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A Comparative Study of Environmental Taxation in the Electricity Sector in the Nordic Countries as of 1994

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Introduction

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instance of the "polluter pays" principle in one country would, under free market competition, only lead to a flight of affected industry from the country.

The prisoners' dilemma of environmental policies thus blocks avant-garde unilateral environmental initiatives and such strategies are in principle self-destructive. Furthermore, given the dissimilarities of ecological vulnerability, abatement costs and popular support for environmental policies, collective strategies through unanimous multilateral agreements are hard to achieve as the countries' commercial interests are too diverse to find a common ground.

In the absence of an international authority which could enforce majority decisions, collective regimes must be based on fairly consensual decision rules to prevent defection from dissenting groups. Such consensual decision rules in fact imply giving every actor veto power with subsequent ample scope for bargaining. Bargaining, again, is inherently vulnerable to deadlock, because the only way to succeed in bargaining is to engage in tactics that delay or reduce the likelihood of reaching an agreement (Elster 1989).[1]

Several studies, however, point out that the endeavors to meet the environmental policy challenges vary considerably among countries, and even among highly industrialized nations. The Nordic countries rank as the front-runners of environmental policies (Sprinz & Vaahtoranta 1994). They figure in the front line with the most ambitious policy goals in international fora, and in some cases take avant-garde domestic environmental initiatives. This leads us to the question addressed in this article: what allows the Nordic countries to escape this dilemma, and how do they do it?

We seek an answer in Rokkan's (1966) famous distinction between electoral/numerical and corporatist/functional politics and argue that the dual character of political decision making may provide an answer to the prisoners' dilemma spelled out above. If the Nordic avant-garde policy is primarily electorally oriented, while the corporatist channel allows industrial interests to strongly modify this policy in practice, then these countries may be able to formulate unilateral, avant-garde environmental policies and at the same time survive as industrial nations.

The Nordic governments are exposed to strong environmental concerns from their populations. The electorate is stimulated to voice environmental concern by environmental organizations, media focused action groups like Greenpeace, experts, and political parties with a green profile. This creates electoral pressure on governments to act irrespective of the implications for national industrial interests. Yet, the electoral pressure is to some extent offset by another source of domestic policy pressure stemming from organized industrial interests which are more directly affected by competitive disadvantages. The prisoners' dilemma of collectively oriented environmental strategies versus individually oriented commercial strategies thus feeds into a duality in national political decision making between numerical/electoral and

functional legitimation. The first channel represents a pressure to take unilateral avant-garde positions. The second channel represents a pressure for environmental policy moderation to save affected industry from the burden of carrying the costs of a national commercial handicap.

Empirically, we present a systematic overview of Nordic environmental taxation policies as proclaimed and practiced, and document that the two policy making channels do indeed produce different results that are compatible with a dual policy solution to the prisoners' dilemma of avant-garde environmental politics.

The Numerical and Functional Modes of Legitimation

Numerical/electoral legitimation is based on the idea that political decisions should have popular support. The legitimacy of political decisions thus rests on how they are coupled to popular institutions of government, like general suffrage, representative assemblies, and executive responsibility to the electorate. The liberal political ideals embedded in the numerical/electoral democracy have traditionally been linked to a liberal market model with extensive freedom to engage in commercial exchange (Sabine 1968).

Functional legitimation rests on a very different political economy, characterized by tight coupling of politics and markets. The functional channel, also described in modern political science as the "corporatist channel" or "the channel of organized interests" opens up for a second stream of policy input and policy legitimation besides the electoral channel.

The mixture of the two modes of policy legitimation is poignantly formulated by Rokkan (1966) who has argued that the multifarious interactions of government agencies and interest organizations – what he calls "corporate pluralism" – supplements, and to some extent supplants, representation through the electoral process – what he calls "numerical democracy." His thesis is that votes count in regular elections and determine who shall be members of representative bodies. But organized interest groups, with their permanent and full-time staffs, manned by experts on par with those found in specialized state agencies, continuously provide the more important bases for political decisions, and hence to a large extent influence the contents of public policy (Hernes & Selvik 1979). Later neo-corporatist literature that has followed Rokkan's point of departure has stressed the ability of economic interests to dominate the corporatist channel (Cawson 1986; Midttun 1991).

Transferred to environmental policy, the dual nature of political legitimation allows, to some extent, for an accommodation of the prisoners' dilemma. On the one hand, we expect the popular concern with environmental issues in the Nordic countries to translate into avant-garde

positions in support of strong environmental policy regimes, even if they are unilaterally imposed. The general and ideological orientation of the numerical/electoral channel does not lend itself as easily to specific sectoral industrial policy concerns. We therefore expect that ambitious Nordic environmental policy positions will first and foremost be reflected in more electorally oriented arenas and figure in general policy documents and in the general rules and principles of environmental tax regulation.

On the other hand, the vested interests in the energy industry that dominate the corporatist/functional channel will naturally focus on commercial consequences and reflect concern with the competitive disadvantage of a strong, unilateral, national environmental policy. The strong functional control of decision making in the implementation of environmental policies leads us to expect a stronger voicing of commercial concerns in more specified policy documents and in the applied tax regulation. The corporatist channel produces *de facto* policies that modify strong unilateral environmental declarations. In this way, the two policy channels may be said to accommodate the dilemma of combining a unilateral, ambitious environmental policy with due concern for affected industrial interests.

Design and Documentation

The empirical analysis is divided into three parts. The first part analyzes ambitious declarations of general principles for environmental policies. The second part analyzes the reflection of general environmental principles in energy taxation. The third part analyzes the influence of sectoral interests in the implementation of *de facto* energy policies. The declarations of general principles cleary refer to the numerical/electoral channel. The same applies to the general taxation rules, whereas the exceptions clearly are results of corporatist policy making.

The analysis focuses on environmental taxation. Methodologically, the comparison of the Nordic countries is facilitated by the fact that they all explicitly adhere to taxation as a major energy policy tool (Nordic Council of Ministers 1991). Nevertheless, it should be mentioned that particularly Denmark supplements its environmental taxation policy with administrative planning. Given our focus, this aspect of environmental policy is excluded from the analysis.

The analysis relies on a critical selection of party programs, relevant White Papers, bills and government memoranda, international conventions and protocols, as well as tax regulations. Our interpretation of the material is not based on formal content analysis, but rather on a qualified evaluation of the texts.

The output variable, in our case environmental taxes on electricity production, needs careful delineation. We rely on a combination of objective and evaluative criteria. Firstly, we include taxes that are targeted at environmental emissions, such as SO_2, NO_x or CO_2 taxes, when these are applied to specific energy carriers. Secondly, we include taxes that are given explicit environmental justification even if they do not fulfill the above criteria.

Energy and environmental taxes are levied at different stages in the electricity value chain. The main part of this article deals with environmental taxation at the producer stage. None of the Nordic countries levy environmental taxes on distribution, whereas extensive taxation is targeted at the consumption level. We discuss the premises for different national taxation regimes as well as differentiation between three consumer segments: general consumption (households, agriculture, the public sector, and the private commercial sector), light industry (non-energy intensive industry), and heavy industry (energy intensive industry). We analyze policy outputs in the form of environmental taxation rules across the four Nordic countries by systematically converting the various taxes for different energy carriers into ECU per Mwh produced electricity.[2]

General Policy Declarations

International Conventions and Protocols

Sweden, Norway, Denmark and Finland have signed a number of international environmental declarations and ratified most of the resulting conventions or related protocols.[3] In this regard, the Nordic countries have been among the first to make strong environmental commitments.

