

THE DESIGN OF CARBON AND BROAD-BASED ENERGY TAXES IN EUROPEAN COUNTRIES

*Stefan Speck**

TABLE OF CONTENTS

Introduction	31
I. The History of Energy Taxation in Europe.....	32
II. The Use of Energy and Carbon Taxes for Environmental Policy	36
III. Taxation of Transport Fuels in EU Member States.....	38
IV. How Have the Energy and Carbon Taxes Levied on Non-Transport Energy Products Developed Over Time?.....	42
A. Denmark.....	44
B. Germany.....	47
C. Sweden.....	50
D. The United Kingdom	53
Summary and Conclusion	55
Appendix.....	57

INTRODUCTION

Since the early 1990s, economic instruments in environmental policy have become an increasingly widespread trend in Europe. These policies began in the Scandinavian states and soon moved to other European countries. An increase in environmental awareness and mounting pressure on the environment culminated in the adoption of new economic instruments and tools, specifically energy and carbon taxes. This development came together with the understanding that economic instruments should be seen as complements to the traditional command-and-control measures.

Part I of this article discusses that, contrary to popular belief, energy taxes have been used for almost a century and are far from a new phenomenon. This section also reviews the most recent development of the

* Kommunalkredit Public Consulting, Türkenstr. 9, 1092 Vienna, Austria, tel: +43 1 31631-248, fax: +43 1 31631-104, email: s.speck@kommunalkredit.at.

European Union (EU) policy regarding the use of economic instruments for environmental policy. Part II highlights the underlying reasons and principles for using energy and carbon taxes in environmental policy. However, a more complicated and complex taxation scheme, driven by the fear that domestic industries would lose competitiveness, accompanied a more widespread use of energy and carbon taxes in case economic intervention was carried unilaterally.¹ Part III compares tax rates on transport fuels in four EU member states—Denmark, Germany, Sweden, and the United Kingdom (U.K.)—and the United States (U.S.). Part IV reviews the schemes implemented by the EU member states, provides assessment of energy and carbon taxation schemes levied on other energy products, and reveals differences in coverage, scope, tax rates, and their development over time.

I. THE HISTORY OF ENERGY TAXATION IN EUROPE

Energy taxes in Europe are not a recent development. European countries have utilized energy taxes for nearly ninety years. For example, Denmark and Sweden levied taxes on transport fuels, such as gasoline, as early as 1917 and 1924 respectively.² Sweden later instituted energy taxes on other non-transport energy products like mineral oils and coal beginning in 1957.³

The rationale behind these energy taxes was not based on environmental issues, but rather on fiscal issues.⁴ The taxes were seen as a means to raise revenues for the national budget and to control oil imports.⁵ However, during the 1980s, a change in the underlying principle for energy taxation emerged when European governments began using gasoline taxes

1. See Andrea Baranzini et al., *A Future for Carbon Taxes*, 32 *ECOLOGICAL ECON.* 395, 401 (2000) (discussing the impact of carbon and energy taxes on competitiveness); see also ZhongXiang Zhang & Andrea Baranzini, *What Do We Know About Carbon Taxes? An Inquiry into Their Impacts on Competitiveness and Distribution of Income*, 32 *ENERGY POL'Y* 507, 512 (2003) (noting that this fear is real and ongoing for policymakers).

2. See STEFAN SPECK ET AL., *NORDIC COUNCIL OF MINISTERS, THE USE OF ECONOMIC INSTRUMENTS IN NORDIC AND BALTIC ENVIRONMENTAL POLICY 2001–2005* AT 66, 197 (2006), available at <http://www.norden.org/pub/miljo/ekonomi/sk/TN2006525.pdf> (discussing the introduction of taxes on transport fuels in Denmark and Sweden).

3. See *id.* at 192 (discussing the implementation of energy taxes on fossil fuels beginning in the late 1950s).

4. See Speck, *supra* note 2, at 66–67 (discussing the fiscal basis for the introduction of taxes on transport fuel).

5. See *id.* (discussing the fiscal basis for the introduction of taxes on transport fuel).

to achieve environmental objectives.⁶ Gasoline taxes were designed in a way that favored unleaded gasoline, which received a tax rebate based on environmental considerations and the recognition of lead's harmful effects.⁷

The following decade saw even more widespread application of energy and carbon taxes driven by environmental policy objectives and by their revenue-raising potential. The forerunner countries, Denmark and Sweden, started to revise their overall energy taxation schemes in the early 1990s and implemented carbon dioxide (CO₂) taxes in response to the increased attention towards climate change.⁸ Other countries, including the Netherlands, Germany, and the U.K., soon followed by using energy and carbon taxes as policy instruments for climate change action.

The European Commission promoted the use of energy taxation schemes for climate change policy and proposed the first EU-wide energy and carbon tax in 1992.⁹ However, this proposal, and an amended version presented by the European Commission (EC) in 1994, was rejected by several EU member states.¹⁰ Shortly after, the European Commission made another attempt for energy taxation by submitting the 1997 energy products taxation proposal.¹¹ Unlike the 1992 proposal, which was primarily based on environmental considerations, the 1997 proposal

was born more as an internal market and taxation one. The aim was now no longer to introduce a new totally harmoni[z]ed EU CO₂/energy tax, but, more pragmatically, to extend and improve the existing framework for the

6. See European Env'tl. Agency [EEA], *Environmental Taxes and Charges, Deposit-Refund Schemes*, 69, EEA Tech. Rpt./No. 8/2005 (2005) (prepared by Stefan Speck, Ian Skinner, Dominic Hogg, and Patrick ten Brink) [hereinafter *Environmental Taxes and Charges*] at 40 (discussing that these taxes began to emerge as market-based instruments associated with the 'polluter pays' principle).

7. See *id.* (discussing how unleaded gasoline was preferred over leaded gasoline for its lessened environmental impact).

8. See SPECK, *supra* note 2, at 62 (noting that the Danish Parliament passed the carbon tax bill as a reaction to the increased attention on climate change).

9. See generally Commission of the European Communities, *Proposal for a Council Directive Introducing a Tax on Carbon Dioxide Emissions and Energy*, COM (92) 226 final (June 30, 1992), available at http://aei.pitt.edu/4830/01/000990_1.pdf (recognizing the need to address carbon emissions to limit the greenhouse effect).

10. Jacob Klok, *Energy Taxation in the European Union. Past Negotiations and Future Perspective* 10–11 (Instituto de Estudios Fiscales, Working Document No. 21/05, 2005), available at http://www.ief.es/Publicaciones/Documentos/Doc_21_05.pdf.

11. Commission of the European Communities, *Restructuring the Community Framework for the Taxation of Energy Products*, COM (97) 30 final (Dec. 3, 1997), available at http://aei.pitt.edu/3522/01/000671_1.pdf.

Member States taxation of mineral oils to cover all energy products sold on the Internal Market.¹²

The adoption of the Energy Taxation Directive by the Council of Ministers in 2003,¹³ a watered down version of the 1997 proposal, marked the end of lengthy discussions and negotiations between the EU member states at the European Council.¹⁴

The 2003 Energy Taxation Directive was of great significance for EU member states as it articulated the fiscal framework and structure for the taxation of energy products and electricity.¹⁵ The Directive widened the coverage of the Community framework, which had previously been limited to mineral oil products, to other energy products such as natural gas, coal, and electricity.¹⁶ In addition, it increased the minimum rates of taxation for mineral oils and introduced new minimum rates for other energy products. These new rates differentiated between business and non-business uses, and set the minimum rate for business use lower than the rate for non-business use.¹⁷ All EU member states are legally obligated to set national tax rates in accordance with the requirements of the Directive, which has to be transposed into national law.¹⁸

One of the reasons behind the slow progress in establishing a common EU structure of energy taxation is the EC's unanimity requirement on taxation issues. A single EU Member State can block any decision with respect to taxation.¹⁹ In 2001, a proposal was brought forward to revise the unanimity rule for certain tax issues and replace it with a qualified majority vote based on the "enhanced co-operation" mechanism.²⁰ The revised rule

12. Klok, *supra* note 10, at 10–11.

13. *Id.*

14. *See generally* Council Directive 2003/96, 2003 O.J. (L 283) (EC), available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:283:0051:0070:EN:PDF> (directing the EC to adopt certain environmental taxation measures).

15. *See generally id.*

16. The taxation scheme based on this Directive can be described as a broad-based energy tax and the tax base is defined in terms of the volume of the energy.

17. *See* Council Directive 2003/96/EC, *supra* note 14, art. 5, at 54 (allowing member states to apply differentiated rates of taxation for business and non-business use).

18. *See id.* art. 4, at 54 (prohibiting levels of taxation for specified energy products and electricity from being below prescribed minimum levels of taxation).

