STUDY

Requested by the FISC Subcommittee

European Parliament

The effectiveness and distributional consequences of excess profit taxes or windfall taxes in light of the Commission's recommendation to Member States

Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies
Authors: Katharina NICOLAY, Daniela STEINBRENNER,
Nikolas WOELFING, Julia SPIX
PE 740.076 - March 2023

EN

The effectiveness and distributional consequences of excess profit taxes or windfall taxes in light of the Commission's recommendation to Member States

Abstract

This study analyses the design and functioning of windfall profit taxes for energy suppliers in the EU. Based on profit data from 2021, the estimated revenue gains from the solidarity contribution amount to 4.4 bn EUR for the selected sample of firms. Applying the revenue cap to power prices of 2022 suggests a tax revenue of 106 bn EUR. The actual tax revenue might diverge substantially from these numbers due to different energy price levels during the application period. The revenue can be redistributed according to the Member States' priorities to face hardship of the energy crisis. Despite efficiency in theory, investment distortions might arise if investors expect the tax instrument to be extended to other sectors.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Subcommittee on Tax Matters (FISC).

This document was requested by the European Parliament's Subcommittee on tax matters.

AUTHORS

Katharina NICOLAY, Professor of Business Taxation, Leibniz Centre for European Economic Research (ZEW), Mannheim and University of Mannheim.
Julia SPIX, Researcher, Leibniz Centre for European Economic Research (ZEW), Mannheim and University of Mannheim.
Daniela STEINBRENNER, Researcher, Leibniz Centre for European Economic Research (ZEW), Mannheim.
Nikolas WOELFING, Professor of Economics, Hochschule für Wirtschaft und Gesellschaft, Ludwigshafen and Researcher at the Mannheim Institute for Sustainable Energy Studies, University of Mannheim.

ADMINISTRATOR RESPONSIBLE

Jost ANGERER

EDITORIAL ASSISTANT

Roberto BIANCHINI

LINGUISTIC VERSIONS

Original: EN

ABOUT THE EDITOR

Policy departments provide in-house and external expertise to support European Parliament committees and other parliamentary bodies in shaping legislation and exercising democratic scrutiny over EU internal policies.

To contact the Policy Department or to subscribe for email alert updates, please write to:
Policy Department for Economic, Scientific and Quality of Life Policies
European Parliament
L-2929 - Luxembourg
Email: Poldep-Economy-Science@ep.europa.eu

Manuscript completed: February 2023
Date of publication: March 2023

This document is available on the internet at:
http://www.europarl.europa.eu/supporting-analyses

For citation purposes, the publication should be referenced as: Nicolay, K, Spix, J., Steinbrenner, D., and Woelfing, N., 2023, *The effectiveness and distributional consequences of excess profit taxes or windfall taxes in light of the Commission's recommendation to Member States*, publication for the Subcommittee on tax

matters, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CIT	Corporate Income Tax
BEPS	Base Erosion and Profit Shifting
DAP	Day-ahead price
EOM	Energy-only-market
EP	European Parliament
EU	European Union
GDP	Gross Domestic Product
LNG	Liquified Natural Gas
SME	Small- and medium-sized enterprise
TFEU	Treaty on the Functioning of the European Union
TSOs	Transmission System Operators
UK	United Kingdom
US	United States
VAT	Value Added Tax

EXECUTIVE SUMMARY

Background

The current energy crisis is in essence a shock in natural gas prices, which also affects electricity prices. Energy prices had been increasing in Europe for over a year before the Russian invasion of Ukraine in February 2022. With the economic recovery in 2021, global natural gas demand bounced back to pre-pandemic levels and outstripped supply. European natural gas prices increased further following the invasion of Ukraine, and surged after Russia began restricting its exports to the EU in June 2022. Since many power plants are gas-fired, the lower natural gas supply induced an increase in electricity prices. Wholesale electricity prices are not homogeneous across Member States and reflect different levels of dependency on natural gas imports and of electricity interconnection with neighbouring countries. This upsurge in energy prices has dramatically increased firms' input costs and households' energy expenditure.

