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CARBON TAXATION IN EUROPE

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The subject of the study is the carbon tax legislations of European countries.
The purpose of the article is to identify the general consistent patterns of carbon taxation in a number of European countries: the United Kingdom, the Netherlands, Norway, France, Sweden and Switzerland.
The methodology of the research includes the analysis of the provisions of the carbon taxing legislation of these countries.
The main results, scope of application. The analysis shows that the structure of the carbon tax in European countries has differences, but the predominant form of taxation is an excise tax on fuel. In Sweden and Switzerland the excise rate is in direct proportion to the carbon content of the fuel, however in the UK, Norway and France excise rates are set more voluntary. Each country countries grant exemptions for specific fuel uses and industries that they deem essential to protect from the exceeding tax burden. In the Netherlands, Norway and France, carbon/energy taxation is applied in addition to the emissions trading system. In all these countries, this is motivated by the evaluation of the latter as insufficient to attain the objectives of diminishing CO_2 emissions. Based on the experience of these countries, there is no prevalent model for the arrangement of carbon / energy taxation. For instance, France imposes an energy tax as an excise tax, that is, a consumption tax. The UK levies excise taxes on the consumption of natural gas, LNG, coal and electricity, correlated to the amount of energy contained in these fuel products. Norway applies both an excise and an indirect output tax in the oil sector. In the Netherlands, a carbon tax is levied on actual CO_2 emissions (as far as they are accounted for under the EU ETS), but this tax only applies to ETS participants and only if the ETS prices are below the established level. Despite the high tax rates (up to 120 euros per ton of CO_2 in Sweden and Switzerland), the significance of the carbon tax for the economies of the considered countries is low due to both low energy consumption and the high proportion of carbon-neutral energy sources such as hydroelectric, nu- clear and biofuel.
Conclusions. An analysis of the provisions of the carbon taxing legislations of various European countries revealed that these countries adopt such carbon tax schemes that optimize their administrative feasibility, public acceptability, and economic impact mitigation for vital sectors. At the same time, in the majority of countries, the carbon tax is implemented as an excise tax on fuel.

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1. Introduction

On 14 July 2021, the European Commission published the final text of the Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism (CBAM). CBAM is a part of the European Union's (EU) Green Deal programme, which aims to achieve a carbon neutrality in the EU by 2050 as a part of its commitments under the Paris Climate Agreement.

As a part of the second stage of the CBAM, which is scheduled to start in 2026, only companies that have acquired special permits will be able to export goods covered by the CBAM to the EU. However, importers will be given the opportunity to deduct a part of the amount from their tax liability if they can prove that they have already paid this amount in the form of a carbon price in their country. At the same time, the text of the CBAM Law does not contain detailed characteristics of the carbon pricing system that the EU would consider sufficient to implement such offsets in practice. Also, at the moment, the EU has not issued any clarifying documents on this issue.

In this regard, an urgent task is to study the existing mechanisms of carbon taxation in the EU and other European countries, which, according to the European Commission, are making sufficient efforts to reduce the emissions. Based on the experience of taxing carbon emissions in these countries, it is possible to draw conclusions about a promising design of a carbon tax that complies with the EU standards and allows offset of tax amounts paid within the framework of the CBAM.

2. Purpose, hypothesis and research method

The purpose of this article is to identify general patterns of the carbon taxation in a number of European countries: the UK, the Netherlands, Norway, France, Sweden and Switzerland.

The hypothesis of the study is that in these countries the prevailing approach to taxing emissions is a carbon tax in the form of a fuel excise tax.

The study is carried out by analyzing the provisions of the tax legislation of these countries related to carbon dioxide (CO2) emissions.

3. Research results

3.1. The United Kingdom

The UK climate change levy (CCL) was announced in 1999 and has been levied since 2001 [1].