19. *See Environmental Taxes and Charges*, *supra* note 6, at 69 (discussing that progress is slow because all taxation decisions require unanimity).

20. *See* EEA, *Market-based Instruments for Environmental Policy in Europe*, 69, No. 8 (2005) http://reports.eea.europa.eu/technical_report_2005_8/en/EEA_technical_report_8_2005.pdf (offering an expanded discussion on enhanced cooperation in the EU), *see also Environmental Taxes and Charges*, *supra* note 6 (explaining that the European Commission proposed

was introduced by the Amsterdam Treaty, developed further by the Nice Treaty, and entered into effect on February 1, 2003.²¹

In 2005, the interest in energy and carbon taxes lost its momentum at the EU level and within EU member states with the adoption of the EU Emission Trading Scheme (EU ETS).²² The EU ETS can be described as the cornerstone in the fight against climate change at the EU level because it helps EU member states comply with their emission reduction commitments under the Kyoto Protocol. The scheme covers energy-intensive installations including combustion plants, oil refineries, coke ovens, iron and steel plants, and factories producing cement, glass, and other commodities.²³ These installations are emitting around fifty percent of the EU's CO₂ and are subject to energy taxation articulated in the Directive.²⁴

The adoption and implementation of the EU ETS, in combination with the recent sharp increase in world oil prices, lead any discussion of further increases in the energy tax level *ad absurdum* since consumers and producers are facing higher energy prices. This has led to calls for the reduction of energy tax rates in many European countries during the spring and summer of 2008.²⁵

Although the structure and minimum tax levels were laid down in the Directive, the actual design of the energy/carbon taxation regimes implemented by the EU member states are quite different, particularly with regard to energy and carbon taxes levied on industry. The reasons for these differences were manifold, but were generally introduced by national

that environmental taxation should in the future be decided under qualified majority rules as a fix to the slow progress resulting from the unanimity requirement).

21. *Market-based Instruments for Environmental Policy in Europe*, *supra* note 20; *Environmental Taxes and Charges*, *supra* note 6.

22. *See generally* Council Directive 2003/87, 2003 O.J. (L 275) (EC), <http://www.bmu.de/files/pdfs/allgemein/application/pdf/emissionshandel031030.pdf> (establishing a scheme for greenhouse gas emission allowance trading).

23. *See id.* at 42 (listing categories of activities covered by the EU ETS).

24. Larry Parker, *Climate Change: The European Union's Emissions Trading System (EU-ETS)*, (Congressional Research Service, Wash. D.C.), July 31, 2006, <http://fpc.state.gov/documents/organization/70317.pdf>. *See also* *Market-Based Instruments for Environmental Policy in Europe*, *supra* note 20, at 83 (discussing European environmental tax reform); Council Directive 2003/96/EC, *supra* note 14, art. 17, at 57 (allowing EU member states to apply tax reductions for energy-intensive businesses).

25. *See generally* European Commission, Oil Bulletin, No 1414, (July 1, 2008) *available at* http://ec.europa.eu/energy/oil/bulletin/2008/without_taxes/2008_06_30.pdf (charting the consumer price of petroleum products in European countries since July 2007).

governments in order to protect the competitiveness of their domestic industries.²⁶

II. THE USE OF ENERGY AND CARBON TAXES FOR ENVIRONMENTAL POLICY

The application of environmental taxes, including energy and carbon taxes, as a means aimed to achieve environmental protection can be traced back to the scholars Pigou, Baumol, and Oates.²⁷ In 1932, Pigou developed the rationale for environmental taxation, and in 1971 Baumol and Oates²⁸ analyzed how taxes could be applied to reach environmental standards cost effectively. Although their approaches and promoted rationales differ slightly, all three scholars postulate a uniform tax rate for both polluters and energy products, thereby equalizing marginal costs so that the total cost of abatement would be minimized.²⁹ Furthermore, environmental taxes would be an appropriate tool for implementing the polluter pays principle (PPP) which, in addition to the precautionary principle, is a foundation of European environmental policies.³⁰ The rationale behind the PPP is to

26. See Paul Ekins & Stefan Speck, *The Impacts of Environmental Policy on Competitiveness: Theory and Evidence*, in INTERNATIONAL COMPETITIVENESS AND ENVIRONMENTAL POLICIES 33, 34, 48 (Terry Barker & Jonathan Köhler eds., 1998) (offering a detailed discussion about the competitive effects of environmental taxes); see also Paul Ekins & Stefan Speck, *Competitiveness and Exemptions From Environmental Taxes in Europe*, 13 ENV. & RES. ECON. 369, 370 (1999) [hereinafter *Competitiveness and Exemptions*] (“The principle reason for the introduction of the tax exemptions is concern about the effects of environmental, and especially energy, taxes on competitiveness”); Paul Ekins & Stefan Speck, *Environmental Tax Reform in Europe: Energy Tax Rates and Competitiveness*, in 5 CRITICAL ISSUES IN ENVTL. TAX’N 77, 78 (Nathalie J. Chalifour et al. eds., 2008) [hereinafter *Energy Tax Rates and Competitiveness*].

27. See ARTHUR PIGOU, *THE ECONOMICS OF WELFARE* 113–14 (Macmillan 4th ed. 1932) (noting that environmental prudence from sound education can produce lasting effects because future generations inherit these new ideas and build upon them for further, generational, environmental advancements). See also *id.* at 236 (discussing price caps on commodities including coal).

28. See generally William J. Baumol & Wallace E. Oates, *The Use of Standards and Prices for Protection of the Environment*, 73 SWED. J. OF ECON. 42, 42–51 (1971) (discussing the cost-effectiveness of the pricing and standards approach to energy taxation).

29. See *Market-based Instruments for Environmental Policy in Europe*, *supra* note 20, at 45 (explaining that taxes should be set at a level that internalizes environmental damage); see also National Environmental Research Institute [NERI], *Working Paper: Overview of Environmental Tax Reforms in EU Member States*, in *Competitiveness Effects of Environmental Tax Reforms*, 22, WP. 1 (2007) (prepared by Stefan Speck), http://www2.dmu.dk/COMETR/COMETR_Final_Report.pdf [hereinafter *Environmental Tax Reform in Member States*] (discussing that while the scholars disagree in approach, all three agree that the cheapest way to achieve political environmental objectives is through a uniform tax).

30. See Consolidated Version of the Treaty Establishing the European Community, Dec. 29, 2006 O.J. (C 321) 174 (stating that the community policy on the environment shall be based on the precautionary principle and as such polluters should pay).

internalize environmental costs—externalities—which accrue through environmental pollution.

However, current political practice differs from its theoretically-principled basis. Energy and carbon taxes implemented by EU member states generally discriminate between energy users. The taxation schemes differentiate between energy products by setting tax rates that are not in accordance with the fuels' energy content. Furthermore, special tax provisions, including reduced rates for specific energy products, tax rebates for the industry as a whole, or rebates for individual industry sectors, are often the rule and not the exception (discussed in Part III below).³¹ The legal framework for granting special tax provisions, which are regarded as a form of state aid, is outlined in the Community Guidelines on State Aid for Environmental Protection (Environmental Guidelines).³² These Environmental Guidelines, combined with the Energy Taxation Directive, set rules for determining which tax provisions may be granted by EU member states. For example, they allow for reduction of energy tax rates if the reduced rates are still above the minimum excise rates established under the Energy Taxation Directive.³³ Further reductions are also possible if member states consider special rules, including agreements for introducing energy-saving measures under the Environmental Guidelines.³⁴

It is important to recognize that the current developments in the energy and carbon taxation schemes in the four EU member states are part of a policy reform process within the concept of environmental tax reform (ETR).³⁵ The underlying principle of an ETR is to reform the national tax system by shifting the tax burden from conventional market areas, such as production labor and capital, to environmentally related fields, such as environmental pollution or natural resource use.³⁶

The original idea emanates from levying a tax on energy consumption and using these revenues to reduce the taxes and charges levied on labor,

31. See *Energy Tax Rates and Competitiveness*, *supra* note 26, at 78 (discussing European tax rebates and exemptions in different sectors, especially industry sectors).

32. See generally *Community Guidelines on State Aid for Environmental Protection*, 2008 O.J. (C 82) 1, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:082:0001:0033:EN:PDF>.

33. See *id.* at 25, ¶ 153 (allowing for a reduction of tax rates as long as the new rates are above the minimum level set by the 2003 Energy Tax Directive).

34. See Council Directive 2003/96/EC, *supra* note 14, art. 15, at 56 (allowing member states to apply full or partial exemptions for reductions involving environmentally-friendly products and energy from renewable resources).