For some companies, this surge of energy prices has come as an opportunity. Many energy firms have seen their profits and stock prices rise, earning rents from the increase in coal, oil and natural gas prices. This surge in prices lead to substantial windfall profits in the energy sector. Windfall profits' are profits that do not stem from direct and planned actions of a firm but from unanticipated external changes in the market conditions, changes that could not have been foreseen at the time when the initial investment decision had been taken. While the benefits mainly went to firms that extract fossil fuels, profits have also increased for oil refineries and not-gas-or-oil-fired electricity generators.

Meanwhile, countries face fiscal pressures to support post-COVID economic recovery and alleviate the strain on vulnerable households and firms arising from the high-energy prices. At the same time, there is the need to contain inflation, maintain energy security, and transition to renewable energy.

Against this background, the "Council Regulation on an emergency intervention to address high energy prices" includes the introduction of windfall profit taxes, i.e. a revenue cap on inframarginal technologies and a solidarity levy for the fossil fuel sector, in a unified framework, to avoid negative spillovers within the European energy market caused by uncoordinated national measures.

The revenue cap on inframarginal technologies caps market revenues at a minimum of 180 euros per MWh for specific electricity generators. Revenues exceeding the pre-defined threshold are considered as windfall profit and to be collected up to 90% in the majority of Member States.

The solidarity levy for the fossil fuel sector defines the windfall profit based on the average earnings method. Windfall profits are profits that exceed 120% of the reference period, defined as the average profit of 2018 to 2021, and are subject to a tax rate of at least 33%.

Aim

The aim of this study is to analyse the effectiveness of windfall profit taxes, in particular with respect to the Commission's recommendation to the Member States and to quantify the potential tax revenues. Moreover, the study briefly summarizes considerations on the distribution of collected revenues.

To this end, the study discusses design features of windfall profit taxes and summarizes historical experiences. Based on these insights, the study briefly presents the content of the Council Regulation and provides an overview on windfall profit taxes already implemented in the EU. For a better understanding, the study describes the basic functioning of power markets in the EU and discusses the role of coordination for windfall taxes as a policy tool. Furthermore, one aim of the study is to quantify the level of expected tax revenues. The quantification of the solidarity contribution is based on firm

level profits and reference profits from the ORBIS database. The quantification of the revenue cap uses data on day-ahead-prices and actual generation volumes by production type from the ENTSO-E Transparency Platform. Finally, the study provides a critical analysis of the foreseen measures with respect to its effectiveness of collecting revenue but also evaluating efficiency issues and redistribution potential.

Key Findings

Companies active in the oil and gas industry faced pronounced increases in profits in 2022. This is in line with the argumentation of the Council of the EU that these companies benefited from excess profits that do not correspond to any regular profit that they could have expected to obtain.

Within the framework of the Regulation, Member States have some leeway for implementing the revenue cap and the solidarity contribution. The comparison of national implementations shows that Member States indeed use their leeway. We observe that Member States frequently use their ability to implement a stricter **cap on market revenues** from inframarginals. In addition, several countries rely on different caps depending on the underlying technology used to generate electricity. Implementation is mostly dated to the 1st of December 2022. The application phase in most countries expands to the end of 2023. Most EU Member States follow the proposed average earnings method to define the tax base for the **solidarity contribution** for the fossil fuel sector. Still, we find some variation in the implemented tax bases. The applicable tax rate ranges from the minimum tax rate of 33% to 75% in Ireland. Largest variation exists in the respective application period of the solidarity contribution.