The background of the tax relates to the request for the possibility of introducing a tax on industrial and commercial use of energy, and the response to this request by Lord Marshall's report. Lord Marshall favored an energy tax over a carbon tax due to the difficulties in calculating the CO2 equivalent content of electricity generated using different fuels. He warned against levying the carbon tax on households for fear of fuel poverty, and also argued for the need for careful planning in the design of the tax to protect the competitiveness of British industry while maximizing environmental benefits [2].

By its nature, the CCL is an energy tax levied on industrial energy consumption rather than a carbon tax levied on energy suppliers [2]. By design, the CCL is effectively a single-stage sales tax [3].

When introducing the CCL, the UK Government intended not to cause an increase in the tax burden on business, so as compensation it was planned to reduce national insurance contributions by 0.5 percentage points [4]. The actual reduction was made by 0.3 percentage points [5].

The CCL taxes supplies of electricity, natural gas, liquefied natural gas and coal. The moment the tax liability arises is the moment the supplier issues an accounting document with the allocated CCL amount.

Formally, the payers of CCL are suppliers of fuel and electricity - electricity and gas supply companies, etc. But in fact, the amount of the fee is transferred to buyers of fuel and electricity. For

example, in a monthly business energy bill for electricity and gas, a commercial enterprise will be allocated the amount and CCL rate. The number of CCL taxpayers in 2019/2020 is 459, in 2020/2021 – 476, in 2021/2022 – 485.

Supplies of excisable goods to private users, non-profit and charitable entities are exempt from the CCL. There are other exemptions (for example, transportation by rail).

If an enterprise has entered into a Climate Change Agreement (CCA) with the government, it is provided with discounts to the basic CCL rates, which range from 77% to 93%. A discount to the basic CCL rate is provided in return for commitments to reduce CO2 emissions and increase energy efficiency. Specific figures for such obligations are agreed between industry associations and the UK Secretary of State [2].

There is an academic debate regarding the appropriateness of providing tax benefits under the CCA. Researchers initially noted significant reductions in CO2 emissions under the CCA when comparing baselines to actuals [6, 7]. More recent researchers, based on microdata analysis, note that the CCL leads to large reductions in energy intensity and energy consumption in industries that have not entered into a CCA [8], and find no justification for providing tax benefits under the CCA [9]. Using the theory of information asymmetry, researchers also note smaller CCA discounts at enterprises with higher levels of energy efficiency [10].

3.2. The Netherlands

In the Netherlands the carbon tax for industry (*CO_2-heffing industrie*) was introduced since 2021 [11, p. 4]. According to the government the introduction of the tax in addition to the European Union Emissions Trading System (*EU ETS*) is due to the insufficiency of the latter to achieve the goal of reducing annual CO_2 emissions in industry by 14,3 million tonnes by 2030.

The carbon tax for industry is regulated by the Environmental Taxes Act (*Wet belastingen op milieugrondslag*). The tax is in substance an add-on at the national level to the EU ETS [12, p. 1]. It applies to CO_2 emissions from industrial installations, waste incineration and to a number of specific processes that emit nitrous oxide (N_2O) (art. 71j par. 1 of the Act). The tax is levied on the basis of installations annual industrial load, which is indicated in industrial emissions report subject to submission by the operator of installation annually including for the EU ETS purposes (art. 71l par. 1, art. 71m par. 1).

The tax is paid by the persons who operate the relevant installations, i.e. their operators (art. 71k).

The tax rate is directly related to the price of industrial emissions per tonne of CO_2, while for EU ETS participants it is reduced by the price of emission allowance but not below zero (art. 71p par. 3). Thus, in 2021 with the tax rate of 30,48€ and the emission allowance price of 26,73€ the industrial installations participating in the EU ETS were subject to the carbon tax of 3,75€ per tonne of CO_2 emitted. It has been established that the tax rate will be increased by 10,87€ before indexation every year until 2031 (art. 71p par. 2).

In 2022 the tax rate was 41,75€, but the tax for Dutch EU ETS participants for that year is effectively zero because the emission allowance price was 60,78€, i.e. higher than the tax rate. Accordingly, if the situation in the emission allowances market develops in such a way that their price increases (in particular the supply of free allowances decreases faster than companies reduce emissions), the carbon tax for Dutch companies participating in the EU ETS will be technically zeroed out.