35. See *Market-based Instruments for Environmental Policy in Europe*, *supra* note 20, at 83–84 (outlining environmental tax reforms in the EU).

36. See *id.* (outlining environmental tax reforms in the EU).

particularly on social security and/or pension contributions.³⁷ Therefore, the general strategy behind an ETR—also known as environmental fiscal reform, ecological tax reform, or green tax reform—is to address and achieve multiple policy objectives simultaneously. It is not surprising that the revenue generating effect of environmental taxes—particularly energy taxes, as they generate the biggest share of revenues from all environmental taxes by far—must be the first part of an ETR to be analyzed. Otherwise, the economic policy objective of the reform process, i.e., the reduction of taxes and charges levied on labor, cannot be reached satisfactorily because taxes and charges levied on labor generate the highest amount of revenues for national budgets in Europe. It is worthwhile to state that the high tax burden on labor was a perceived cause of high rates of unemployment in several European countries during the 1990s, as well as an impediment for hiring additional workers during periods of low economic growth and when economies were depressed.³⁸ Revenues from taxes and charges levied on the factory production labor were increased during these decades and were seen as too high, especially in the Scandinavian countries with rather high marginal income tax rates.³⁹

The concept of an ETR has been introduced in all four EU member states analyzed in this paper. At the time of the ETR implementation, energy and carbon taxes were significant in all of these countries. However, these countries have adopted varying strategies regarding both the introduction of new energy and carbon taxes and the revision of already existing ones.⁴⁰ The following sections of the article assess the different designs of energy and carbon taxes.

III. TAXATION OF TRANSPORT FUELS IN EU MEMBER STATES

The taxation of transport fuels has a long history and, as mentioned above, was often implemented as a means of generating revenues for national budgets. Therefore, it is not surprising that transport fuel taxes

37. See generally ARBEIT OHNE UMWELTZERSTÖRUNG. STRATEGIEN FÜR EINE NEUE WIRTSCHAFTSPOLITIK [EMPLOYMENT WITHOUT ENVIRONMENTAL DEGRADATION: STRATEGIES OF A NEW ECONOMY DIRECTION] (H.C. Binswanger, H. Frisch & H.G. Nutzinger eds., 1983) (addressing the tensions between advancing business interests and environmental protection).

38. See *Environmental Tax Reform in Member States*, supra note 29, at 21 (suggesting high taxes on labor are perceived to be a cause for high unemployment).

39. *Id.*

40. See SPECK, supra note 2, at 41 (discussing different strategies of EU member states regarding the increase of existing energy and carbon taxes, as well as, the introduction of new ones). See also *Environmental Tax Reform in Member States*, supra note 29, at 27 (discussing the launch of new environmental taxes and the revision of existing ones by Nordic governments).

also have some significance in the context of the ETR packages, particularly in the German ETR as discussed in the “*Germany*” section.⁴¹ Table 1 shows the development of gasoline taxes since 1990 in the four EU member states and the U.S. The tax rates in national currencies are converted into Euros, which can lead to some distortions because of the recent exchange variations. This is particularly visible in the case of the U.S., as the respective federal and state average tax rates are expressed in dollars per 1,000 liters as well as in Euros per 1,000 liters. Exchange rate variations also affect Denmark, Sweden, and the U.K. since these EU member states have not adopted the Euro.

41. See *Environmental Taxes and Charges*, *supra* note 6, at 50–51 (discussing how environmental tax reforms in Germany have included raising fuel taxes).

Table 1: Overview of development on tax rates on gasoline unleaded.⁴²

	Denmark	Germany	Sweden	U.K.	U.S.	U.S.
	€/1,000L	€/1,000L	€/1,000L	€/1,000L	\$/1,000L	€/1,000L
1990	286.4	291.0	388.2	268.8	82	64.4
1991	284.5	307.0	398.4	312.7	99	79.9
1992	288.1	419.0	391.6	315.1	101	77.8
1993	296.3	419.0	425.3	328.0	90	76.9
1994	324.8	501.0	426.7	367.2	101	84.9
1995	412.1	501.0	429.7	380.9	101	77.2
1996	444.3	501.0	488.6	423.9	101	79.5
1997	443.6	501.0	493.6	555.8	101	89.1
1998	449.4	501.0	501.3	636.6	101	90.1
1999	507.0	531.7	503.0	708.5	101	94.7
2000	519.2	562.4	529.3	796.6	101	109.3
2001	532.7	593.1	486.2	771.7	101	112.7
2002	547.7	623.8	504.3	776.4	101	106.8
2003	547.7	654.5	516.2	710.5	102	90.2
2004	547.1	654.5	525.0	739.5	103	82.8
2005	546.2	654.5	534.4	740.1	104	83.6
2006	545.6	654.5	539.2	736.4	105	83.6
2007	546.3	654.5	547.0	752.8	105	76.6

The pattern of development of the national tax rates levied on diesel fuel for transport is similar to that of gasoline. Between 1990 and 2008, tax rates increased in the four EU member states. The smallest increase was in Denmark where rates rose approximately eighty percent. In contrast, Sweden's tax rate quadrupled during the same time period. The U.K. also experienced a dramatic tax rate increase during the 1990s, which can be attributed to the road fuel duty escalator.⁴³

42. The U.S. tax rate data has been converted into Euro for comparison reasons using the exchange rates published by Eurostat (the Statistical Office of the European Communities) for the years 1990–2007. The U.S. data is the sum of the federal average rate and the state average rate. *Environmental Tax Reform in Member States*, *supra* note 29, at 134; EUROPEAN COMMISSION DIRECTORATE GENERAL TAXATION AND CUSTOMS UNION *Excise Duty Tables*, July, 2008; OECD International Energy Agency [IEA], *ENERGY PRICES & TAXES Q. STAT.*, First Quarter 2008, at 114, 141, 258, 284, 292 [hereinafter IEA 2008]; International Energy Agency [IEA], *ENERGY PRICES & TAXES Q. STAT.*, Third Quarter 1999, at 135, 279 [hereinafter IEA 1999].

43. See Paul Ekins & Stefan Speck, *Proposal of Environmental Fiscal Reforms and the Obstacles to Their Implementations*, 2 J. OF ENVTL. POL'Y AND PLAN. 93, 102 (2000) (discussing this increase in "road fuel duty [as] . . . a major innovation compared with other European countries").

Table 2: Overview of tax rates levied on diesel for transport.⁴⁴

	Denmark	Germany	Sweden	U.K.	U.S.	U.S.
	€/1,000L	€/1,000L	€/1,000L	€/1,000L	\$/1,000L	€/1,000L
1990	224.0	230.0	127.6	290.3	87	68.3
1991	222.5	230.0	121.7	312.0	102	82.3
1992	225.4	280.0	107.5	307.4	105	80.9
1993	231.8	280.0	110.7	317.7	105	89.7
1994	270.4	317.0	246.6	359.9	116	97.5
1995	309.8	317.0	259.8	380.9	116	88.7
1996	311.2	317.0	297.1	424.1	116	91.3
1997	319.4	317.0	297.5	557.2	116	102.3
1998	318.7	317.0	299.7	647.7	116	103.5
1999	352.4	347.7	300.8	749.0	116	108.8
2000	382.4	378.4	346.0	845.8	117	126.6
2001	406.6	409.1	328.4	833.3	118	131.7
2002	407.8	439.8	340.7	824.1	118	124.7
2003	407.8	470.4	348.3	754.1	119	105.2
2004	407.3	470.4	365.1	784.9	120	96.5
2005	406.6	470.4	392.7	785.5	121	97.3
2006	406.2	470.4	396.0	781.4	122	97.2
2007	406.7	470.4	402.2	799.0	128	93.4

These large increases took place mainly during the 1990s. Since 2000, the tax rates have been more or less frozen with the exception of Sweden. Sweden is one of the few European countries which indexes its energy and carbon tax rates; the nominal tax rates are adjusted with inflation annually so that the real value of the tax rates is kept constant.⁴⁵ This is in clear contrast to Germany where the transport fuel tax rates have been frozen since 2003 so that the real tax rates—tax rates with constant prices—have been reduced.⁴⁶ The increase in U.S. tax rates can best be described as meager during this period given that the nominal average tax rates for gasoline and diesel have been increased by around twenty-eight percent and forty-seven percent respectively.⁴⁷ It is interesting to note that the tax rates levied on diesel fuel are higher only in the U.K. and the U.S., as opposed to

44. See *Environmental Tax Reform in Member States*, *supra* note 29 (giving an overview of the history of diesel taxes); IEA 2008, *supra* note 42, at 113, 140, 257, 283, 291; see also IEA 1999, *supra* note 42, at 116, 134, 243, 269, 278.