For our sample data, we find that the proposed solidarity contribution and the revenue cap fulfil the objective of collecting tax revenue. This revenue could -in a second step- be redistributed according to the Member States' priorities to face specific hardship of the energy crisis. Applying the selection criteria for the application of the solidarity contribution on the Orbis database results in a sample of 293 firms. Based on these firms' profits for 2021 and reference profits from 2017 to 2020, we compute an aggregate tax revenue for the solidarity surcharge. The quantification shows that, based on the data selection process and calculation assumptions described, the calculated tax revenue for the solidarity contribution amounts to 4.4 bn Euro. For the calculation of tax revenue from the revenue cap, we use (hourly) day-ahead prices per bidding zone covering the period 01.01.2022-31.12.2022. Descriptive analysis shows that in more than 200 days in the year 2022, the average day-ahead price exceeded the cap of 180 Euro. In total, according to our calculations and based on the assumptions described, the calculated tax revenue from the revenue cap amounts to 106 bn Euro. Almost half of the tax revenue from the revenue cap stems from taxing windfall profit taxes on revenues from lignite (50.5 bn EUR), followed by onshore wind (30.9 bn EUR), biomass (16.7 bn EUR), and offshore wind (7.9 bn EUR). It is important to note that these estimates need to be interpreted against the backdrop of the available sample period for this study. Actual tax revenues can turn out to be very different in light of the changing market conditions, i.e. decreasing power prices in the early months of 2023.

Introducing the solidarity contribution and the revenue cap imposes a double taxation since the respective tax base of both windfall taxes is already part of the tax base of the corporate income tax. Consequently, Member States are also in the absence of windfall profit taxes collecting taxes on these excess profits via the corporate income tax. Double taxation is problematic because it amplifies the asymmetric taxation of profits and losses thus reducing investment and (risky) innovation incentives.

In theory, taxes on economic rents are efficient since they do not reduce investment. The tax applies only to returns above what is required to invest. Yet, empirical evidence finds that historical windfall taxes affected investment. The US excess profits tax on domestic oil production of the 1980s significantly reduced production of affected oil wells.

One of the most problematic aspects of (temporary) windfall profit taxes is that firms might anticipate the introduction of these types of taxes in other sectors. When confidence into a reliable tax system is lost, uncertainty increases and affects future investments negatively.

In addition, excess profits can have an important signalling function. They highlight scarcity and provide an incentive for market entry or for expanding production capacities. Taxing excess profits reduces these incentives, which could be detrimental for the economy. In this vein, levying windfall profit taxes on renewables is not straightforward given the relevance of these energy sources for alleviating the crisis of energy supply and for facilitating decarbonisation.

The extent to which the imposition of the current proposed windfall taxes changes the behaviour determines both the deadweight loss of such taxes and the effectiveness of tax collection. Other than investment, behavioural responses could include avoiding the applicability of the tax (e.g. by splitting up activities or reallocating profits). This, however, is not possible with retroactive windfall profit taxes.

A cap on excess revenues of inframarginal technologies has the potential to be more precise compared to a general profit tax, as it can be targeted on exactly those additional revenues that are considered to generate excess profits. On the contrary, being quantity based, such levies risk distorting production decisions, thus giving rise to allocative inefficiencies. The risk is limited by the restriction on inframarginal capacities with sunk investments and by the still significant profits that are possible below the cap of 180 EUR/MWh. In markets with large producers, with a diverse generation portfolio, the cap might lower the cost to withhold inframarginal capacities to raise overall prices and earn higher profits on non-capped installations. Possible counter measures are (i) close scrutiny by competition authorities and (ii) to collect less than 100% of the excess revenues. From an allocative efficiency perspective, the cap included in the Regulation is not strategically neutral to market participants, but clearly superior to alternative measures that affect price formation overall, such as subsidies to marginal technologies or a departure from uniform pricing.