An early international agreement was the Economic Commission for Europe (ECE) convention on long range, transboundary air pollution in 1979. This convention was ratified by all Nordic countries, and emission reduction/stabilization targets were set in the related Helsinki protocol (1985) at a 30 percent SO_2 emission reduction by 1993, in the Sofia protocol (1988) on NO_x emission stabilization by 1994, and finally in the Geneva protocol (1991) at a 30 percent cut in VOC (Volatile Organic Components) emissions by 1994. All Nordic countries, except Iceland, set more ambitious reduction targets for the Helsinki and the Sofia protocols than what was internationally agreed on, whereas national emission targets were in accordance with the Geneva protocol in which both Norway and Denmark set the SO_2 reduction target at 50 percent by 1993.

Another major convention which was ratified by all Nordic countries was the 1987 Vienna convention for protection of the stratospheric ozone layer. Again, the Nordic reduction targets were more ambitious than the targets set in the subsequent Montreal, London and Copenhagen protocols. The 1992

framework convention on climate change and sustainable development in Rio has similarly been ratified by all Nordic countries. At present, no specific emission reduction targets have been formulated according to the Rio Convention, but certain actions were agreed on at the 1995 Berlin meeting on climate change, such as a pilot phase for joint implementation and defining uniform principles and accounting methods for emission of climate gasses. However, all Nordic countries have decided to attempt stabilization of CO_2 emission by the year 2000, with 1989 or 1990 as base year.

As a general trend, the national emission targets of the Nordic countries are equal to or stricter than those found in international agreements (Nordic Council of Ministers 1994). Thus, the Nordic countries have elected to be exponents for environmental protection by introducing national objectives which in several areas are more ambitious than the commitments agreed to in international treaties (International Energy Agency (IEA) 1994).

Party Programs

Some of the most radical formulations of energy-related environmental policies are found in the party programs. They are policy documents with a high level of electoral visibility and at the same time far removed from implementational obligation. Generally, the most ambitious and radical environmental policy statements are made by the small, environmentally focused parties in the Nordic countries, but even the large parties make clear environmental commitments. Representative statements from different party programs may support this view:

The Center Party (Sweden):

> The energy system shall be based on renewable and environmentally friendly energy sources . . . small scale and flexible systems are the basis for the energy supply in general . . . all Swedish nuclear power shall be closed down. The burning of fossil fuels, such as coal and oil, implicates large emission levels of e.g. carbon dioxide . . . the utilization of these fossil fuels for energy purposes must gradually come to an end . . . such a transition can be facilitated through taxes, environmental surcharges and other economic instruments. (Centerpartiet 1990).

Socialist People's Party (Denmark):

> Environmental legislation must be changed so that the principle of nature benefitting from uncertainty becomes the basis of all environmental policy, national as we all internationally. . . . The Brundtland report recommends a 50 percent reduction in global energy consumption by the year 2020, and by the year 2000, Denmark must reorganize its energy production according to the following targets: significant limitation of use of fossil fuels and better general use of energy resources; maximum purification of smoke in connection with electricity and heat production; . . . and more support of renewable energy, so that by the year 2000, this type of energy covers 20 percent of the consumption instead of the current 2–3 percent. (Socialistisk Folkeparti 1991).

Socialist Left (Norway):

> The party supports the UN objective that the rich countries shall reduce their energy consumption by 50 percent by the year 2000 to allow poor countries a 30 percent increase in their energy consumption. . . . Powerful measures must be used to reduce CO_2 emissions from the oil industry . . . the conditions for electrifying off-shore platforms by hydropower instead of gas turbines must be evaluated . . . emissions of CO_2 must be reduced by 10 percent by the year 2000. (Sosialistisk Venstreparti 1993).

Social Democratic Party (Sweden):

> Regard for the environment must be the basis for production and production processes, for energy and transportation systems as well as for the general use of raw materials and other natural resources. Strict environmental regulation shall apply for all power and heat production. (Socialdemokraterna 1993).

Social Democratic Party (Denmark):

> A central part of Danish energy policy must be to reduce emissions of CO_2 to the atmosphere, especially through energy conservation and renewable energy. . . . Energy conservation is the most important resource and the key to sustainable development. . . . the proposed carbon dioxide charge bill furthers this project. . . . New power stations shall ensure that combined power and heat generation and the utilization of correct CO_2 fuel are given first priority. Existing power stations shall be upgraded in such a way that the environmental impact and coal consumption are significantly reduced. (Socialdemokratiet 1992).

The Labor Party (Norway):

> The labor party supports the idea of increased on-shore use of natural gas, including increased industrial use. Substitution of natural gas for fossil fuels will reduce emissions of climate gasses. On-shore use of natural gas shall fall into line with general climate policy and emission targets already set. . . . To be able to reach these targets, the environmental policy must be based on a combination of direct regulation and powerful legislation. (Arbeiderpartiet 1992).

Social Democratic Party (Finland):

> The technological development solves many problems within the economy, lightens the work load, and makes it feasible to use more sensible products and new production methods. However, if natural resources, technology, and energy are utilized aimlessly, the result may be non-reversible damages on the environment and human beings. (Suomen sosialidemokraattinen puolue 1987).

White Papers, Bills, and Government Memoranda

Although White Papers, bills and government memoranda are in some cases functionally oriented as indicated for instance by the practice of exposing such documents to hearings from affected interests, they clearly have a basis in electoral politics. A number of these documents reflect radical environmental commitment.

Many of these documents also have an inherent environmental orientation that leads us to consider them a part of electoral/numerical politics. These documents generally reflect radical environmental commitment. The Swe-

dish Government White Paper on "Economic Instruments in Environmental Politicy" suggests that environmental taxes be used extensively to reduce CO_2 and SO_2 emissions (Swedish Ministry of Environment and Energy 1989c). The Committee's proposition would have made Sweden the first country in the world to introduce an energy-related CO_2 tax.

Another central document is the Ministerial Proposal from the Ministry of Environment and Energy, entitled "How Environmental Taxes Work" (Swedish Ministry of Environment and Energy 1994), proposes a strategy for increased use of economic means in environmental policy, the argument being that economic incentives lead to more efficient goal attainment and reduce administration and control costs.

Extensive support for environmental taxation also appears in Danish ministerial documents. A White Paper on "Economic Means and Sustainable Development" (Betænkning 1989), a follow-up to the government action plan on environment and development, concludes that economic policy instruments should be based on the polluter pays principle. The White Paper sees taxes as a good alternative and supplement to traditional regulation by directives. A 1994 report on "Green Taxes and Industry" from the Ministry of Finance supports the White Paper and argues that green taxes imposed on the industry may work better than other economic instruments (Danish Ministry of Finance 1994).

Finnish adherence to the use of environmental taxes on energy is clearly stated in the Ministry of Energy's fall 1993 ministerial address to the Parliament (Finnish Ministry of Energy 1993), which proposed environmental taxes to promote energy efficiency and to reach environmental goals. Tax was here seen as one of the most important instruments. This was followed up in a government bill that proposed a tax structure based on the energy content of primary energy sources.[4] In addition, a carbon tax was proposed.