45. See SPECK, *supra* note 2, at 35, 171 (stating that the real value of energy related taxes in Norway remains constant due to the fact that environmental taxes have been increased annually according to the inflation rate).

46. See IEA 2008, *supra* note 42, at 140–41 (showing identical tax rates since 2003).

47. See *id.* at 291–92 (listing tax rates for diesel and gasoline in the U.S.).

Denmark, Germany, and Sweden where taxes levied on gasoline are higher.⁴⁸

IV. HOW HAVE THE ENERGY AND CARBON TAXES LEVIED ON NON-TRANSPORT ENERGY PRODUCTS DEVELOPED OVER TIME?

The current energy tax policies introduced in EU member states, as well as those adopted at the EU level in the form of the 2003 Energy Taxation Directive discussed above, are far from the theoretical rationale. Taxes are generally set at different rates for different energy users and products. The taxation of transport fuels is probably the closest to the theoretical rationale because only certain industries, such as the agriculture and fishing, are regularly eligible for special tax provisions in the form of reduced tax rates for gasoline and diesel.⁴⁹

In contrast to the taxation of transport fuels are the energy and carbon taxes levied on non-transport energy products. EU member states, including the four examined in this article, adopted disparate and complex taxation strategies aimed at lowering the effective tax burden for their domestic industries. National policies in all of these countries share the same objective, protecting the competitiveness of domestic industries. The rationale for implementing these strategies is simple. Environmental taxes, emission trading schemes (when emission allowances are being auctioned), and stricter regulations are leading to higher costs for the industries. Additionally, if these taxes are introduced unilaterally, the international competitiveness of the domestic industry can be impaired.⁵⁰

The policy of providing special tax provisions to industries is also underpinned by the argument that high uniform energy and carbon taxes would reduce environmental pollution in the countries levying these taxes while increasing environmental pollution in countries without the taxes.⁵¹ Furthermore, these high, uniform energy and carbon taxes could lead

48. See *id.* at 113–14, 140–41, 257–58, 283–84, 291–92 (listing tax rates for diesel and gasoline in Denmark, Germany, Sweden, the U.S., and the U.K.).

49. See *Environmental Tax Reform in Member States*, *supra* note 29 (explaining that a tax levied on transport fuels follows the theoretical rationale because there is a uniform effect across society).

50. See Ekins and Speck, *supra* note 26, at 386 (stating that where environmental taxes are imposed only in one country, the international competitiveness of industries in that country may be impaired); See also ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, *THE POLITICAL ECONOMY OF ENVIRONMENTALLY RELATED TAXES 75* (2006) (discussing the negative impacts of unilateral taxes on international competitiveness).

51. See *Environmental Tax Reform in Member States*, *supra* note 29, at 23 (discussing the effects of special tax provisions on environmental pollution).

industries to relocate to those countries with lower energy tax burdens.⁵² Relocation of industrial production due to stricter environmental regulation has been widely discussed in the economic literature and is often linked to the Porter hypothesis.⁵³

There are also arguments against granting special tax provisions to industries. One of main reasons for implementing environmental taxes instead of traditional regulatory measures is the belief that distributing these taxes equally across all polluters will produce more efficient results.⁵⁴ Furthermore, tax provisions can impede the utilization of cheap emission abatement efforts in the production sector. These increased emissions must be offset by more costly emission abatement options in the household sector to reach a given target.⁵⁵ This situation can lead to “substantial excess costs” as discussed in the economic literature.⁵⁶

52. See Terry Barker, Sudhir Junankar, Hector Pollitt & Philip Summerton, *Carbon Leakage: Analysis within an E3ME Framework*, in COMPETITIVENESS EFFECTS OF ENVIRONMENTAL TAX REFORMS: FINAL REPORT TO THE EUROPEAN COMMISSION, DG RESEARCH AND DG TAXATION AND CUSTOMS UNION 474 (2007), available at http://www2.dmu.dk/cometr/COMETR_Final_Report.pdf (“The model shows that the energy-intensive industries will re-locate in response to the change in relative prices brought about by twenty-eight percent carbon abatement below business as usual by 2010”). See also Sci. Ass’tment & Pol’y Analysis, Sub-Comm’n Neth. Res. Programme on Climate Change, *Spillovers of Climate Policy An Assessment of the incidence of Carbon Leakage and Induced Technological Change Due to CO₂ Abatement Measures*, 19–20, No. 500036 002 (Dec. 2004) (prepared by J.P.M. Sijm et al.), available at <http://www.rivm.nl/bibliotheek/rapporten/500036002.pdf> (discussing how high energy taxes could lead to relocation of industries); Mustafa H. Babiker, *Climate Change Policy, Market Structure, and Carbon Leakage*, 2 J. INT’L ECON. 421, 422 (2005) (discussing the relocation of industry based on carbon controls).

53. Harvard economist Porter stated that the setting of environmental standards would actually be promoting innovations. The gains from innovations would then offset the increased costs of the environmental standards. See Michael E. Porter & Claas van der Linde, *Toward a New Conception of the Environment-Competitiveness Relationship*, J. ECON. PERSP. 97, 98 (1995) (arguing that environmental standards lead to innovations that will partially or totally offset compliance costs of environmental regulations); see generally Mikael Skou Andersen, *An Introduction to Environmental Tax Reform and The Competitiveness Issue*, in COMPETITIVENESS EFFECTS OF ENVIRONMENTAL TAX REFORMS, *supra* note 52 (discussing the relationship between environmental regulations and competitiveness); Adam B. Jaffe et al., *Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?*, 33 J. ECON. LITERATURE 132, 132–63 (1995) (discussing that the proponents of the Porter hypothesis suggest that the competitiveness of the U.S. as a whole can be enhanced by more stringent environmental regulations); Rhys Jenkins, *Environmental Regulation and International Competitiveness: A Review of Literature and Some European Evidence* (The United Nations University, Institute for New Technologies, Discussion Paper No. 9801, 1998), available at <http://www.intech.unu.edu/publications/discussion-papers/9801.pdf> (discussing the effects of stricter environmental regulations on competitiveness at the industry level).

54. Organization for Economic Co-Operation and Development [OECD], *Green Tax Reforms: An Assessment*, in ENVIRONMENTALLY RELATED TAXES IN OECD COUNTRIES: ISSUES AND STRATEGIES 126 (2001) [hereinafter *Green Tax Reforms*].

55. See Michael Kohlhaas, *Energy Taxation and Competitiveness: Special Provisions for Business in Germany’s Environmental Tax Reform*, 6–7, (F.R.G. Inst. for Econ. Res., Working Paper No. 349 2003), available at <http://www.diw.de/documents/publikationen/73/40455/dp349.pdf> (discussing

Having briefly discussed the pros and cons for granting special tax provisions in EU member states, the following sections explore the actual designs of energy and carbon taxation schemes in Denmark, Germany, Sweden, and the U.K. The final section compares the schemes of these four countries.

A. Denmark

The Danish energy/carbon tax regime consists of three individual taxes: the energy tax, the CO₂ tax, and the sulfur tax. The energy tax, which is based on the energy content of the fuel, is levied on fossil fuels, oil products, and coal. Natural gas is the exception because the energy content is not taken into account.⁵⁷ The carbon dioxide tax was introduced in 1992 at a rate of approximately thirteen Euros per ton of CO₂.⁵⁸ In 2005, the CO₂ tax rate was slightly reduced to twelve Euros per ton of CO₂.⁵⁹ This reduction corresponded with an energy tax increase so that the overall tax burden remained constant.⁶⁰

The sulfur tax was introduced in 1996 and is levied on all fossil fuels with a sulfur content exceeding 0.05% (based on weight).⁶¹ Since its introduction, the rate has been set at 2.7 Euros per kilogram of sulfur in energy products, or at about 1.3 Euros per kilogram of sulfur dioxide (SO₂) emissions. The tax design provides an incentive to consume energy

how the goods and materials sector pays reduced taxes as compared to private households which pay the full tax rate); Michael Kohlhaas, Deutsches Institut für Wirtschaftsforschung [DIW], *Gesamtwirtschaftliche Effekte der ökologischen Steuerreform*, in *Quantifizierung der Effekte der Ökologischen Steuerreform auf Umwelt, Beschäftigung und Innovation 2* (2005), available at <http://www.umweltdaten.de/publikationen/fpdf-l/2961.pdf>; see also Christoph Böhringer & Thomas F. Rutherford, In Search of a Rationale for Differentiated Environmental Taxes 1 (Zentrum Für Europäische Wirtschaftsforschung GmbH [Center for European Econ. Res.], Discussion Paper No. 02-30, 2002), available at <http://opus.zbw-kiel.de/volltexte/2003/867/pdf/dp0230.pdf> (discussing how deviation from uniform taxation results in excess costs and the fact that lowering taxes on certain sectors of the economy requires increased taxes in other sectors).