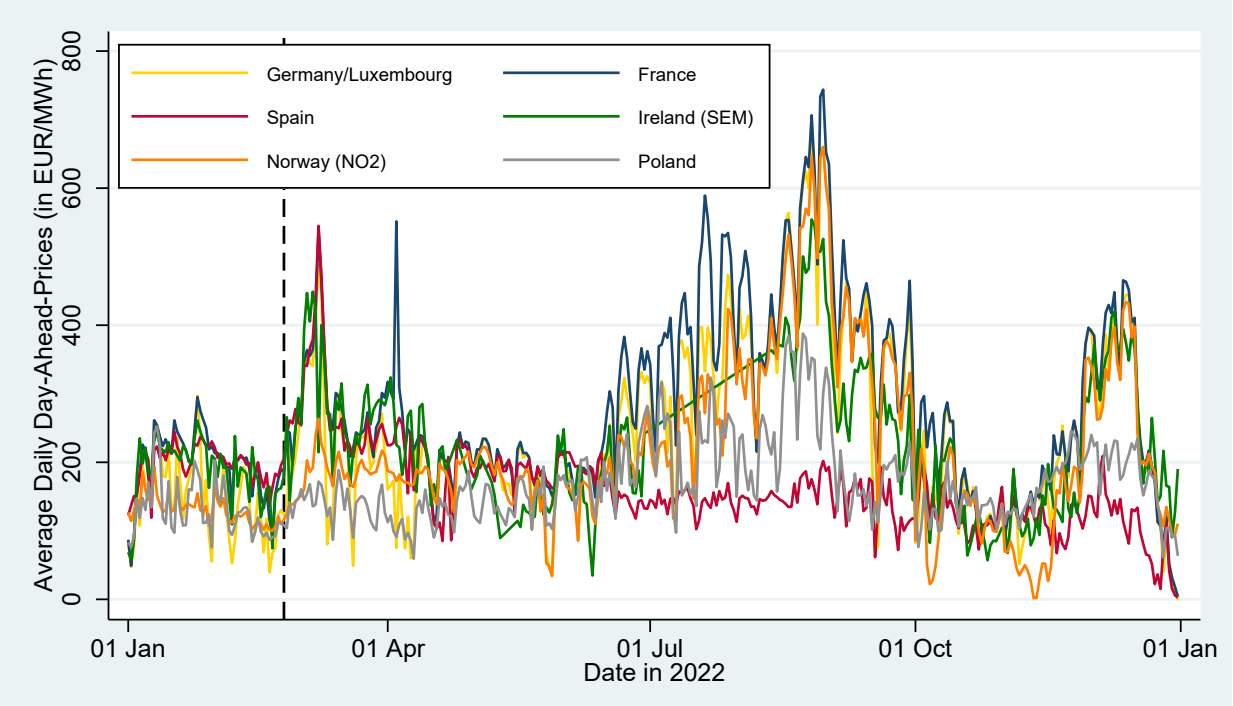
Since the Council Regulation is silent on the measure to distribute the collected revenue to vulnerable households or hard-hit firms, Member States will be able to tailor the measures according to their country specific needs. According to prior research, untargeted measures are a rather expensive way of reaching poor households. Moreover, incentives for reducing energy consumption should be restored as soon as possible

In view of global capital mobility, a coordinated introduction of excess profit taxes is preferable to reduce the scope for tax arbitrage. Moreover, uncoordinated measures of EU Member States risk inducing diverging outcomes in neighbouring markets that are not grounded in fundamentally different economic conditions. The market coupling mechanism (which in principle maximises overall allocative efficiency) would then result in trade flows and additional costs and windfall profits that are driven by the diverging regulatory framework.

1. INTRODUCTION

The current energy crisis is in essence a natural gas price shock, which also affects electricity prices. Energy prices had been increasing in Europe for over a year before the Russian invasion of Ukraine in February 2022. With the economic recovery in 2021, global natural gas demand bounced back to pre-pandemic levels and outstripped supply. Yet, the invasion of Ukraine by Russia in February 2022 and the ensuing war have brought further hardship to the global economy and to the economy of the European Union (EU) in particular. European natural gas prices first increased following the invasion of Ukraine, and surged after Russia began restricting its exports to the EU in June 2022. Since many power plants are gas-fired, the reduced fuel supply induced an increase in electricity prices. This joint upsurge in energy prices has dramatically increased firm's input costs and households' energy expenditure. As Figure 1 shows, the evolution of wholesale electricity prices varies across Member States. These differences are mainly due to the different levels of dependency on natural gas imports and of electricity interconnection with neighbouring countries[1].

Figure 1: Average daily day-ahead market prices in 2022 [in EUR/MWh]



Source: Authors' own elaboration.

Note: We take all energy price data from ENTSO-E Transparency Platform. The prices displayed are Average Daily DAPs. We calculate these prices by dividing the sum of all hourly DAPs per bidding zone on a certain day by 24 hours. The black, dashed line indicates the beginning of the Russian Invasion of Ukraine on February 24, 2022.