Since the late 1980s, Norwegian environmental policy has generally attempted to follow the recommendations set by the World Commission for Environment and Development, headed by Norway's former Prime Minister, Gro Harlem Brundtland. Lately, with some difficulty, however. The Government White Paper, "The Long Term Program 1990–1993" (Norwegian Ministry of Finance 1988–89), set forth an introductory plan for the use of economic instruments in Norwegian environmental policy and formed the Commission for Environmental Taxation to perform further studies in this field. That same year, the Government White Paper, "The Environment and Development," presented an extensive study of the Norwegian follow-up of the World Commission's recommendations from 1987 (Norwegian Ministry of the Environment 1988–89). A work report presented by the Commission for Environmental Taxation in 1991 established the basis for the introduction of the CO_2 tax in Norway (Commission on Environmental Taxation 1991). The final government memorandum from this commission came in 1992

(NOU 1992). It presented a comprehensive study of environmental policy instruments with special focus on the administrative and economic instruments available and viable in Norwegian environmental policy. At present, the Government White Paper, "The Long Term Program 1994–1997," outlines the principal official framework for Norway's environmental policy, including policy targets in the field of future energy supply (Norwegian Ministry of Finance 1992–93).

Summary

The above discussion of conventions, party programs and White Papers demonstrates high environmental policy ambitions from all the Nordic Countries. On the basis of this material, it does not seem unreasonable to attribute them a forerunner status on the international arena.

Taxes on Primary Energy

The ambitious environmental commitments in the above-mentioned sources feed into very ambitious general principles for energy taxation. Before presenting a comparative Nordic analysis, we shall briefly describe the rules for taxation applicable to the general use of stationary fuels for each of the Nordic countries, i.e. taxation on coal, fuel oil, natural gas, nuclear power, and hydropower.[5]

Coal

Both Sweden and Denmark have very high general taxes on coal. In Sweden, the total tax levied on coal consists of three distinct parts: 1. An SO_2 charge;[6] 2. a CO_2 charge; and 3. an energy charge. Both the sulfur tax and the carbon tax were introduced in 1991 as a result of the Green Tax Commission,[7] whereas the general energy charge stems from legislation introduced in 1974. The specific electricity tax was introduced as far back as 1957.[8] In Denmark, the coal tax consists of two parts: 1. A basic excise, which was introduced in 1982; and 2. a CO_2 charge, introduced in 1992 after a parliamentary majority vote.[9]

The Norwegian tax level is less ambitious, but still relatively high. In Norway, the coal tax is a CO_2 charge. The tax is meant to reduce CO_2 emissions from burning coal and was introduced in 1992.[10] Finland has the least ambitious general coal tax regime among the Nordic countries. The Finnish coal tax consists of an energy charge and a carbon dioxide charge. The environmental energy taxation was introduced in 1990. It was later revised, and the current formula is from 1993.[11]

Heavy Fuel Oil

The same general pattern applies to fuel oil. Here, the tax level is even higher, especially in Denmark, where heavy fuel oil (class 6) is taxed with a carbon tax (effective 1977) and a basic energy tax (effective 1992).[12]

In Sweden, heavy fuel oil is taxed by a three-part scheme: 1. A sulfur tax;[13] 2. a CO_2 tax; and 3. an energy tax. The sulfur and carbon taxes were introduced in 1991, whereas the basic energy charge stems from a law passed in 1957.[14] Thus, Sweden's taxation level is very high, but still somewhat lower than Denmark's.

In Norway, heavy fuel oil is taxed with a sulfur charge and a carbon dioxide charge.[15] The former consists of a basic rate per liter and a component differentiated on the basis of sulfur content. The latter, the CO_2 charge, was introduced in 1992. The two taxes together provide a fairly high tax level for heavy oil in Norway, but considerably lower than in Denmark and Sweden.

Finland uses the same tax formula as for the other fossil fuels, i.e. an energy charge and a carbon charge. In addition, there is an excise on heavy fuel oil consisting of a basic rate per kg of consumed oil, making fuel oil the most heavily taxed fossil energy in Finland.[16] In spite of this, the generally heavy oil taxation in Finland remains moderate by Nordic standards.

Natural Gas

Compared to coal and heavy oil, environmental taxation on natural gas is far more moderate. Norway is the exception with a fairly extensive natural gas tax and a CO_2 charge on natural gas utilization consisting of a basic charge per Sm^3 of combusted gas.[17] As yet, natural gas is only utilized off shore.

In Sweden, natural gas is taxed with a three-part tax formula: 1. A CO_2 charge; 2. an energy charge; and 3. a charge on NO_x (electrical boilers and gas turbines producing more than 25 GWh per year).[18]

The Finnish tax scheme for natural gas consists of a basic energy tax and a specific carbon tax. There are no other taxes on natural gas in Finland, only NO_x emission quotas.[19]

In Denmark, natural gas is not taxed directly. Natural gas is priced according to the price of oil, and thus the price of gas will implicitly include oil taxes. Like Finland, Denmark has NO_x emission quotas for large commercial combustion plants.[20]

Hydro and Nuclear Power

Compared to the environmental taxes on coal and heavy fuel oil, the general taxes on hydropower and nuclear power are small.

In Norway, hydropower production is taxed with an energy tax that is differentiated according to the age of each power station. For new hydropower stations or expansion of existing stations, there is a three-year exemption period after production start-up, and then a gradual increase up to the full tax rate after 15 years of operation. The 1994 calculation was based on the period from 1977 to 1991. For existing plants, the tax calculation is based on the average production of the last 15 years. The tax was introduced in 1993.[21] The sliding scale is used in order to reduce the financial burden for the newer power stations. In the analysis, we have estimated the real average production tax to be somewhat lower than the full tax rate.

In Sweden, hydropower is taxed in a similar way, but the scheme is simpler. Stations established before 1973 pay full tax, those established between 1973–1977 pay half the tax, and newer stations get full rebate.[22] In Finland, hydropower is taxed with a basic energy tax per kWh of electricity produced each year.[23] While hydropower is taxed in Sweden, Norway and Finland, there is no explicit energy or environmental taxation of hydropower in Denmark.