To give companies time to change processes a portion of the annual CO_2 emissions from industrial installations is exempt from tax; it is assumed that this portion will decrease annually. Tax exempt emissions take the form of so called dispensation rights (*dispensatierechten – DPR's*) with 1 DPR equals to the emission of 1 tonne of CO_2. Dispensation rights for each installation are calculated and accounted by the Emissions Authority (*Nederlandse Emissieautoriteit – NEa*) – the carbon tax administering body under the authority of the Minister of Finance (art. 71r par. 1).

The calculation of dispensation rights is generally done in the same way as the allocation of

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free emission allowances to installations under the EU ETS. It is not possible to keep the dispensation rights for use in the subsequent years, but it's allowed to transfer rights between installations including owned by different companies each year through the register created by NEa (*CO_2-heffingsregister – CheR*). Dispensation rights can only be sold to the portion that exceeds their number required to offset the CO_2 emissions of an industrial installation and a purchase of rights is always permitted, even if there are sufficient rights on the installations account to offset its emissions. When calculating the tax base of the carbon tax the annual industrial load of the installation is reduced by the number of dispensation rights (art. 71l, art. 71n par. 1). In addition dispensation rights can be used to credit and refund previously paid carbon tax[1].

Some general exemptions from the carbon tax for industry are established (art. 71i). In particular the tax doesn't apply to industrial installations that are directly or indirectly operated for cultivation of agricultural products in greenhouses and for central heating.

3.3. Norway

Norway has 2 main carbon taxes simultaneously: the carbon tax in the petroleum business (*CO_2-avgift i petroleumsvirksomheten*) is regulated by the Act on CO_2 emissions tax in petroleum business on the continental shelf (*Lov om avgift på utslipp av CO_2 i petroleumsvirksomhet på kontinentalsokkelen*), the carbon tax on mineral products (*CO_2-avgift på mineralske produkter*) – by the annual Parliamentary decision on excise taxes (*Stortingsvedtak om særavgifter*). Both taxes have been introduced since 1991, while the first targets on CO_2 emissions were adopted in the late 1980s [13, p. 34].

Carbon taxes are levied alongside the emissions trading system, it's due to two interrelated reasons [14, p. 33, 34]:

1) The government considers EU ETS allowances prices low to achieve national reduction emissions targets and sees carbon taxes as an additional incentive;

2) As a result of Norway's joining the EU ETS in 2008 oil and gas companies pay both the Norwegian carbon tax and for emission allowances. To prevent the level of payments from increasing the government adjusts the carbon tax rates taking into account the prices of allowances.

The carbon tax in the petroleum business is levied on petroleum which is burnt and natural gas which is discharged to air on installations used in connection with production and transportation of petroleum in Norwegian internal waters, sea territory and on the continental shelf (§ 2 of the Act).

The duty to pay the tax is jointly borne by the holders of a production/extraction license or a consent to develop and operate an installation for transportation and utilization of petroleum, applicable for installations where petroleum is burnt or natural gas is discharged. The operator of an installation is responsible for calculation, reporting and payment of the tax to the Petroleum Directorate (*Oljedirektoratet*) on behalf of all license/consent holders.

The tax rates in 2022 are set at 1,65 NOK per liter of petroleum fuel and per m^3 of natural gas, but 10,66 NOK – for gas discharged to air.

The relation between tax rates of the carbon tax in the petroleum business and the CO_2 emissions from the use of a product is not obvious, so this tax should be classified as an indirect output tax [14, p. 29].

The carbon tax on mineral products, which is in substance and form an excise tax, is levied on the domestic production and import of oil, petroleum fuels, natural gas and liquefied petroleum gas (section B, subsection I, § 1 of the Parliamentary decision on excise taxes for 2022).