For some companies, however, the conflict has come as an opportunity. Many energy firms have seen their profits and stock prices rise, earning rents from the increase in coal, oil and natural gas prices[2]. The surge in fossil fuel prices has generated substantial windfall profits in the energy sector mainly to the benefit of fossil fuel extracting. In some cases, profits have increased also in the transformation layer of the energy value chain, such as for oil refineries and non-gas-fired electricity generators[3].

[1] Batlle et al. (2022), p. 3.

[2] Francois et al. (2022), p. 1.

[3] Baunsgaard, Vernon (2022), p. 1.

Meanwhile, countries face fiscal pressures to support the post-COVID economic recovery and alleviate the strain on vulnerable households and firms arising from high-energy prices. Looming over all of this is the need to contain inflation, maintain energy security, and transition to a decarbonised energy system[4]. Political interest in taxing windfall profits has therefore increased, as this could generate tax revenue and is perceived as a measure of fairness. Targeting the energy sector could be an effective instrument to re-channel exceptional profits generated by energy companies due to favourable external conditions, while generation costs have remained low for those companies[5]. Some countries have already introduced exceptional tax measures in response[6].

In order to prevent unilateral action, the "*Council Regulation on an emergency intervention to address high energy prices*" contains the framework for the introduction of a temporary revenue cap on 'inframarginal' electricity producers and a temporary solidarity contribution on excess profits generated from activities in the oil, gas, coal and refinery sectors. Both measures target windfall profits taxes generated by the sharp rise in energy prices. The collected tax revenue should help to finance measures in support of vulnerable households and energy-intensive firms. The objective of our study is to analyse, based on desk research, the effectiveness and distributional consequences of the windfall profit taxes in light of the Commission's recommendation to Member States.

The comparison of national implementations shows that Member States frequently use their ability to implement a stricter cap on market revenues from inframarginals. In addition, several countries rely on different caps depending on the underlying technology used to generate electricity. The application phase in most countries expands to the end of 2023. Most EU Member States follow the proposed average earnings method to define the tax base for the solidarity contribution for the fossil fuel sector. The applicable tax rate ranges from the minimum tax rate of 33% to 75% in Ireland. Largest variation exists in the respective application period of the solidarity contribution.

Based on profit data from 2021, the estimated revenue gains from the solidarity contribution amount to 4.4 bn EUR for the selected sample of firms. Applying the revenue cap to power prices of 2022 suggests a tax revenue of 106 bn EUR. Actual tax revenues can turn out to be very different in light of the changing market conditions such as decreasing energy prices in 2023. The revenue can be redistributed according to the Member States' priorities to face hardship of the energy crisis. Despite efficiency in theory, investment distortions might arise if investors expect the tax instrument to be extended to other sectors.

This study is structured as follows. Chapter 2 will give a short definition of windfall taxes and their measurement in the past. Building on this, Chapter 3 will describe and give an overview on the national implementation of the recommended cap on market revenues for inframarginals and the solidarity contribution for the fossil fuel sector. Chapter 4 will quantify the potential tax revenue of the proposed measures. Chapter 5 will critically asses the proposed measures also in light of other proposed fiscal instruments. Chapter 6 summarises the main findings.

[4] Baunsgaard, Vernon (2022), p. 1.

[5] KMPG (15. September 2022).

[6] Fuest (2022).

2. EXCESS/ WINDFALL PROFIT TAXES AND THEIR OBJECTIVE

KEY FINDINGS

'Windfall profits' are profits that do not stem from direct and planned actions of a firm but from unanticipated external changes in the market conditions, changes, that could not have been foreseen at the time when the initial investment decision had been taken.

In theory, taxes on economic rents are efficient since they do not reduce investment; the tax applies only to returns above what is required to invest. Yet, empirical evidence finds that historical windfall taxes affected investment. The extent to which the imposition of the current proposed windfall taxes changes the behaviour determines both the deadweight loss of such taxes and the effectiveness of tax collection.