Only Sweden and Finland have nuclear power. In Sweden, nuclear power taxation consists of three distinct parts. 1. A basic energy tax[24]; 2. an energy charge[25]; 3. an additional environmental charge that helps finance plutonium fuel storage in the future.[26]

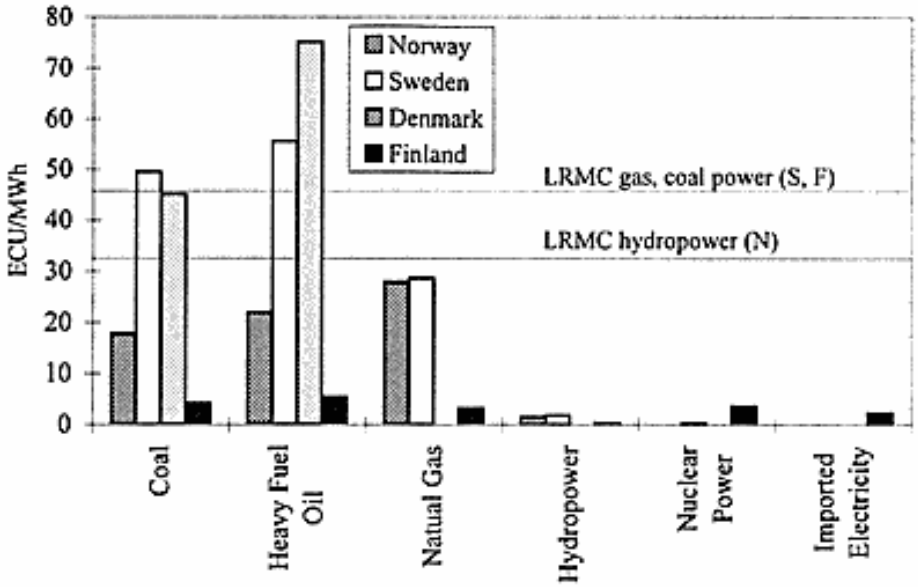
The two latter charges can not really be classified as taxes, but more as payments to state-initiated funds and included in the nuclear production cost. For this reason, only the energy tax will be included in the analysis, but the two latter charges are nevertheless a financial burden for nuclear producers in Sweden, and they are based on environmental concerns.

In Finland, nuclear power is taxed in order to prevent nuclear power from becoming too competitive, but in practice it has become a fiscal tax for the state budget, since there is already a ban on new nuclear capacity expansion.[27] The tax on nuclear power generation is paid by the nuclear generators and thus incorporated in the nuclear production cost function. Tax on nuclear power is obtained by dividing a general energy tax component (FIM 2.10 per MWh) with the assumed efficiency of coal-fired condensing power (38 percent). Nuclear power is also subject to a fiscal base tax. In addition to these taxes, there are certain appropriations in the accounts of the nuclear producers which, similar to the Swedish nuclear power arrangements, will finance future fuel storage, decommissioning of plants, and safer nuclear fission technology. These costs are not taxes but production costs and are therefore not included in our analysis.

Imported Electricity

Tax on imported electricity is levied only on imports to Finland. The tax is a fairly low basic charge per kWh of electricity, and its purpose is to reduce

Fig. 1. General Taxes By Selected Fuels and Energy Carriers 1994.



the attractiveness of imported electricity relative to the domestic production that is taxed in terms of both energy and environment.[28] This tax is partly motivated by protection of domestic electricity production, which is a commercial rather than an environmental concern. However, burning wood chips is CO_2 neutral if new trees are planted, as is the case in Finland, and in this respect the import tax may also serve an environmental purpose.

The General Picture

The general picture of environmental energy taxation in the Nordic countries is one of a high and very ambitious tax level (Figure 1). Compared to the Long Run Marginal Cost (LRMC) of Nordic electricity production, which ranges from 32 ECU/MWh for Norwegian hydro to 46 ECU/MWh for gas and coal based systems utilized in Sweden and Finland,[29] some of the Danish and Swedish environmental taxes appear to be extremely high. The general environmental taxes on coal and oil would, for instance, more or less double coal or oil-based electricity prices in Sweden and Denmark.[30] The same would be true for gas-based electricity production in Norway. Thus, for three of the Nordic countries, we are talking about general environmental taxes with dramatic economic implications if they were fully implemented. Finland stands out as the only exception, with a far more moderate general tax level.

There are large differences between countries and energy carriers (Figure 1). Sweden and Denmark range highest with taxes in the range between 45 to 75 ECU per MWh for coal and fuel oil.[31] The Norwegian and Finnish levels

are far lower (between 17 to 22 ECU per MWh for Norway and under 5.5 ECU per MWh for Finland). A special Norwegian feature is the rather extensive tax on off-shore natural gas burning which provides significant revenues for the state budget. A special Finnish feature is a low, but nevertheless important tax on imported electricity.

Corporatist Modification of Environmental Tax Policies

The level where the corporatist channel presumably exercises the strongest influence is the sectoral adaptation of the environmental policies and the general tax regulations. At this level, the specificity of the regulatory regimes makes them less accessible for outside actors. Participation is qualified and relies on intrasectoral knowledge and competence.

As mentioned earlier, we expect the corporatist influence on policy implementation to pull towards commercially viable solutions for national industry. We therefore expect the corporatist adaptation to imply exemptions that favor sectoral interests.

Implementation Concerns in Policy Formulation

The specificity of policy implementation and functional legitimation makes this theme more appropriate for targeted government bills, White Papers and memoranda than for broad declarations. Nevertheless, we do find traces of commercial and implementational concern both in party programs and in international conventions. Thus, both the Norwegian Labor Party and the Swedish Social Democrats voice commercial concern in their party programs:

The Labor Party (Norway):

> But the use of regulative instruments in environmental policy has to be evaluated according to the policies of those nations we trade with, so that environmental regulation does not burden Norwegian industry alone (Arbeiderpartiet 1992).

The Social Democratic Party (Sweden):

> Securing supply of electricity at a competitive price is an important precondition for the Swedish industry's international competitiveness (Socialdemokraterna 1993).

We also find traces of commercial considerations in international conventions. Norway, for instance, submitted a national communication under the Framework Convention on Climate Change specifying that the Norwegian stabilization target is only a conditional obligation:

CO_2 emissions are to be limited so that they do not exceed the 1989 level in the year 2000. This target is preliminary and will be considered in the light of further studies, technological advances, developments in the international

energy markets and international negotiations and agreements (Norwegian Ministry of the Environment 1994).

Finnish climate policy in the energy field is similarly conditioned by developments in competing countries' national climate policies. This is clearly stated in current Finnish energy policy:

The present government continues to pursue use of energy taxation in line with the principles set by the objectives for use of economic instruments in environmental policy. The environmental taxes shall increase gradually, provided that similar taxation is implemented in other OECD countries. If this is not the case, then special refunding schemes must be considered or alternatively a reduction in other taxes (Finnish Ministry of Energy 1993).

The clearest reservation on behalf of commercial interests, however, figures in targeted government memoranda and White Papers:

The Swedish Memorandum on Lowering of Energy Taxes, for instance, focuses on the taxation pressure on industry and discusses lowering the existing taxes (Swedish Ministry of Environment and Energy 1989b). The relative competitive position vis-à-vis industry in other countries is here an explicit motivation. Similarly, a government White Paper on "Competition Neutral Energy Taxation," presented by the Swedish Ministry of Finance (1991), seeks to design an alternative tax and levy system to maintain favorable conditions for industry, while the tax revenue is sought upheld by tougher taxes on households. A Danish White Paper on Energy Taxes expresses similar concerns (Danish Ministry of Energy 1990). It discusses the exemptions given to industry and their justification in terms of international competitiveness. And in Finland, an interim report by the Environmental Economics Committee on Energy Related Taxation (Finnish Ministry of the Environment 1994) concludes that only extreme tax levels will lead to significant changes in energy use in the short run, but that such a policy would be economically irresponsible from a national economic point of view. The report explicitly recommends that the environmental tax level in Finland does not exceed that of other countries.