56. See Christoph Böhringer, *Environmental Tax Differentiation Between Industries and Households—Implications for Efficiency and Employment*, 2 (Center for European Economic Research [ZEW], Discussion Paper No. 02-08, 2008), available at <ftp://ftp.zew.de/pub/zew-docs/dp/dp0208.pdf> (stating that as tax differentiation comes close to exempting the productions sector, substantial excess costs result).

57. See SPECK, *supra* note 2, at 61 (discussing the energy taxes levied on fossil fuels).

58. The tax is differentiated on the basis of the carbon content of the different fuels so that the CO₂ tax rate for light fuel oil is about 0.036 Euro per liter, for heavy fuel oil 0.043 Euro per liter, and for coal 0.032 Euro per kg.

59. See SPECK, *supra* note 2, at 64 tbl.2.2 (illustrating the overall principles in the Danish CO₂ tax).

60. *Id.*

61. See SPECK, *supra* note 2, at 62 (discussing the introduction of the Danish sulfur tax).

products with low sulfur content or to abate SO₂ emissions by using pollution reducing technologies, i.e., scrubbers.

A rather complex system of energy and carbon tax differentiation for industry has been in place since the 1996 tax reform. This replaced a regime in which all VAT registered companies had been exempt from virtually all energy tax burden.⁶² Industries are eligible for a full energy tax refund for the energy used for process purposes and which still applies nowadays. However, since 1998, industries have had to pay the full energy tax for the energy used for space heating purposes.⁶³

An even more complicated exemption regime applies to the CO₂ tax. When the CO₂ tax was introduced in 1992, industries were completely exempt from any CO₂ tax payments. From 1993 to 1995, non-energy intensive industries were subject to a CO₂ tax equivalent to fifty percent of the total CO₂ tax. Energy-intensive industries were subject to a more generous refund amounting to about ninety percent of the CO₂ tax burden.⁶⁴

The 1996 tax reform led to a change in the special tax provisions granted to industry. Since then, industry has been paying CO₂ taxes according to different types of usage. The full CO₂ tax rate applies to space heating while differentiation between heavy and light processes has been established to determine the effective tax burden. Companies can further reduce the CO₂ tax burden for these processes if they enter into voluntary agreements with the government.⁶⁵ Table 3 provides an overview of the development of energy and CO₂ tax rates for different energy users and usages.

62. Env'tl. Prot. and Emp. in Nordic Countries [TemaNord], *The Use of Economic Instruments in Nordic Environmental Policy 1999–2001*, 44–45, 114, 581 (2005).

63. SPECK, *supra* note 2, at 63.

64. See *Environmental Tax Reform in Member States*, *supra* note 29, at 34 (discussing the three-tiered reimbursement scheme for the Danish CO₂ tax).

65. For a more detailed discussion of the Danish system including the development of energy tax rates over time, see *Environmental Tax Reform in Member States*, *supra* note 29, at 38 (discussing eligibility for a reduction in the Carbon tax rate by entering agreements with the Danish energy authority to increase energy efficiency); SPECK, *supra* note 2, at 65 (discussing how companies can reduce their tax burden by improving energy efficiency).

Table 3: Development of energy and CO₂ tax rates for different users and usages.⁶⁶

	Household and service sector	Industry–space heating	Industry–light process	Industry–heavy process
Light fuel oil	€/1,000L	€/1,000L	€/1,000L	€/1,000L
1996	239.2	239.2	18.3	1.1
2000	268.3	268.3	24.6	1.1
2007	286.5	286.5	24.6	1.1
Heavy fuel oil	€/ton	€/ton	€/ton	€/ton
1996	269.0	269.0	21.7	1.3
2000	304.5	304.5	29.2	1.3
2007	324.8	324.8	29.2	1.3
Natural gas	€/1,000m ³	€/1,000m ³	€/1,000m ³	€/1,000m ³
1996	31.3	31.3	14.9	0.9
2000	244.2	244.2	20.1	0.9
2007	305.8	305.8	20.1	0.9

A different taxation regime applies to electricity consumption and consists of two components: an energy tax and a CO₂ tax. Since 1977, the energy tax has been levied on electricity consumption regardless of where or how electricity is generated. For example, the energy tax is the same if the electricity is generated abroad or domestically, and whether or not it is produced by power plants or renewable energy sources. However, fossil fuels used for electricity production are exempt from the energy and CO₂ tax. Since 1992, a CO₂ tax has been levied on electricity consumption in addition to the energy tax.⁶⁷

Table 4 illustrates how the electricity tax regime distinguishes between three categories of use: electricity used for heating purposes, for other purposes and for industry.

66. *Environmental Tax Reform in Member States*, *supra* note 29; SPECK, *supra* note 2, at 64.

67. See Speck, *supra* note 29, at 33–34 (discussing the introduction of the CO₂ tax in addition to the existing energy tax on electrical consumption).

Table 4: Energy and CO₂ taxes levied on electricity.⁶⁸

	Heating purposes	Other purposes	Industry
	€/MWh	€/MWh	€/MWh
1996	57.8	62.5	8.2
2000	76.6	85.3	13.4
2005	80.8	89.5	8.6

A portion of the revenues raised by the energy and CO₂ taxes were earmarked for the Danish ETR programs which can be divided into three distinct packages.⁶⁹ The 1993 tax reform package was implemented between 1994 and 1998. This tax shifting program amounted to approximately six billion Euros, corresponding to 1.2% of the GDP at that time.⁷⁰ The scope of the 1995 tax reform package, implemented between 1996 and 2000, was smaller than the 1993 ETR. The revenues generated by the CO₂ tax and sulfur tax levied on industrial energy consumption totaled about 0.2% of the GDP in 2000.⁷¹ Finally, the 1998 tax reform package, implemented between 1999 and 2002, generated revenues by increasing the energy and CO₂ tax rates. The revenues were then recycled back into the economy.

There are similarities in the recycling mechanisms utilized in the three ETRs; the taxes and charges levied on labor were reduced and part of the revenues were used to provide investment grants for energy-saving measures.⁷²

B. Germany

The German energy tax regime is not a new development and taxes have been levied on the consumption of mineral oils, particularly transport fuels, since the 1950s.⁷³ The scope of energy taxes broadened in 1989 with the introduction of a tax on natural gas.⁷⁴ Nevertheless, coal was not

68. For purposes of comparison, the values have been converted from kilowatt hours to megawatt hours. SPECK, *supra* note 2, at 66.

69. See *Environmental Tax Reform in Member States*, *supra* note 29, at 35–37 (discussing each phase more thoroughly).

70. See *id.* at 34 (evaluating the 1993 tax reform package).

71. *Id.* at 34 (discussing the 1994 tax reform package).

72. *Id.* at 36.

73. BUNDESMINISTERIUM DER FINANZEN, ENTWICKLUNG DER MINERALÖL- UND STROMSTEUERSÄTZE IN DER BUNDESREPUBLIK DEUTSCHLAND 1–10 (2005).

74. *Environmental Tax Reform in Member States*, *supra* note 29, at 40.

subject to energy taxes until 2007. This is because prior to the abolishment of the electricity taxation scheme in 1995, the coal industry in Germany had been heavily subsidized.⁷⁵ This tax scheme was known as *Kohlepfennig* and was an *ad-valorem* tax, its rates differentiating between industry and households.⁷⁶

The energy tax regime experienced some major changes during the implementation of the ETR between 1999 and 2003.⁷⁷ Accordingly, mineral oil taxes on transport fuels were gradually increased by 154 Euros per 1,000 liters for gasoline and diesel, amounting to a thirty-one percent increase on gasoline and forty-eight percent increase on diesel.⁷⁸ The taxes on light heating fuels were increased by fifty percent and the tax on natural gas was increased twofold during the same time period.⁷⁹ Taxes on heavy fuel oil increased in 2000 and again in 2003. Also, it is interesting to mention that heavy fuel oil used for electricity generation in Germany is still subject to an energy tax, unlike Denmark where all energy products used for electricity generation are tax exempt.⁸⁰ Furthermore, an electricity tax was introduced in 1999, increasing gradually in five annual steps.