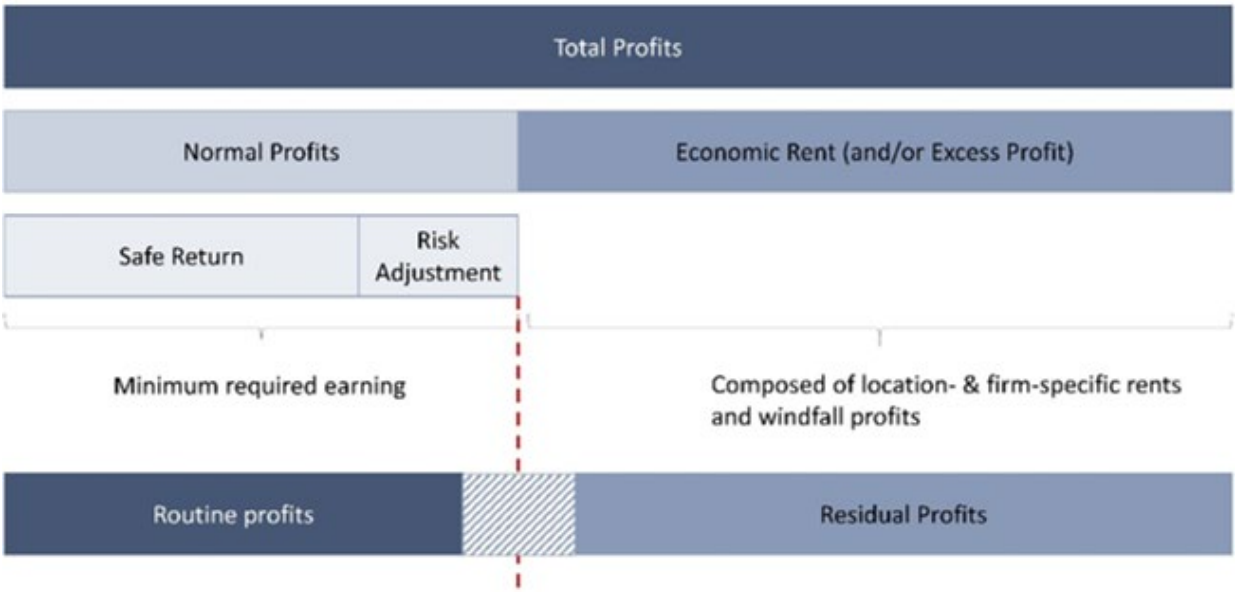
A windfall tax is typically a one-off, retrospective tax on a group of taxpayers that have received a windfall profit, based on the judgement by the government. As there is no clear-cut threshold between windfall profits and other firm- or location specific rents policymakers have relied on the average earnings method (refers to past profits as normal return) and the invested capital method (defines a notional return on capital) in the past to define windfall profits.

2.1. Definition of an Excess Profit Tax

In line with Hebous et al. (2022), we shortly provide a definition on the expression of profits used for this study. The existing literature determines total profits by a normal return that is the sum of the safe return and a risk premium, and an economic rent. This economic rent or excess profit derives from firm-specific characteristics such as monopolistic power or location-specific rents, i.e. natural resources[7]. In addition, the economic rent captures the so-called windfall profits deriving from an unanticipated event that resulted not from direct actions of the companies but rather because of external changes in market circumstances. An obvious example is a surge in commodity prices benefiting a project after an investment decision has been made. The fact that realized profits turn out to be higher than anticipated at the time of the initial investment decision comes down partly to luck. Conceptually, windfall profit can represent the entire economic rent (i.e. excess profit) or just a part of it, as the other part on top of the normal return is due to due to firm- or location-specific rents.

[7] Hebous et al. (2022), p. 7.

Figure 2: Breakdown of Total Profit



Source: based on Hebous et al. (2022).

It is generally agreed among economists that in terms of economic efficiency, taxes should lead to only minimal changes[8] in economic behaviour to avoid allocative inefficiencies, they should be seen to be 'fair', and they should have low collection costs[9]. In theory, taxes on economic rents are efficient since they do not reduce investment; the tax applies only to returns above what is required to invest. Simultaneously, they can raise substantial revenues in sectors with persistent rents. Thus, an efficient tax system capturing a portion of economic rents covers windfall profits as well[10]. Based on this argument, the latter should not jeopardize the incentives to produce and invest.