Norway's SIMEN project was initiated during spring 1988 by the Ministry for Economic Affairs to study whether it is feasible, in the Norwegian economy, to combine industrial growth with the implementation of an ambitious environmental policy (SIMEN 1989). This project was divided into nine different studies with special focus on the energy-intensive industry and other export-oriented sectors within the economy. The executive summary of the final report indicates concerns for industrial competitiveness similar to those expressed in the other Nordic countries:

The analysis performed within the SIMEN project is especially focused on the effects on the Norwegian economy of a potential international agreement on CO_2 emission reductions that may be added to the already existing SO_2 and NO_x agreements. Simultaneously achieving acceptable economic growth,

reduction of hazardous emissions and more energy efficiency calls for a fundamental shift in the development of the economy, a change of traditional consumption patterns, and an upgrade of the technology. Rapid introduction of an ambitious environmental policy will imply significant turbulence in the whole economy. . . . Therefore, a certain conflict may arise between the consideration for a sustainable development and the expectations of economic growth in the domestic economy (SIMEN 1989, 10).

This comes in addition to the above-mentioned 1992 memorandum which also discussed the implications of use of administrative and economic instruments in environmental policy (NOU 1992). One of the conclusions was that the impacts on the Norwegian economy were most severe when central sectors, such as the energy sector and especially fossil fuels, were targeted for heavy taxation. The final memorandum did not take a normative stand on these potential effects on the economy, but only stated that they may occur as a result of energy taxation.

Energy and Environmental Taxes on Electricity Production

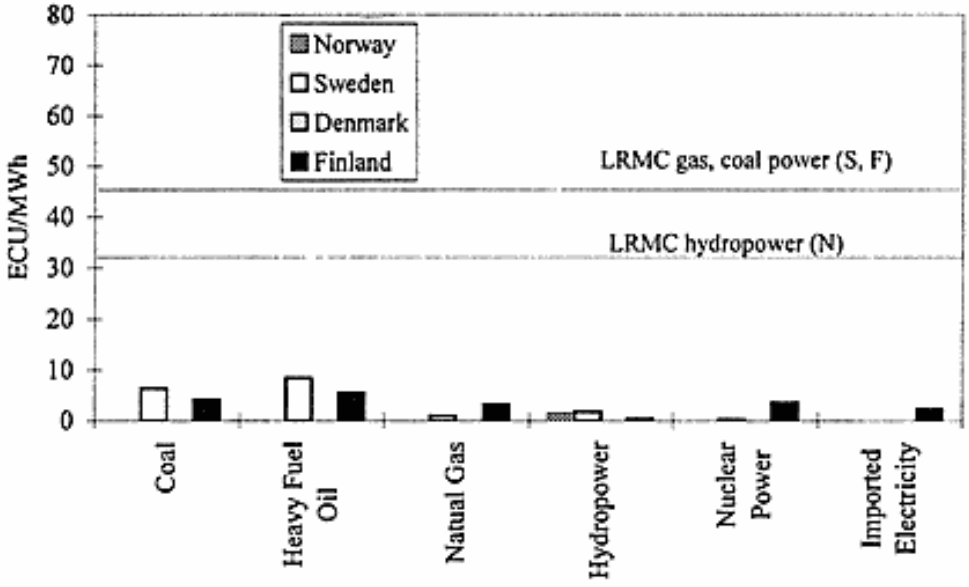
The differences between general rules and principles on the one side and actual practice on the other are quite remarkable for three of the four Nordic countries.

As shown in Figure 2, the picture of taxes applied to electricity production in the Nordic countries is dramatically different from the picture shown in Figure 1. The implemented tax level on energy ranges from 2 to 18 percent of the total production costs (LRCM) of fossil condensed power in Sweden, and from 7 to 12 percent in Finland. It is 4.25 percent of the LRCM of hydropower in Norway, and 0 percent in Denmark.[32]

The difference between general and implemented taxation in Sweden relates to the fact that electricity producing companies are exempt from the general energy tax on fossil fuels. Electricity production is also exempted from the CO_2 tax. What remains to be paid by the generator is the SO_2 tax on coal and fuel oil and the NO_x tax on combustion of natural gas. However, these taxes do not provide net income for the state, because the tax income is redistributed to those generators with the lowest emission figures for NO_x and SO_2. Therefore, generators with the highest emission levels have an incentive to invest in cleaning equipment. Figure 2 includes the fossil fuel taxes, but these taxes amount to net zero due to the special repayment arrangements just explained. The hydropower and nuclear taxes, which even in the general formulation were reasonably low, remain.

In Denmark, commercial electricity production is exempted from the general energy tax on coal and oil products. There is no carbon tax on fossil fuel utilized in power generation, but a carbon tax is levied on imported electricity sold through local power utilities regardless of the type of imported power.

Fig. 2. Applied Taxes on Fossil Energy Input in Electricity Production, 1994.



Because the Danish "import tax" is levied on consumption, it is analyzed in the following section which focuses on consumption taxation.

Norway produces very little electricity from conventional thermal power. The electricity produced this way is industrial autoproduction, mostly off-shore on the petroleum producing installations in the North Sea. We have therefore not included any of the coal, fuel oil and gas taxation as relevant for the electricity industry.[33] In Finland, general and implemented energy taxations are congruent. The discrepancy between electorally oriented proclamations and modified practice due to corporatist influence does not seem to apply to this country.

The above-mentioned exemptions have been added to the commercial interest considerations that are already contained in the general taxation principles. This is indicated in the variation of relative tax levels between energy carriers across nations, probably reflecting national commercial interests. Norwegian environmental taxation penalizes gas-based electricity production compared to both oil and coal-based production, presumably because gas-based electricity production has not yet been introduced on shore. As of 1994, Swedish and Danish taxation penalizes oil more than coal, whereas gas is not taxed at all, presumably reflecting a reluctance to undermine domestic gas supply systems. Finland has a rather similar level of environmental taxation for all fossil fuels due to the general formula which splits the tax into an energy part and a CO_2 part. Therefore, natural gas is favored, whereas heavy fuel oil is the most heavily taxed fossil fuel.

Table 1. Energy Carrier's Shares of Electricity Production, Nordic Countries, 1994

Relative shares (percent) as of 1994	Norway	Sweden	Denmark	Finland
Coal	0	2	82	19
Hydropower	100	42	0	17
Nuclear	0	51	0	27
Natural Gas	0	0.58	8	8
Net imported electricity (disregarding exports)	n/a	0.22	n/a	9
Wind power	0	0.07	3	0
Bio-energy	0	1.3	0	17
Fuel oil	0	2.9	7.7	2.3
Sum	100	100	100	100

Source: Nordel 1994, Statistics: Elproduction.

An assessment of the taxation regimes on electricity production must also consider the actual input mix of energy carriers. As shown in Table 1, Norway and Sweden hardly use fossil fuels, on which the highest taxes are levied, for electricity production. As coal is by far the dominant energy carrier in Denmark and also exempted from taxation, there is almost no taxation levied on electricity production. The Finnish tax on power imports is an exception from the practice of exempting energy production from taxation, as it targets a significant part of the fuel mix in the electricity sector. However, this import tax is intended to protect domestic wood energy.

