 - 2020**	**Status/ year**
Denmark	9.250	12.157	31%	2,22		16%	2005
Finland	10.900	12.000	10%	2,30	12.800	7%	2005
Iceland	640	750	17%	2,40			2006
Norway	7.952	10.100	27%	2, 18	14.140	40%	2006
Sweden	16.829	18.675	11%	2, 10	20.169	8%	2005

Table 1
Titel: CO_2 emission from road transport within the Nordic countries

Differentiated registration tax

This leaves us with the conclusion that other factors than the geographic size of the country matter when it comes to accounting for the extent of traffic and the pollution related to passenger traffic. Taxes, wealth and market conditions matter. While Denmark, Norway and Finland have differentiated their registration tax according to fuel consumption, CO_2 emission, Sweden has not done so – as it *has* no registration tax (TABLE 2). Table 2 accounts for the most important traffic related taxes within the Nordic countries /Denmark, Finland, Iceland, Norway and Sweden.

Dkr. (Danish currency	**Taxes related to the purchase of a car**	**Taxes related to owing a car**	**Fuels, taxes pr. litre**
Denmark	Registration tax – typically 25 – 60 % of a car prize. A number of allowances and deductions	Green owner tax: as according to enercy consumption Petrol cars: 260 – 9.230 kr./annually. Diesel cars: 80 – 12.530 kr./annually	Energy and CO2 taxes Petrol: 36+2 % of sale prize Diesel: 24+2% of sale prize Energy tax: 3,66 (petrol) vs. 2,49 (diesel) CO_2 tax 0,22 (petrol) 0,25 (diesel) Petrol = 3,88 3,88 Diesel = 2,74
Finland	Typically 15 – 30 percent of the actual prize of a car From January 2008 CO_2 correlation	Today: fixed part, plus part depending on the weight of the car From 2010:	Petrol = 4,66 Diesel = 2,71
Iceland	Taxes on commodities i.e. 20/27 % of the full prize 30/45 % of the agent prize for small and big cars – below and more than 2000 cc.	235 – 2.835kr. annually depending on weight	Petrol= 3,03 Diesel= 2,71

Norway	A one-time tax Typically 11-67 % of the prize of a car	Annual tax Petrol: 2.517kr. Diesel without filters against particles 2.924 kr.	Tax on fuel Petrol= 4, 05 Diesel= 3, 17 CO_2 tax Petrol=0,78 Diesel= 0,52 Diesel= 4, 83 Diesel= 3,69
Sweden	0	Annual tax 2005 models and older according to weight 2006 models and younger according to CO_2 –emission	Energy tax Petrol = 2, 35 Diesel = 1,02 CO_2tax Petrol= 1, 86 Diesel= 2,29 Petrol= 4,21 Diesel= 3, 31

Table 2
Title: Traffic related taxes within the Nordic countries

In Denmark and Norway, the registration tax is used to promote cars with a lower CO_2emission. The differentiation in Norway is larger than in Denmark. Therefore, passenger cars with a high fuel consumption level are more expensive in Norway compared to Denmark, while cars like the hybrid Toyota Prius are cheaper in Norway (see, TABLE 3).