When analyzing the German energy taxation scheme, it is important to distinguish between pre-1999 tax rates and the post-1999 tax rates. This is because the revenues raised through increasing energy tax rates from the 1999 ETR were earmarked for the tax shifting program; they were recycled back to the taxpayers by reducing employers' and employees' pension contributions. The revenue generated from the electricity tax is completely earmarked for the tax shifting program and amounts to approximately thirty-two percent of the total revenues used for the tax shifting program.⁸¹ The biggest share is generated from the energy taxes levied on transport fuels, gasoline and diesel, accounting for more than fifty percent of the revenues. "The total volume of the tax shifting program was 18.6 billion Euro in 2003," amounting to around 0.9% of the GDP.⁸²

75. *Id.*

76. *Id.*

77. See *Environmental Tax Reform in Member States*, *supra* note 29, at 41 (explaining the changes as primarily increases in existing energy taxes and the addition of an electricity tax). See generally Stefan Bach, *Be- und Entlastungswirkungen der Ökologischen Steuerreform nach Produktionsbereichen [Loading and Discharge Effects of the Ecological Tax Reform by Branch]* 1-41 (Deutsches Institut für Wirtschaftsforschung, FuE-Vorhaben Förderkennzeichen, 2005), available at <http://www.umweltdaten.de/publikationen/fpdf-l/2960.pdf> (discussing German ecological tax reform).

78. *Environmental Tax Reform in Member States*, *supra* note 29, at 41, tbl.A4-3a (charting the annual increases).

79. See *id.* (charting the annual increases).

80. See *id.* (charting the increases); see also *id.* at 38 (noting the exemption).

81. See *id.* (noting that the reduction is paid to both groups equally).

82. *Id.* at 41.

These changes in the energy taxation regime were also accompanied by a special energy tax provision for energy products other than transport fuels. The industries included in this provision were manufacturing, agriculture, forestry, and fishing, and their tax provisions are set out below.⁸³

All companies in manufacturing, agriculture, fishing, and forestry are granted a tax relief of “40 percent of the standard energy tax rates for electricity, heating oil and natural gas; . . . an effective tax rate of sixty percent of the standard rate.”⁸⁴ This tax relief program only applies for the energy consumption exceeding the base amount of 512.5 Euros annually—referred to as *Sockelbelastung*. In other words, the full energy tax rates have to be paid until the energy tax burden exceeds 512.5 Euros annually, and only then does the tax relief package apply.⁸⁵

Moreover, there is an additional tax option—*Spitzenausgleich*—applicable to the manufacturing industry. Under this rule, “a company is eligible for a refund if the energy tax burden is greater than its tax relief from the reduction in the pension contributions payable by the company.”⁸⁶ However, the refund currently amounts to only ninety-five percent of the difference.⁸⁷

The following example reveals how the manufacturing industry faces considerable tax relief. In 2004, “the standard electricity tax rate . . . was 20.5 EUR/MWh [Euros per megawatt hour].”⁸⁸ Companies which were statistically classified as manufacturing industries, agriculture, fishing, and forestry businesses were facing an effective tax rate of sixty percent of the standard rate, amounting to a tax rate of 12.3 Euros/MWh. The manufacturing industry faced an even lower effective tax rate of 0.62 Euros/MWh—three percent of the standard rate—“but only when they qualify for the ‘*Spitzenausgleich*’ regulations.”⁸⁹

In 2007, the taxation regime for industry underwent a slight revision. By extending the tax rate to the full tax rate, the tax reduction meant that the sixty percent rule was also valid for the pre-1999 tax rate—the rate prior to the implementation of the ETR. An overview of the development of the energy tax rates of selected energy products can be found in the Appendix.

83. See generally Stefan Bach, *supra* note 77.

84. *Environmental Tax Reforms in Member States*, *supra* note 29, at 42.

85. *Id.*

86. *Id.*

87. *Id.*

88. *Id.*

89. *Id.*

C. Sweden

The Swedish energy and carbon taxation regime is very comprehensive and consists of four different types of taxes.⁹⁰ Energy taxes on transport fuels were introduced in 1924 for gasoline and extended to diesel in 1937.⁹¹ In 1957, Sweden introduced an energy tax on fossil fuels limited to mineral oils and coal. A further revision of the scheme extended the tax to liquified petroleum gas (LPG) in 1964 and to natural gas in 1985. The energy tax rates have been increased continuously since the tax was introduced.⁹²

The introduction of a CO₂ tax in 1991 marked a major revision in the energy and carbon tax mechanism. Notwithstanding the fact that the energy tax rates peaked in 1990, they were subsequently lowered, thereby offsetting the increased tax burden caused by the implementation of the CO₂ tax.⁹³ The CO₂ tax rates are set in accordance with the carbon content of the fossil fuel. In 1991, the CO₂ tax rate was around forty-three Euros per ton of CO₂, and increased to around 100 Euros per ton in 2007 and to 106 Euros per ton in 2008.⁹⁴

A sulfur tax, introduced alongside the CO₂ tax in 1991, was the third element of Sweden's energy tax system. It is only levied on heavy fuel oil, coal, and peat fuels. Fuels with a sulfur content not exceeding 0.05% in weight are tax exempt. Nevertheless, the environmental effect of this tax can be questioned because these rates have not been revised since their introduction.⁹⁵

Finally, the nitrogen oxide (NO_x) charge, Sweden's last addition to its tax regime, became effective in 1992. The NO_x charge was originally levied on nitrogen oxide emissions from combustion plants generating at least fifty gigawatts per hour (GWh), but was extended to include plants

90. See SPECK, *supra* note 2, at 192 (noting that the excise duties on fossil fuels in Sweden consist of an energy tax, a CO₂ tax, a sulfur tax, and a NO_x tax); see generally Thomas Sterner, *Policy Instruments for Environmental and Natural Resource Management*, (2003) (reviewing environmental policies and theories); see also Patrik Söderholm, *EXTENDING THE ENVIRONMENTAL TAX BASE: PREREQUISITES FOR INCREASED TAXATION OF NATURAL RESOURCES AND CHEMICAL COMPOUNDS*, REP. NO. 5416, at tbl.2.1 (2004) (showing changes in environmental taxes in Sweden regarding energy taxes, transport taxes, taxes on natural gravel, and taxes on certain other substances between 1994 and 2002).

91. SPECK, *supra* note 2, at 197.

92. *Id.* at 192.

93. See *id.* (discussing the CO₂ tax and subsequent lowering of energy taxes in Sweden).

94. SPECK, *supra* note 2, at 119. See also SWEDISH MINISTRY OF FINANCE GOVERNMENT, BUDGET 2008 HIGHER CARBON DIOXIDE TAX FOR REDUCED TRAFFIC EMISSIONS, FACT SHEET ON THE SWEDISH GOVERNMENT'S BUDGET BILL FOR 2008, <http://www.sweden.gov.se/content/1/c6/08/86/13/5e9ed088.pdf>.

95. See Speck, *supra* note 2, at 193 (discussing the sulfur tax in Sweden).

generating more than twenty-five GWh. This meant that around five percent of the total NO_x emissions are covered by the charges.⁹⁶

Since 1995, energy taxes were indexed and linked to the Consumer Price Index in Sweden. This ensured a constant, real value of the tax rates. As mentioned above, this policy is the exception and not the rule in Europe.

The Swedish broad-based energy and carbon taxation regime is definitely one of the most interesting schemes developed and implemented in Europe. It reveals some appealing features from the last fifteen years as it underwent various revisions that were sometimes directly related to the fear that Swedish industries would lose competitiveness. One of its most striking features was the introduction of the CO₂ tax in 1991. Importantly, special tax provisions (i.e., reduced tax rates) have not been granted to Swedish industry, leading to a significant increase in the overall tax rate.⁹⁷ This particularly affected energy products other than transport fuels.⁹⁸ Consequently, industry was subject to the same tax rates as the rest of the economy which meant that the Swedish industry faced the highest energy and carbon taxes in Europe.⁹⁹ However, the total energy and carbon tax burden had a ceiling; the energy and carbon tax bill of a company could not exceed 1.7% of the sales value in 1991 and 1.2% in 1992.¹⁰⁰

Another major revision of the energy and carbon taxation regime took place in 1993 when industry, agriculture, forestry, and fishing businesses were granted generous tax privileges.¹⁰¹ These sectors were, and still are, completely exempt from paying the energy tax, and also pay a reduced CO₂ tax.¹⁰² Table 5 shows the structure of the energy and carbon tax system and how it developed over time. The total energy tax burden consists of the energy tax and the CO₂ tax, which is levied on light fuel oil consumed by households and the service sector. The last column of Table 5 demonstrates how the industry energy and CO₂ tax rates developed since 1990. During 1990 and 1992, industry faced the same tax burden as households. However, since 1993, industry has been exempted from the energy tax and only a fraction—twenty-one percent in 2007—of the general CO₂ tax.¹⁰³ The last column shows the effective tax burden on industry, while the first column reveals the total energy and carbon tax burden facing households and the service sector.

96. *See id.* (examining the introduction of the NO_x tax).

97. *See* SPECK, *supra* note 2.