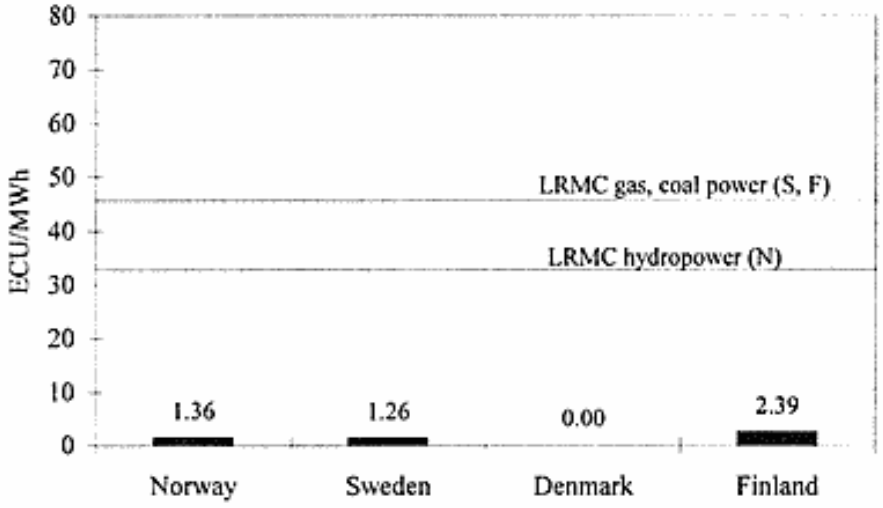
Thus, the weighted tax rate estimated on the basis of the actual input mix of energy carriers is even lower than the tax levied on the individual carriers suggests (Figure 3).

Finland has the highest average burden, 2.39 ECU/MWh, which is 5 percent of LRMC for gas/coal power; Norway is second with 1.36 ECU/MWh, which is 4 percent of LRMC for hydropower and 3 percent of LRMC for gas/coal power; Sweden is third with 1.26 ECU/MWh, which is 3 percent of LRMC for gas/coal power; and Denmark comes in last with no taxes on commercial electricity production. Obviously, these are only rough numbers due to the nature of the LRMC concept and the dynamics of changing tax regimes.

Differential Taxation of Electricity Consumption

Energy and environmental taxes can be levied at different stages in the energy value chain. The main part of this article deals with environmental taxation at the producer stage. However, extensive taxation is targeted at the consumption level. As one would expect from its representation in the corporatist system, industry is typically less exposed to environmental taxation than households. But again, Finland is the exception (Figure 4).

Fig. 3. Weighted Implemented Taxes on Electricity Production in Nordic Countries, 1994.

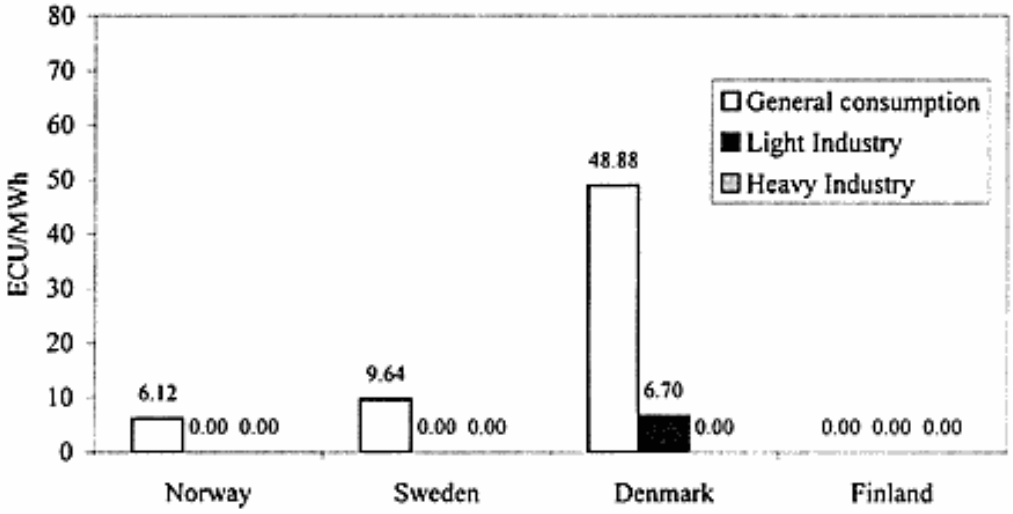


Consumer taxes on electricity are found in all Nordic countries except in Finland, where taxation is levied exclusively on production. In this context, direct use of fossil fuels in the Finnish industrial sector *does* receive preferential treatment in the general energy taxation. For example, industry pays regular environmental taxes (energy $+CO_2$) for use of heavy fuel oil, but reduced basic taxes, and use of coal as raw material is tax free (Nordic Council of Ministers 1994, 47). The latter provision is common for all Nordic countries.

In Norway, the general electricity tax is 6.12 ECU per MWh, but in certain areas in northern Norway, households pay no electricity tax. All power-intensive industry and certain non-power intensive industries are exempted from this tax (Government White Paper No. 1 1993–94). Similarly, in Sweden, the energy tax on electricity consumption is differentiated between consumer groups. Non-industrial customers (general consumption) pay the full rate which equals 9.64 ECU per MWh. For use of electricity, gas, heating or water supplies, customers pay approximately 70 percent of the full rate, while certain northern customers pay approximately 40 percent of the full rate (Svenska Kraftverksföreningen 1994). As is the case for most of the industry in Norway, industrial customers pay no tax on electricity.

The above figures indicate that *de facto* taxation on consumption is highly dependent on organizational capacity, at least for three of the four countries. Industry has achieved extensive tax reductions compared to households, presumably because of better sectoral organization and participation in the corporatist channel (Figure 4). Denmark is the extreme case, where households carry a heavy tax burden of around 100 percent of LRMC of gas/coal power, whereas light industry, in theory, carries only 15 percent of

Fig. 4. Tax on Electricity Consumption, Differentiated by Consumer Groups, 1994.



LRMC. In practice, light industry in Denmark, classified as all VAT-registered enterprises, is subject to a 50 percent rebate in the CO_2 tax on electricity consumption, and, moreover, such enterprises may, with certain exceptions, obtain refunds of other charges and taxes on fossil energy in conjunction with their VAT payment, and they may deduct VAT on other energy products (except gasoline) (Nordic Council of Ministers 1994, 65–73). In addition to the reductions in the CO_2 charge rates, energy intensive industries in Denmark are granted relief from parts of the remaining CO_2 charge burden according to a reduced payment scheme set by the Ministry of Finance. As a result, industry in general is practically exempted from charges on all energy fuels, except gasoline. According to a 1994 study by OECD/IEA, the relative tax on electricity used by households in Denmark is the highest in the OECD, the main reasons being promotion of energy conservation and fiscal income to the state (International Energy Agency 1994).

Summary

In sum, the tax implementation concerns in policy documents and the actual implementation in legislation reveal a strong corporatist influence. At this stage of policy making, the general taxation ambitions and tax rules have been strongly modified to suit national vested interests.

Environmental Policy: Ideals and Realities

We have traced considerable discrepancy in environmental taxation policies between ambitious proclamations and less heroic practices for three of the

four Nordic countries. The empirical analysis also seems to support the thesis that this may be a result of electoral versus functional politics, although the rather indicative classification of policy documents into electorally and functionally oriented categories makes this a tentative finding. Building this analysis on more solid ground would, however, demand in-depth processual studies which are beyond the scope and resources of this article.