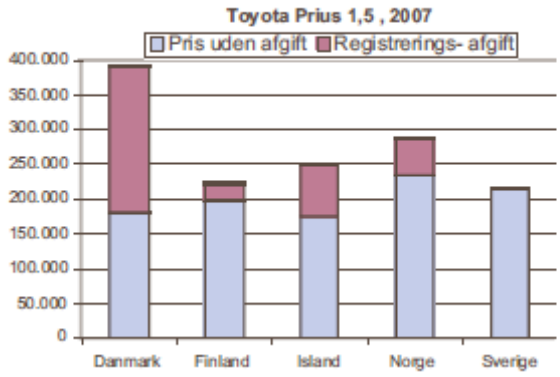

Figure 1
Title: Price of a Toyota Prius with and without tax

Blue= Price without tax
Red= Registration tax

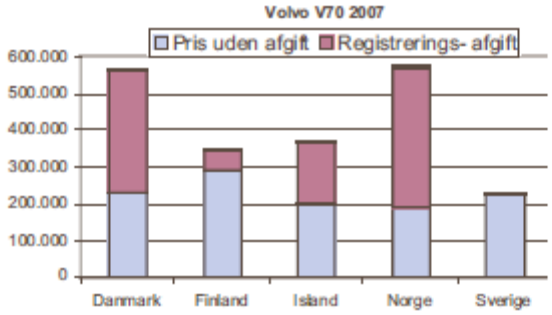

Figure 2
Title: Price of a Volvo with and without tax
Blue=Price of a Toyota Prius without tax
Red=Registration tax

This does not only reveal a different approach to taxation within the Nordic countries, it also raises the question whether the introduction of a differentiated registration tax (as introduced in e.g. Denmark in 2007) has had a behavioral impact? In other words, has it eventually promoted the sale of more energy efficient cars? Has it had an impact which can be traced in the average CO_2 emission of newly registered cars?

Active taxes related to the purchase of a car

One of the conclusions drawn from our survey is that taxes related to the purchase of a car are most efficient to influence a behavior towards a greener and more sustainable transport. The implementation of the differentiated registration tax in Denmark has apparently influenced the number of cars (FIGURE 3). It is also revealed that if the tax is differentiated in the right manner, the implementation has the potential to influence the fuel economy of the fleet of personal passenger cars all over – but because of the average age of the car fleet – between 10 and 11 years – it takes many years, until you can see the effect on the total car fleet. (FIGURE 3)

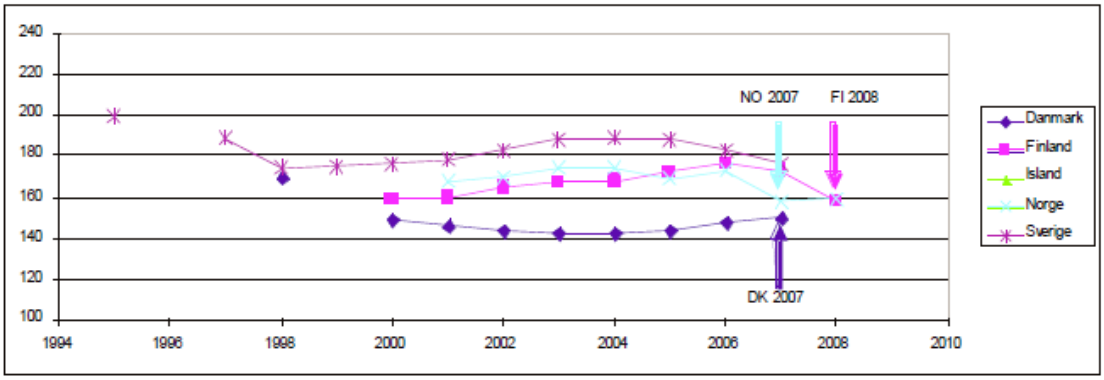

Figure 3 : Passenger cars & average CO_2 emission over the years from 1994 up until 2008 within the Nordic countries

Text: New passenger cars and average CO_2 emission. In the above figure and table 4 below one can trace the exact year when the countries have introduced tax regulating measures to promote a more energy efficient car fleet within the Nordic countries.

Petrol CO_2 emission/1.000 t. year	**1995**	**1996**	**1997**	**1998**	**1999**
Denmark				183	
Finland					
Iceland					
Norway					
Sweden	221		217	204	201

Petrol CO_2emission / 1.000 t. year	**2000**	**2001**	**2002**	**2003**	**2004**
Denmark	180	178	176	175	171
Finland	183	182	181	180	182
Iceland					
Norway		186	183	182	183
Sweden	197	198	197	198	197

Petrol	**2005**	**2006**	**2007**	**2008**

CO_2**emission / 1.000 t. year**				
Denmark	168	166	164	
Finland	181	180	179	168
Iceland				
Norway	180	181	161	155
Sweden	194	189	181	

Table 3
Title: Passenger cars & average CO2 emission
Text: New passenger cars and average CO_2 emission. In the above Table 34 and figure one can trace the exact year when the countries have introduced tax regulating measures to promote a more energy efficient car fleet within the Nordic countries.