The tax is due when: goods are removed from approved premises of registered companies; goods are imported and not placed in an approved premises; the registration is terminated. However transfer of goods between approved premises of one or more registered companies, if the companies are registered as taxpayers on the same products,

[1] https://www.emissieautoriteit.nl/onderwerpen/dispensatierechten

doesn't incur tax liabilities. When supplying goods to an unregistered buyer he must always be invoiced for the amount including tax, i.e. in fact the tax is paid by consumer.

Reduced tax rates are provided for example for oil used in domestic aviation and for gas used in greenhouse facilities.

The principles underlying the choice of climate policy instruments in Norway are built in the current legislation and they also guide the administering authorities in regulatory enforcement practice [14, p. 27–28]. Among them are the polluter pays principle, cost-effectiveness and governance efficiency, the use of cross-sectoral economic instruments [15, p. 154–155].

3.4. France

In France the new regulation for energy taxation is in force since 2022, however the changes affected the form rather than the substance of taxes.

Until 2022 the taxation of energy products, natural gas and coal was realized through the CO_2-dependent component of excise taxes on domestic consumption (*taxes intérieures de consommation*) introduced in 2014 and regulated by the Customs Code (*Code des douanes*). This component was also called the climate-energy contribution (*Contribution Climat-Énergie*) [16, p. 2].

From 2022 the carbon component of taxes on domestic consumption has been replaced by the excise on energy (*accise sur les énergies*) regulated by the new Goods and Services Taxation Code (*Code des impositions sur les biens et services*). This excise has the same regulation (section of the Code) with excises on alcohol and tobacco – except for special provisions for each product group. It is stated that the new regulation meats the objectives of simplifying and rationalizing of goods and services taxation and law codification[2].

The excise on energy applies to: products burned to produce mechanical or heat energy; electricity; products equated to energy products which include in particular products not listed as energy products but used as fuel, except for peat (art. L312-2, L312-6).

The list of products is very wide: from petroleum products to oil/fat based products for textile treatment (art. L312-3).

The excise is generally due on the production or import of excisable goods (art. L311-4). For coal, natural gas and electricity – when supplied to a consumer or consumed by a producer/importer (art. L312-13). Concurrently the consumption of electricity for own use by its producer is not recognized as a taxable event provided that he consumes all electricity produced, not exceeded the thresholds established by decree (art. L312-17).

The tax is transferred to the budget by the producer/importer (art. L311-26, L312-93).

The tax rates of the excise on energy are set for tax categories, determined by typical product (for example it's anthracite for coal). There are normal and reduced tariffs. The latter applies in particular to transport, agriculture and EU ETS participants.

Despite the stated plans the increase in energy tax rates has been suspended since 2019 for domestic political reasons (mass scale discontent with rising fuel prices, economic consequences of COVID-19 control) [17, p. 5].

Energy taxation in France is characterized by significant internal contradictions. Firstly, they are associated with the large-scale exemptions amounted to about €8,5 billion (only refunds – €5 billion) in 2017 compared to receipts of €6,4 billion. Moreover these tax expenditures tend to growth [18, p. 3–4]. Secondly, questions arise regarding social fairness: energy taxation in France is actually regressive, i.e. the burden turns out to be higher for poor households [19, p. 55–56]. It causes discussions on the tax design and uses of tax receipts [16, p. 1, 6–10; 20, p. 2–3].

3.5. Sweden

In Sweden, a carbon tax (*koldioxideskatt*) has been levied since 1991 on fossil fuels in proportion to their carbon content [21]. Taxation rules are

[2] https://www.actu-juridique.fr/breves/fiscalite/imposition-sur-les-biens-et-services-creation-dun-nouveau-code

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regulated under the Energy Tax Act (*Lag om skatt på energy*).

The tax is levied as an excise tax on fossil fuels that are used for heating or as motor fuel. The Swedish government sets the tax base, tax rates and exemptions (table).