An intriguing question turns up in the wake of our analysis, namely whether this discrepancy between proclamation and practice is beneficial or destructive to international environmental policy. At first sight, the latter might appear to be true. The discrepancy between proclaimed and practiced policies might be seen as "cheating." At least three of the Nordic countries want to be among the environmental champions on the international scene, but are unwilling to take the commercial consequences. Therefore, they seek to confound international opinion by a display of principles that are full of loopholes in practice. In this context, Finland stands out as the only fair player. The country does not promise too much, and has until recently stood by its commitments in practice.

Although the above critique intuitively seems well justified and indeed coincides with basic elements of Christian morality: "Your speech should be yes yes and no no," it is also possible to argue differently. The prisoners' dilemma often characterizes environmental policy and indeed leaves little room for strong unilateral commitments. Hence, a consistent and practiced policy would most probably be a minimalist policy, which is the case in Finland. The recent shift of Finnish CO_2 taxation from an ambitious and implemented tax on fossil fuels over to a consumer tax system is a case in point. Finland could no longer remain the only Nordic pioneer with an implemented CO_2 tax when it became exposed to stronger competition in the liberalized Nordic electricity market. As mentioned earlier, in the absence of an international authority which could enforce majority decisions, collective regimes must be based on consensual decision rules, which would give every actor veto power with subsequent ample scope for bargaining. Bargaining, again, is inherently vulnerable to deadlock because of tactics; hence the fallback on individual strategies or strategies pursued by small groups with strong common interests, such as the Nordic countries.

In such a situation, the policy differentiation created by the conflicting interests voiced through electoral and functional politics may to some extent enable a transcendence of the prisoners' dilemma. Through highly visible policy statements directed at the electoral channel, environmentally ambitious nations may signal a readiness to move towards advanced environmental strategies and in fact also make formal commitments towards this end. At the international level, such policies may serve the purpose of demonstrating good intentions, and of creating a normative atmosphere

conducive to breaking the prisoners' dilemma deadlock of falling back on individual minimalist strategies (Axelrod 1970). The signaling effect may also be supplemented by a "pressure effect" as a function of electoral demand for commitment. If the governments of countries A, B and C have committed themselves to collective environmental responsibility and this receives wide international publicity, then country D's government may come under pressure from its electorate to do the same. One may therefore argue, as many researchers do, that implementation is not necessarily the key rationale for international environmental agreements. Instead, their role is to spread information on the environmental hazards facing the international community and to motivate international opinion to put pressure on other governments (Haas et al. 1993). Consequently, many declarations of principle have been ratified without the pragmatism that is necessary to realize the targets in practice.

Through the less visible corporatist channel, the ambitious declaration of collectively oriented environmental policies of the initiator nations may be modified and tailored to safeguard their industrial competition. The duty each nation confirms in a convention is in fact often conditioned by a number of exogenous factors that may relate to international competitiveness and/or other national economic interests.

This may be a precondition for even allowing a country's government to declare ambitious, collectively oriented policies and thus to start the, hopefully, self-reinforcing process towards environmental commitment. It is characteristic of the prisoners' dilemma that such policies would have been self-defeating if pursued only by a minority of nations. The discrepancy between the fundamental and the implemented policies may therefore serve the function of allowing ambitious strategies to be voiced, and thereby initiate international bargaining processes and a build-up of normative pressure. In the next round, this might result in majority commitments that would allow the fundamental policy to be practiced.

Nevertheless, the discrepancy between general environmental principles and commercial realities may at times create true dilemmas. The ambitious Norwegian CO_2 policy and the country's new desire to embark on domestic gas-based electricity production is a case in point. The reason Norway was able to announce such an ambitious CO_2 policy was that its electricity production was almost entirely hydro-based. When commercial interests now see an attractive future for gas, the country is locked by its environmental ambitions. The fact that on-shore, gas-based electricity production did not exist when Norway made its CO_2 commitment according to the Rio Framework Convention on Climate Change on July 9, 1993 meant that no loophole for practical exemptions was made. Now the exceptions will have to be made *post hoc* in the form of an obvious step-down from a general principle, although formally restricted to off-shore installations, under

intense public attention. Such a step-down may be more difficult to defend politically than if an exemption had been made more quietly in the corporate channel as a regular part of the implementation process.

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NOTES

1. The ideal situation for any actor is one where everybody else pursues a benevolent environmental policy (square II and III in the table below for nations 1 and 2 respectively) The roman numerals enumerate the squares or strategic outcomes. The Arabic numbers indicate priorities assigned by each actor to the strategic outcome where 1 stands for first and best priority and 4 stands for last and worst priority. Numbers in the lower left corner refer to nation 1 and in the upper right corner to nation 2. If all nations pursue this reasoning, however, they will all end up in IV (3/3), which is sub-optimal compared to I (2/2), where they could have ended up if they had all pursued collectively oriented environmental strategies.

Environmental Policy as a Prisoners' Dilemma Game

	NATION 2	
	Collectively oriented environmental policy	Individually oriented commercial policy
NATION 1	2	1
Collectively oriented environmental policy	I 2	II 4
Individually oriented commercial policy	4	3
	III 1	IV 3

2. The environmental taxes on fossil fuels in the original documents are denoted in several measures. For example, oil taxes are usually denoted in liter (currency/liter), coal taxes in kilos (currency/kg), and natural gas taxes in Sm^3 (currency/Sm^3). Furthermore, taxes are listed in their respective national currencies, and due to different technologies used in the electricity sector, this implies that taxes really cannot be compared on a cross-Nordic level. In this article, this problem is solved by a five-step conversion where the environmental taxes are converted into a common unit. For further specification, interested readers may contact the authors for a theoretical note on the specific methodology used in the conversion of taxes and charges into the common unit of ECU per MWh.
3. Selected international agreements are the 1990 North Sea Declaration on emissions to regional waters; the 1985 ECE Convention on Long Range Transboundary Air Pollution: The Helsinki Protocol on SO_2; the 1987 Vienna Convention for Protection of the Stratospheric Ozone Layer; and the Rio Framework Convention on Climate Change and Sustainable Development, which was followed up by the 1995 Berlin Convention on Climate Change.