Taxes to what degree?

However, taxes of a certain size are required to have a behavioral impact. How high or differentiated should the taxes be in order to have the greatest behavioral effect – in terms of a decrease in the traffic related emission of CO_2? The study looks at the differences between the effect of the annual green owner tax and a differentiated registration tax

Taxes related to the purchase of a car and taxes related to owning a car

The survey indicates that the most positive environmental effect is gained by differentiating taxes on the actual purchase of a car – or the actual action of buying a car Taxes which are tied to the actual action of buying a car, has the greatest behavioral impact. On the other hand, the taxes related to owning a car has had a rather small effect on the choice of car model (that is the energy efficiency of the car) and the time of disposal.

Changes in transport related taxes in recent years

Denmark has through various changes related to the purchase of cars and the ownership of a car tried to guide people's behaviour into more environmentally friendly behaviour. The Danish registration tax has been revised in 2007 and differentiated according to the model shown below (TABLE 4).

June 2007	1000 Dkr. , extra tax on cars driving less than the	4000 Dkr. reduction in taxes on cars driving more

	listed km/l	than the listed km/l
Cars on petrol	16 km/l	16 km/l
Cars on diesel	18 km/l	18 km/l

Table 4
Title: The differentiation of the Danish registration tax

Differentiation on fuel

Our study shows that the differentiation of taxes on fuels has had a significant impact on behavior. A couple of times – latest in 2005, a differentiated diesel tax accounting for the level of sulfur very quickly outphased diesel with a higher level of sulphur

Congestion charges

In Denmark one has not yet – as in the case of Stockholm, Oslo and London implemented congestion charges in the city of Copenhagen. The municipality wants to introduce it, but the Danish government will not allow it. However, several studies have shown that congestion charges do have a positive environmental effect, especially if the revenue is used to invest in public transport. The London congestion charge is a fee for motorists travelling within the Congestion Charge Zone (CCZ), a traffic area in London. The charge aims to reduce congestion. A payment of £8 is required each day for each vehicle which travels within the zone between 7am and 6pm (Monday-Friday only); a fine of between £60 and £180 is levied for non-payment. The money raised from congestion charges is largely used for traffic investments in London. In London congestion charges have reduced traffic remarkably within the city, while in Oslo the purpose of the congestion charge is only to collect money for traffic investments. Therefore it is not surprising that the charge in Oslo has not reduced the traffic remarkably.

What can be concluded?

The following can be concluded from our survey:

- *Taxes on fuel does have an effect both on the number of kilometer driven and to some extent also on the car model chosen*
- *The implementation of a differentiated registration tax has had a relatively fast impact on promoting more fuel efficient passenger cars – even though the differentiation is very moderate. Much more could be achieved through a stronger differentiation*
- *Differentiation of taxes on fuels have a significant influence: e.g. the introduction of a differentiated diesel tax accounting for the level of sulfur very quickly phased out diesel with a high level of sulphur in Denmark*
- *The registration fee does have an effect on people's behavior. The relative high taxes in Denmark leads to the relatively low number of cars pr. 1000 inhabitants in Denmark*

PART TWO

The promotion of electrical cars through tax policy in Denmark

Denmark has been chosen as one of the first countries to test the full scale infrastructure of the Betterplace project. This development can mainly be explained by two different national political developments. Denmark as a leading developer of sustainable energy supply. During the 1990's, Denmark was a leading developer of sustainable energy supply. Wind turbines were the main driver in this development, which saw the part of electricity from sustainable sources rise, and today wind turbines account for 18.9% of the Danish electricity supply. And it will soon be around 25% with the offshore wind mills now under construction.