Table

Carbon tax rates in Sweden, 2022

Type of fossil fuel	Units	Tax per unit, SEK
Gasoline	1 liter	2,61
Aviation gasoline	1 liter	2,61
Disel fuel	1000 liters	3 444
Heating oil	1 м^3	3 444
Gasoil	1 000 kg	3 624
Coal	1 000 kg	2 997
Natural gas	1 000 м^3	2 579

Carbon tax payers include importers, distributors, and large consumers of fossil fuels. For example, natural gas supplied to gas stations is already taxed at the stage of import or distribution, i.e. there is no tax to be collected from the gas station operator or the final consumer that purchasing the gas from the gas station. In fact, the tax amount is included in the price in whole or in part.

These rules simplify administration since the number of taxpayers is significantly limited. For example, in 2017 the number of registered tax payers was about 500. Nevertheless, tax regulation of these pollutants was important for the achieved reduction in their emissions from both stationary and mobile sources [23].

There is an exemption from carbon tax for several types of fuel use including metallurgical processes, maritime and railway transport, consumption of special equipment in agriculture and fisheries. Participants of the EU ETS are also exempt [24].

Although the carbon tax in Sweden does not apply to fossil fuels in the electricity production, this exemption is not very common since the Swedish electricity sector relies on nuclear and hydroelectric generation and produces few emissions [25].

Despite the high tax rates as well as ambitious plans for CO_2 reduction of the Swedish government [26], a relatively small impact on emissions reduction is shown for several reasons. Firstly, for a long time the carbon tax for industry was only 50% of the national wide level. Second, when the carbon tax was introduced, only a relatively small share (about 30%) of industry's energy supply relied on fossil fuels. Third, , the cost of energy is a small part of the total production and non-production costs for most industrial companies and, therefore, it is not so important for their production technology choice [27].

However, there is an evidence that the carbon tax, due to its fiscal nature, affects fuel demand three times more strongly than the price increasing only [28]. In addition, it has been shown for the EU that the countries applying taxes and other restrictions on CO_2 emission reduced the emission by 15% compared with countries without any restrictions or tax measures [29].

3.6. Switzerland

Climate policy of Switzerland is also based on carbon pricing approach that actually includes three ways affecting different economic agents and corresponding to very different carbon prices. First, carbon tax (*CO_2-Abgabe*) is levied for the population and small business. Second, the largest emitters participate in the Swiss emission trading scheme (CH EHS). Third, for energy-intensive industries at risk of the negative impact of a high carbon prices is applied “nonEHS” program when firms subject themselves to a set of specific abatement measures and emissions targets.

The Swiss climate policy is based on the Federal Law on the Reduction of CO_2 Emissions.

CO_2 levy in Switzerland was introduced in 2008 and is regulated by the CO_2 Law as well as the CO_2 Regulations.

Since Switzerland has not fossil fuel production, the carbon tax is collected by the Federal Customs Service either upon crossing the country's border or upon shipment from a duty free warehouse. However, the CO_2 levy is completely and clearly transferred to households and companies that consume fossil fuels for technological purposes

and heating. Art. 95 of the CO_2 Regulations requires sellers of fuel subject to tax to indicate the amount of CO_2 levy on invoices for the consumers' information.

The carbon tax rate in Switzerland is steadily increasing: in 2008 it was 12 CHF per 1 ton of CO_2, in 2010 it was 36 CHF, etc. From 1 January 2022 the tax rate has been increased up to 120 CHF if national carbon dioxide emission in 2020 will exceed 67% of 1990 level.

The carbon tax is levied in proportion to the carbon content of fossil fuels. For each specific fuel type, the tax amount is calculated in accordance with the tariffs specified in Annex 11 to the CO_2 Regulation.

One third of the carbon tax revenues in Switzerland (but not more than 450 million CHF per year) goes to finance green energy programs, and about 25 million CHF goes to a technology fund to support innovative companies. The remaining almost 2/3 of carbon tax revenues are distributed between the population (per capita) and enterprises (in proportion to their payroll). In 2022, each citizen received 88.2 CHF, and each employer returned 85.2 CHF for every 100,000 CHF (this amount is closely to average payroll per employee) of wage fund. This mechanism was supposed to ensure public support for the carbon taxation but researchers do not find the expected effect [30].