98. *See* tables in the Appendix.

99. *Environmental Tax Reform in Member States*, *supra* note 29, at 48.

100. *Id.*

101. SPECK, *supra* note 2, at 194.

102. *Id.*

103. *Id.*

Table 5: Development of the energy and CO₂ tax rates levied on light fuel oil.¹⁰⁴

	Total energy and CO ₂ tax	Energy tax	CO ₂ tax	Energy and CO ₂ tax burden— industry
	€/1,000L	€/1,000L	€/1,000L	€/1,000L
1990	143.3	127.6	0	143.3
1991	168.5	72.2	96.3	168.5
1992	167.3	71.7	95.6	167.3
1993	160.1	59.2	100.9	25.2
1994	165.8	61.3	104.4	26.1
1995	167.1	61.8	105.2	26.3
1996	193.1	69.3	123.8	31.0
1997	197.0	75.6	121.4	30.4
1998	202.0	83.3	118.7	59.3
1999	202.7	83.6	119.1	59.6
2000	213.3	88.0	125.3	62.6
2001	239.3	74.3	165.0	57.8
2002	273.4	77.2	196.3	58.9
2003	317.2	78.9	238.3	59.6
2004	365.0	80.2	284.7	59.8
2005	360.3	79.2	281.1	59.0
2006	363.3	79.9	283.4	59.5
2007	369.0	81.1	287.9	60.5

When discussing the Swedish taxation regime, it is important to draw attention to how the electricity tax on industry developed.¹⁰⁵ The 1993 ETR completely exempted Swedish industry from the electricity tax. Later, in 2004, the industry's exemption status changed when a reduced electricity tax rate was set, corresponding with the minimum tax rate laid down in the 2003 Energy Taxation Directive discussed above. However, energy intensive industries are still eligible to receive a full exemption of the electricity tax if they participate in projects to increase their electrical efficiency, which has the same effect as the tax would have had.¹⁰⁶ This

104. See *Environmental Tax Reform in Member States*, *supra* note 29, at 79, tbl.A5-1 (regarding the overview of tax rates on light fuel oil—nominal versus effective).

105. Shown in Table A.3 in the Appendix.

106. See Council Directive 2003/96/EC, *supra* note 14, art. 15, at 56 (allowing reductions or exemptions for electricity produced from high-efficiency generators).

policy is consistent with the regulations of the 2003 Energy Taxation Directive.¹⁰⁷

In addition to the provision granting generous tax rebates, energy intensive companies are still eligible for a refund scheme if their CO₂ tax liability exceeds 0.8% of their sales value. This refund scheme has remained intact since its introduction in 1997.¹⁰⁸

The introduction of the CO₂ tax in 1991 was part of a major fiscal reform process primarily aimed at cutting high income taxes. The reduction in income taxes amounted to a loss equivalent to approximately 4.6% of the GDP in that year, which was partially offset by revenues equivalent to 1.2% of the GDP generated from the CO₂ and SO₂ taxes.¹⁰⁹

D. The United Kingdom

The U.K. energy tax structure is rather simple when compared to the schemes implemented in the Scandinavian countries. The U.K. scheme relies heavily on revenues generated by energy taxes levied on transport fuels. Unlike the Scandinavian countries, the U.K. does not have a general scheme of energy taxes for energy products, such as natural gas, coal, and electricity.

The U.K. government introduced a tax for all consumers in 1990, the Fossil Fuel Levy (FFL), which was imposed on the purchase of taxable electricity.¹¹⁰ The tax was designed as an *ad valorem*, similar to Germany's electricity taxation scheme of the early 1990s. Initially, the majority of the revenues raised by the FFL were used to subsidize nuclear power with only a small fraction earmarked to support renewable energy.¹¹¹ After 1998, the nuclear industry no longer received subsidies raised by the FFL. Instead, the FFL revenues were utilized to support renewable energy projects under the Non-Fossil Fuel Obligation. The levy peaked in 1992 at eleven percent of the end-user electricity price (exclusive value added tax) and was set to zero in 2003.¹¹² This zero percent rate is still in place and as a result, the FFL has not been abolished.¹¹³

107. *Id.*

108. *Environmental Tax Reform in Member States*, *supra* note 29, at 49; *see also Competitiveness and Exemptions*, *supra* note 25, at 376–77 (discussing the context in which this refund scheme was introduced).

109. *See Environmental Tax Reform in Member States*, *supra* note 29, at 47. (discussing the fiscal reform process in Sweden in 1991).

110. *See id.* at 49 (explaining the introduction of the FFL).

111. *Id.*

112. *Id.*

113. *Id.*

In April 2001, the U.K. government introduced a new economic instrument, the Climate Change Levy (CCL). It applied only to non-domestic energy use—commercial and industrial use—and exempted household use.¹¹⁴ Since 2001, the consumption of natural gas, electricity, and coal has been subject to the CCL and the consumption of LPG is subject to both the CCL and the existing energy tax.¹¹⁵ The revenues generated by the CCL are used for a tax shifting program, the ETR, in the U.K.¹¹⁶ Between 2001 and 2007, the CCL rates remained constant implying that the alterations in the rates presented in these tables are caused by variations in exchange rates.¹¹⁷

The U.K. approach regarding the grant of special tax provisions was drawn from the three previously analyzed EU member states, evidenced by the fact that tax provisions reducing the CCL rates are also part of the CCL. Energy intensive companies are eligible for an eighty percent tax discount if they agree to stringent energy efficiency improvement targets.¹¹⁸ These regulations have been introduced due to concerns over the loss of the U.K. industry's international competitiveness. The government's policy approach was to give conditional tax exemptions to energy intensive companies.¹¹⁹ The concept behind this approach is that companies benefit from reduced tax liability when they enter into legally binding Climate Change Agreements, requiring adoption of an energy saving reduction program.¹²⁰ In the U.K., the definition of energy intensive industries is crucial since only those industries deemed to be energy intensive are eligible for the CCL reduction. In contrast, German industries are eligible for special tax treatment based on statistical classification.¹²¹ The German approach must be challenged because the use of statistical categories as the

114. *Id.*

115. *Id.*

116. *See id.* at 49–50 (discussing three tax shifting programs that directly target businesses households).

117. POLICY NETWORK, BRIEFING PAPER: THE POLITICS OF CLIMATE CHANGE IN THE U.K. 4 (2008), http://www.policy-network.net/uploadedFiles/Events/Events/The_politics_of_climate_change_in_the_UK_briefing.pdf (discussing the flat rate of CCL taxes between 2001 and 2007).

118. *See* OECD Env't. Programme, *Working Paper: The United Kingdom Climate Change Levy: A Study in Political Economy 2* (discussing tax exemptions available to companies implementing energy savings programs).

119. *See id.* at 92 (offering conditional exemptions to energy-intensive industries as an approach to economic concerns generated by the CCL).

120. *See id.* (“Any sector within this legal ambit can then enter into a Climate Change Agreement (CCA) which requires them to adopt and implement an energy saving or carbon emission reduction program[]. The CCA is legally binding. In return, the sector will be exempt from eighty percent of the CCL.”).

121. *See Environmental Tax Reform in Member States, supra* note 29, at 50–51 (explaining the difference between U.K. and German selection process for special tax treatment).

basis for providing tax relief does not take into account the issue of energy intensity.

The introduction of the CCL generated small revenues (approximately 0.1% of the GDP) that were recycled back to U.K. industries via reduction in the rate of employers' social security contribution.¹²² This policy guarantees that the total tax burden remains the same while various industrial sectors are affected differently. For example, some sectors are benefitting from the recycling measures, in particular those which are labor-intensive as opposed to energy-intensive. Others are net losers, in that their net tax burden is higher than before the CCL was implemented.¹²³ The recycling mechanism adopted in the U.K. only affects industries, which is logical because only this sector is subject to CCL payments. In Germany, however, the ETR policies are levied on the energy consumption of the whole economy resulting in a reduction of employers' and employees' pension contribution.

SUMMARY AND CONCLUSION

This article analyzes the main features of the energy and carbon taxation regimes in four EU member states. This discussion can only be described as a starting point for such analysis as the national designs are complicated and complex. This article reveals some of the differences between the four countries, particularly whether they have implemented broad-based energy taxation schemes or if their energy taxation regime is only applicable to industry.

As discussed throughout the article, special tax provisions for industries are implemented widely in the four EU member states. However, tax provisions vary between the countries, making it difficult to provide an overview of effective tax rates that affect industries. Depending on the country and its particular industry-specific tax provisions, reduced tax rates either affect specific industrial sectors or the whole industry. Additionally, some countries—Germany and Sweden—have placed ceilings on the total energy tax burden for individual companies. However, all of these policies aim to protect the competitiveness of domestic industries, since energy and carbon taxes are often blamed for industrial relocation.¹²⁴

122. See OECD, *supra* note 118, ¶ 83 (“In the case of the CCL, recycling involves a reduction in employers' social security contributions . . .”).