Tax exception on electric vehicles

Secondly the registration taxes on cars sold in Denmark are some of the highest in the world. EVs are omitted from taxation, so far until the end of 2015, thus making the cars substantially more competitive, compared to conventional combustion engine cars. This tax exception is crucial to the potential success of the Better Place project and other projects with electric vehicles. The model for taxation of EVs after 2011 has been debated over a long time period in Denmark and the Danish government has only recently decided a longer exception time, until 2015. Some talks about until the EV have a specific market share, for instance 20% of new cars sold. The result of this debate will no doubt have an effect on potential EV projects in Denmark.

Background and major target of the Better Place project

The aim of the Better Place Denmark project is to create infrastructure that will facilitate charging both at home and at the site of major connecting points, workplaces, train stations, airports etc., and battery change stations by major roads, to allow users to switch from an empty to a fully charged battery. It is expected that more than 90% of the charging will be made at charging stations at home, at workplace or in public space. 10% of the discharged batteries will go to the battery changing stations. The overarching aim of the Better Place project is to combine EVs with sustainable production of electricity. The main challenge for doing so is to enable intelligent charging, which means that the charging will start when the rest of the energy consumption is low or when the production from sustainable energy sources is high. This will potentially mean that the cars will provide additional flexibility in the consumption of electricity, and therefore be able to utilize electricity when production is high, and consumption is low. This happens in Denmark especially during night hours, because the wind is almost as strong at night as during daytime. If the improved flexibility enhances the effort to build more renewable energy plants, this will lead to reductions in the total CO2 emissions coming from the transport sector and from the energy sector. But on the other hand – this will only happen if we introduce the intelligent grid with price incentives to charge the cars when production is high and consumption is low.

The company also stresses other obvious benefits from EVs, such as reduced noise and air-pollution, as being important factors in the effort to secure a well functioning EV infrastructure. A very important task for the project is to be a front runner and develop infrastructure for charging, that doesn't eliminate other possible EV schemes from Denmark, or any other country. For this reason the company aims at developing a system based on international standards for charging stations and the plugs that connect to the cars.

Major results and lessons learned

Even though Better Place now is only in the process of setting up the first pilot project to test cars and charging stations, the interest is massive from both public and private organisations as well as individuals. Even before the new EVs have been introduced, a significant number of agreements with large companies and public institutions have been made. This seems to indicate that the interest in EVs and reducing CO2 emissions from transport is growing, partly because Better Place and other such schemes represent a viable alternative to the combustion engine.
Of course such a large infrastructure project needs to be put into practice, before the actual effect can be soundly measured. The schedule for Better Place's reality check has among other things lead to a pilot project during the COP15 conference in Copenhagen with 50 charging stations, and electric vehicles from Tesla, Renault, Fiat and Citroën. The first battery change station will be established during 2011. From 2011 the plan is to start building infrastructure around the larger Danish urban areas and introducing EVs to the Danish consumers in the second half of 2011.

Future perspectives on tax exception on electric vehicles in Denmark

Although the Danish government has decided an exception on electric vehicles up until 2015, this time period is still a relative short horizon – when one takes into account how big the investment actually is. Also the government has not solved the challenges related to the plug-in hybrid cars which will soon be ready for marketing. But if Denmark does not introduce an exception, or partly exception, for the plug-in hybrids, they will probably not have much chance on the Danish market, because the registration tax will make them too expensive. These vehicles both have an electric motor and a battery which should be uploaded before start and reloaded with an efficient gas and diesel motor while driving, once the battery has run out of capacity. They could play an important role supplementing the EVs, for people driving far – people who can not or do not want to wait for battery change on their way – or they drive to countries without battery change stations.

Tax-excemption on the battery – and how?

To ensure the development of an actual market for electric vehicles, it is important to stick to the excemption until electric vehicles have a specific market share, for instance 20%. The eventual political result of this debate will no doubt have an effect on both the

Better Place Project and other potential EV projects in Denmark. Also it will be relevant to look at the discussion on how one can lower the high cost of the batteries. Should this be done by introducting an exemption on car taxes? Following this scenario, all batteries on the hybrid cars are exempted from taxes until a market exists. In a different scenario, the taxes on the batteries are differentiated according to their capacity. This is an ongoing debate right now in Denmark …