4. Finnish Ministry of Energy. 1994. Government Bill HE 237. Changes in the law on energy fuel taxes. Helsinki.
5. In a special position are Combined Heat and Power (CHP) in Sweden, Denmark and Finland, where fuel burned to generate electricity has a different tax scheme than fuel utilized to generate heat. This is a complex issue, and in order to simplify the following analysis it will not be discussed in this article. To be precise, peat should be included as an energy carrier too, especially for Finland, but an exclusion will not change the picture essentially. For practical purposes, the 1994 tax on fuel peat consists only of an energy component which is about ECU 0.74 per MWh electricity.
6. This tax is levied according to the sulfur content of fuel, but is repaid in proportion to any reduced emissions. There is no real state revenue from this tax.
7. Key studies: Swedish Ministry of Environment and Energy 1989a, 1989c. Relevant laws: Lag 1990, nr. 582 om koldioxsidskatt (regarding a cardon dioxide tax); Lag 1990, nr. 587 om svavelskatt (regarding a sulfur tax).
8. Swedish Law: Lag 1957, nr. 262: Kunglig Majestets förordning om allmän energiskatt (regarding a general energy tax).
9. Danish laws: Lov nr. 265 af 9. juni 1982 om afgift af stenkul, brunkul og koks m.v. (regarding taxes on coal, etc.); Lov nr. 388 af 6. juni 1991 om planlægning (regarding planning); Lov nr. 143 af 3. marts 1992 om ændring af visse ikrafttrædelsestidspunkter i CO_2-pakken (regarding effective dates for the implementation of taxes on CO_2 emissions).
10. St. prp. nr.1, 1993/94. Skatter og avgifter for budsjettperioden 1994. (Proposition for the Norwegian State Budget 1994, Taxes and Charges). Oslo: Finansdepartementet.
11. Finnish Ministry of Finance 1994. The Finnish State Budget Proposition for 1994 and 1995, The Government's Proposition to the Parliament on a New Bill on Charges.
12. Danish laws: Lov nr. 453 af 7. september 1977 om afgift af visse olieprodukter (regarding charges on certain oil products). Lov nr. 889 af 21. december 1991 om Ìndring af lov om afgift af visse olieprodukter, lov om afgift af stenkul, brunkul og koks m.v., lov om afgift af elektricitet og lov om afgift af gas (regarding changes of three laws on energy charges); Lov nr. 388 af 6. juni 1991 om planlægning; Lov nr. 143 af 3. marts 1992 om ændring af visse ikrafttrædelsestidspunkter i CO_2-pakken. These taxes were later revised in the Parliament's Budget Proposition for 1994, *Folketingstidende* 1993–94 (tillæg D), and The Danish Tax Reform of January 1, 1994.
13. This tax includes the same arrangements as the SO_2 tax on coal. The tax is paid by the generators with the highest SO_2 emission levels, but are repaid to the generators with the lowest emission levels.
14. Riksdagsproposition 1989/90, nr. 111 om reformerad mervärdeskatt, m.m. (Government Proposition regarding a reformed value added tax, etc.). Swedish Laws: cf. notes 7 and 8.
15. Cf. note 9.
16. The Finnish Law, 1161:1993, Regarding Tax on Certain Energy Sources. The Government Bill to the Parliament on Changes in the Law on Energy Fuel taxes. Helsinki.
17. Cf. note 14.
18. Swedish Laws: Lag 1990, nr. 582 (cf. note 7); Lag 1957, nr. 262 (cf. note 8). Lag 1992, nr. 354 Regarding Tax on NO_x. Note that the NO_x tax is redistributed to the generators with the lowest NO_x emission levels relative to their energy generation. There is no state income from this tax.
19. Cf. note 15.
20. Nordic Council of Ministers 1994.
21. Cf. note 14.
22. Swedish Laws: Lag 1982, nr. 1201 om skatt på viss elektrisk kraft (regarding taxation of old hydropower stations); Lag 1957, nr. 262 (cf. note 8).
23. Cf. note 10.
24. Swedish Law: Lag 1983, nr. 1104 om särskild avgift för elektrisk kraft från kärnkraftverk (regarding special taxation of electricity from nuclear power stations).

25. Swedish Law: Lag 1988, nr. 1597 om finansiering av hanteringen av visst radioaktivt avfall m.m. (regarding financing of handling of radioactive waste).
26. Swedish Law: Lag 1992, nr. 1537 om finansiering av framtidiga utgifter för användt kärnbränsle m.m. (regarding financing of future expenses for nuclear power).
27. The Finnish State Budget Proposition for 1994 and 1995, The Government's Proposition to the Parliament on a New Bill on Charges: The Law Regarding Charges on Liquid Fuels, and The Law Regarding Charges on Certain Energy Sources.
28. Ibid.
29. Slapgård 1993. The LRMC for Norwegian hydropower does not include the production tax on hydropower because this tax was introduced after the NVE study was completed. LRMC for gas and coal power includes energy or environmental taxes but excludes installment of cleaning equipment and applies to investment cost in Norway. The LRMC estimates are generally estimates and not real definitive costs.
30. In Norway, the average price on the spot market for electricity has for the past years been far below the LRMC (Bye and Johnsen 1991) whereas in Sweden, Denmark and Finland there is no obvious single system market price. However, there is reason to believe that average market prices, at present, are not equal to the production system's LRMC (Bye, Johnsen, & Strøm 1993). Therefore, market prices may rise quite steeply but will not necessarily double.
31. Cf. note 2.
32. The industrial generation of energy is not included in this analysis. In this respect, there are national differences in the relative share of industrial power generation (e.g. Finland vs. Denmark), and in the importance of power intensive industry in the national economies (e.g. Norway vs. Denmark). Industrial power generation is by and large given preferential treatment similar to that given to commercial electricity producers. Comparing taxes with LRMC here assumes somewhat similar investment costs across the Nordic countries.
33. Thermal industrial autoproduction must, however, pay a sulfur tax and half of the basic carbon tax. Coal is exempted. Only a very marginal amount is produced from conventional thermal power (condense 128 GWh, back-pressure 288 GWh, and gas turbine, diesel etc. 7 GWh (Nordel 1993)). Natural gas is not, at present, utilized on-shore.

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27. The Finnish State Budget Proposition for 1994 and 1995, The Government's Proposition to the Parliament on a New Bill on Charges: The Law Regarding Charges on Liquid Fuels, and The Law Regarding Charges on Certain Energy Sources.
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intense public attention. Such a step-down may be more difficult to defend politically than if an exemption had been made more quietly in the corporate channel as a regular part of the implementation process.

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NOTES

1. The ideal situation for any actor is one where everybody else pursues a benevolent environmental policy (square II and III in the table below for nations 1 and 2 respectively) The roman numerals enumerate the squares or strategic outcomes. The Arabic numbers indicate priorities assigned by each actor to the strategic outcome where 1 stands for first and best priority and 4 stands for last and worst priority. Numbers in the lower left corner refer to nation 1 and in the upper right corner to nation 2. If all nations pursue this reasoning, however, they will all end up in IV (3/3), which is sub-optimal compared to I (2/2), where they could have ended up if they had all pursued collectively oriented environmental strategies.

Environmental Policy as a Prisoners' Dilemma Game

	NATION 2	
	Collectively oriented environmental policy	Individually oriented commercial policy
NATION 1	2	1
Collectively oriented environmental policy	I 2	II 4
Individually oriented commercial policy	4	3
	III 1	IV 3

2. The environmental taxes on fossil fuels in the original documents are denoted in several measures. For example, oil taxes are usually denoted in liter (currency/liter), coal taxes in kilos (currency/kg), and natural gas taxes in Sm^3 (currency/Sm^3). Furthermore, taxes are listed in their respective national currencies, and due to different technologies used in the electricity sector, this implies that taxes really cannot be compared on a cross-Nordic level. In this article, this problem is solved by a five-step conversion where the environmental taxes are converted into a common unit. For further specification, interested readers may contact the authors for a theoretical note on the specific methodology used in the conversion of taxes and charges into the common unit of ECU per MWh.
3. Selected international agreements are the 1990 North Sea Declaration on emissions to regional waters; the 1985 ECE Convention on Long Range Transboundary Air Pollution: The Helsinki Protocol on SO_2; the 1987 Vienna Convention for Protection of the Stratospheric Ozone Layer; and the Rio Framework Convention on Climate Change and Sustainable Development, which was followed up by the 1995 Berlin Convention on Climate Change.