In order to protect the interests of energy-intensive industries, the Swiss government has introduced two preferential programs that allow enterprises to receive an exemption from CO_2 levy. The first incentive program known as "nonEHS" (i.e., outside the emission trade system) was introduced in 2008 and can be considered as a contract between the government and companies with the commitment to reduce emissions. If a company's emissions fall below its target in a given year, it can sell the difference (called "over-abatement") for a fixed fee. In contrast, in case of non-compliance a fine of 125 CHF is imposed for each excess ton of CO_2-equivalent emitted. Currently, this program includes about 1,300 enterprises [31].

The second exemption program is the Swiss emissions trading scheme (CH EHS) introduced in 2013 (Art. 17 of CO_2 Act). In 2020, after many years of political negotiations between Switzerland and the EU, the CH EHS has been integrated in the EU ETS [31].

High carbon tax rates combined with a favorable electricity consumption structure with 99% of the electricity generated from hydro and nuclear sources contribute to Switzerland achieving its national climate policy goals more quickly than neighboring countries [32].

4. Discussion

The considered examples show that the structure of the carbon tax in European countries varies, but in most cases the taxation has a form of an excise tax on fuel. Our observations correspond to the position of international institutions such as OECD, IMF and the World Bank allowed three main approaches to the design of a carbon tax: 1) taxation of the emissions directly, 2) an excise tax on fossil fuels in proportion to its carbon content, or 3) a tax on the production of carbon minerals.

While Sweden and Switzerland apply excise taxes linked to the carbon content of the fuel, the UK, Norway and France apply excise taxes with rates are set more arbitrarily. Each country provides exemptions for those types of fuels and those industries that is considered need to protect from increased tax burden.

In the Netherlands, Norway and France, carbon/energy taxation is applied in addition to the ETS. The necessity of additional measures is explained by the impossibility to achieve national emission targets with the cap-and-trade system only. Based on the experience of these countries, it is impossible to draw a conclusion about the prevailing approach for carbon / energy taxation. Thus, France levies an energy tax in the form of an excise tax, i.e. consumption tax. The UK has excise taxes on the consumption of gas, LNG, coal and electricity, linked to the amount of energy contained in these fuel products. Norway applies both an excise tax and an output tax in the oil business.

In the Netherlands, a carbon tax is levied on actual CO_2 emissions to the extent that they are accounted for in the EU ETS, but the tax applies only to participants of the ETS and only in cases of ETS

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prices are below a specified level.

Despite the high tax rates, up to 120 euros per ton of CO_2 in Sweden and Switzerland, the importance of the carbon tax for the economies of the considered countries is small due to both the low level of energy consumption and the high share of carbon-neutral energy sources such as hydroelectric power stations, nuclear power plants and biofuels.

5. Conclusions

An analysis of the legislative provisions of a number of European countries – the UK, the Netherlands, Norway, France, Sweden and Switzerland – regarding taxation of CO_2 emissions showed that these countries use carbon tax options that are most suitable for them in terms of tax administration, compliance, public perception, as well as minimizing negative consequences for key sectors of the economy. Moreover, in most countries the carbon tax has the form of an excise tax on fuel.

Taking into account the position of international institutions, in case of introduction a carbon tax in Russia with the EU environmental policy standards, two priority tax design approaches are possible. First, a carbon tax in the form of a fuel excise tax, as in most European countries. Secondly, given the raw materials orientation of Russian exports, the carbon tax can be structured in the form of a tax on the extraction of carbon containing minerals. The second approach is a symmetrical response to the CBAM mechanism, i.e. if the EU takes responsibility for the emissions of other countries associated with European consumption, then Russia can take responsibility (for example, in form of stamp duties) for the emissions associated with the European consumption of Russian exported minerals.

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