123. See *id.* ¶ 86 (“While the CCL was designed as part of a revenue-neutral reform, this does not mean that each and every industry would find itself in a tax-neutral position.”).

124. For further discussion, see Mikael Andersen's article, also published in this volume.

The Scandinavian countries, Denmark and Sweden, have been the forerunners in implementing broad-based energy and carbon taxes. They are regularly described as high energy tax countries when assessing the standard rate, i.e., the energy and carbon rate which particular households are facing. Denmark and Sweden have also implemented wide-ranging tax provisions so that the energy and carbon tax rates faced by industries are only a fraction of what households have to pay. It is therefore necessary to distinguish between different types of energy consumers when applying the “high energy and carbon tax” label. Currently, the interest in the application of economic instruments has shifted away from environmental taxes—specifically energy and carbon taxes—more to the EU ETS at the EU energy and climate policy level, which started to be operational in the pilot phase from 2005 to 2007 inclusive and from 2008 to 2012 during the first commitment period of the Kyoto Protocol.¹²⁵

As highlighted above, the energy sector, as well as energy-intensive sectors are covered by the EU ETS. This is in contrast to the coverage of the 2003 Energy Taxation Directive, as it does not extend to all energy products consumed in both sectors. The Energy Taxation Directive does not apply to energy products used for purposes other than motor fuels and heating fuel.¹²⁶ For example, energy products used for chemical reduction and electrolytic and metallurgical processes and the ones used in mineralogical processes are not covered in the Energy Taxation Directive. Nevertheless, double regulations do exist, meaning that the consumption of energy products can be subject to energy and carbon taxes as well as covered by the EU ETS¹²⁷ resulting in calls by industries for a complete tax exemption of fuels, i.e., a zero level of taxation, covered by the EU ETS.¹²⁸ This discussion is still ongoing at the EU level as well as the national hampering of the further development of energy and carbon taxation regimes.¹²⁹

125. See Claudia Dias Soares, *Coordinating Energy Taxes With the EU Emission Trading System*, in 5 CRITICAL ISSUES IN ENVIRONMENTAL TAXATION, INTERNATIONAL AND COMPARATIVE PERSPECTIVES 209–10 (Nathalie J. Chlalfour et al. eds., 2008) (discussing the impacts of the EU ETS directive).

126. See *id.* at 211–12 (discussing the application of the EU ETS directive).

127. See Kai Schlegelmilch & Maïke Bunsé, *Ecological Tax Reform and Emissions Trading: Can They Work Together in Practice? An Empirical Analysis for Germany*, in 5 CRITICAL ISSUES IN ENVIRONMENTAL TAXATION, *supra* note 125, at 183, 197 (discussing the dual burden resulting from electricity tax and high electricity prices).

128. The Energy Taxation Directive allows the possibility of a zero level of taxation in Article 17.4. Council Directive, *supra* note 14.

129. See *Commission Green Paper on Market-based Instruments for Environment and Related Policy Purposes*, at 15, COM (2007) 140 final, (Mar. 28, 2007) (discussing the potential of market-based instruments in environmental policy as well as the interaction between energy taxation regimes).

APPENDIX¹³⁰

Table A.1: Development of the taxes levied on light fuel oil.

	Denmark	Germany	Germany (Manf. Industry)	Sweden	Sweden (Manf. Industry)	U.K.
	€/1000L	€/1000L	€/1000L	€/1000L	\$/1000L	€/1000L
1990	224.0	28.4	28.4	143.3	143.3	11.4
1991	222.5	39.0	39.0	168.5	168.5	12.7
1992	225.4	39.6	39.6	167.3	167.3	12.8
1993	231.8	41.2	41.2	160.1	25.2	13.3
1994	233.3	41.7	41.7	165.8	26.1	15.5
1995	240.2	42.7	42.7	167.1	26.3	20.2
1996	239.2	41.9	41.9	193.1	31.0	22.4
1997	235.2	40.7	40.7	197.0	30.4	28.5
1998	262.7	40.9	40.9	202.0	59.3	31.6
1999	264.9	61.4	45.0	202.7	59.6	39.0
2000	268.3	61.4	45.0	213.3	62.6	44.6
2001	275.1	61.4	45.0	239.3	57.8	44.1
2002	282.6	61.4	45.0	273.4	58.9	43.6
2003	282.6	61.4	53.2	317.2	59.6	51.3
2004	282.3	61.4	53.2	365.0	59.8	57.5
2005	281.8	61.4	53.2	360.3	59.0	76.4
2006	281.5	61.4	53.2	363.3	59.5	94.5
2007	281.9	61.4	45.0	369.0	60.5	135.8

Note: the standard tax rate payable is presented for the four EU member states, i.e., no special tax provisions are considered. In addition, the reduced rates for German and Swedish industries are shown.

and other market-based instruments, such as the EU ETS. The intention of the green paper was to generate a discussion about what role market-based instruments can and should play in European Community policies).

130. See *Environmental Tax Reform in Member States*, *supra* note 29, at 79 tbl.A5-1 (displaying an overview taxes rates on light fuel oil in EU member states).

Table A.2: Development of the taxes levied on natural gas.

	Denmark	Germany	Germany (manu- facturing industry)	Sweden	Sweden (industry)	U.K.
	€/1000m ³	€/1000m ³	€/1000m ³	€/1000m ³	€/1000m ³	€/1000m ³
1990	0	13.7	13.7	46.5	46.5	0
1991	0	19.0	19.0	94.9	94.9	0
1992	0	19.3	19.3	94.3	94.3	0
1993	0	20.1	20.1	93.7	18.6	0
1994	0	20.3	20.3	97.0	19.3	0
1995	0	20.8	20.8	97.7	19.4	0
1996	31.3	20.4	20.4	115.0	23.2	0
1997	193.8	19.9	19.9	115.2	22.7	0
1998	225.4	19.8	19.8	115.9	44.4	0
1999	227.3	37.7	23.5	116.3	44.6	0
2000	244.2	37.7	23.5	122.3	46.9	0
2001	292.5	37.7	23.5	147.7	43.3	26.1
2002	301.5	37.7	23.5	171.9	44.1	25.8
2003	301.5	59.6	43.9	204.0	44.6	23.5
2004	301.1	59.6	43.9	239.3	44.8	23.9
2005	300.6	59.6	43.9	236.2	44.2	23.8
2006	300.3	59.6	43.9	238.2	44.6	23.8
2007	300.6	59.6	35.8	241.8	45.3	24.4

Note: the standard tax rate is presented for the three EU member states (Denmark, Germany and Sweden), i.e., no special tax provisions are considered. In addition, the reduced rates for German and Swedish industries are shown. The situation in the U.K. is different as the rates of the climate change levy are reported. Discussed above, only industry is subject to this levy and households are exempt from these economic instruments.

Table A.3: Development of the taxes levied on electricity.

	Denmark (other purposes)	Germany (house- holds)	Germany (industry)	Sweden (house- holds)	Sweden (industry)	U.K. (CCL) (industry)
	€/MWh	€/MWh	€/MWh	€/MWh	€/MWh	€/MWh
1990	42.0	8.6	5.5	9.6	6.6	0
1991	41.7	8.6	5.4	9.6	6.7	0
1992	47.4	8.4	5.2	9.6	6.6	0
1993	48.7	8.8	5.3	9.3	0	0
1994	53.0	10.3	5.9	9.6	0	0
1995	58.7	10.6	6.0	9.6	0	0
1996	62.5	0	0	11.4	0	0
1997	66.8	0	0	13.1	0	0
1998	75.5	0	0	17.0	0	0
1999	78.1	10.2	2.0	17.1	0	0
2000	85.3	12.8	2.6	19.2	0	0
2001	87.4	15.3	3.1	19.6	0	6.9
2002	89.6	17.9	3.6	21.6	0	6.8
2003	89.6	20.5	12.3	24.9	0	6.2
2004	89.5	20.5	12.3	26.4	0.5	6.3
2005	89.4	20.5	12.3	27.4	0.5	6.3
2006	89.3	20.5	12.3	28.2	0.5	6.3
2007	89.4	20.5	12.3	28.6	0.5	6.4

Note: the standard tax rate is presented for the three EU member states (Denmark, Germany, and Sweden), i.e., no special tax provisions are considered. In addition, the reduced rates for German and Swedish industries are shown. The situation in the U.K. is different as the rates of the climate change levy are reported. Discussed above, only industry is subject to this levy and households are exempt from these economic instruments.