In practice, however, it is difficult to distinguish between windfall profits arising from commodity price surges and underlying economic rents due to firm- or location specific characteristics. Moreover, if businesses and investors anticipate such a tax (upon either initial introduction or reintroduction) substantial behavioural effects may occur[11]. The extent to which the imposition of these windfall taxes changes the behaviour determines both the deadweight loss of such taxes and the effectiveness of tax collection. Thus, if supply in the targeted sector is inelastic, governments could raise substantial revenue without the risk of a dead-weight loss; however, if businesses respond to the after-tax price, these windfall taxes will be far less efficient[12].

Empirical evidence confirms that excess profit taxes lead to behavioural responses. The finding of Thomas (1978) that the increase in the tax rate of the British Excess Profits Duty during World War One led to unexpectedly high tax revenues, as companies had expected abolition, illustrates the behavioural adjustment of companies. In the context of energy, Rao (2018) and Lazzari (2006), show that the US excess profits tax on domestic oil production of the 1980s significantly reduced production of affected oil wells. Rao (2018) stresses that permanent taxes on exhaustible resources change the opportunity cost of production identically for all future periods, while temporary taxes incentivize

8 Except for cases in which taxes fulfil a steering function and are explicitly designed in a way to induce desired behaviour.

9 Designing an optimal tax system means keeping tax distortions to a minimum, subject to restrictions introduced by the need to raise revenue and maintain an equitable tax burden, see Auerbach, A. J. & Hines Jr., J. R. (2002).

10 Baunsgaard & Vernon (2022), p. 2.

11 Kydland & Prescott (1977), p. 486.

12 Rao (2018), p. 269.

retiming (so-called Hotelling effect).

2.2. Design features of windfall profit taxes (and historical experiences)

Windfall profit taxes have been implemented before, including in the years immediately following World War II, led by the British introduction of a 100% excess profit tax on companies. Yet, these excess profit taxes are common in the context of energy markets resulting from short-term shocks to global supply chains, i.e. the US windfall profit taxes (1980-1988) on crude oil following the oil crisis of the 1970s, and the UK windfall profit tax on privatised utilities in 1997. Additional examples are the introduced windfall profit taxes on profits made in the banking sector, e.g.in 1982 in the UK or on bonuses from the banking sector in 2009 in France[13].

In general, the introduction of windfall profit taxes has two main objectives:

- the fiscal policy objective of covering exceptionally **high public financial needs**, e.g. to finance the war or expenditure measures to soften the consumer impact of higher costs of living due high inflation; and
- skimming profits from certain industries that were either generated because of or during the unexpected event, e.g. wars and were, therefore, perceived as **unfair**. These profits should then be redirected towards the wider society[14].

In line with the general objective to tax the part of the profit, which is partly due to luck, a windfall profit tax is typically a one-off, retrospective tax on a group of taxpayers that have received a windfall profit, based on the judgement by the government. Despite the fact, that there is no clear-cut threshold between windfall profits and other firm- or location specific rents, policymakers have relied on the following two methods to define windfall profits in the past[15]:

- the **average earning method** that refers to actual profits of the same company from a certain period before the unanticipated event; and
- the **invested capital method** that is based on a given notional return on a companys' assets.

In particular, the average earning method calculates the windfall profit as the total net income during the defined crisis period minus the average profits during the pre-specified period before the unanticipated event. Recent studies use this method to estimate the potential revenues of a windfall profit tax arising from the Covid-19 pandemic (see Oxfam (2020), Busby et al. (2021) and Dubinina et al. (2021)). However, when employing this method, the arbitrarily chosen comparison period has a relatively strong impact on the determination of the excess profit.

In contrast, the invested capital approach requires the government to define a normal rate of return on capital. Plehn (1920) highlights that this is an arbitrarily declared threshold by the government. In the past, the United States (US) implemented a nominal return on capital of 8% in 1918, while Great Britain set different normal rates for specific businesses in the 1920s to capture industry specific risks.

Dubinina et al. (2021) argue that there are several reasons that are in favour of the average earnings method, among others the easier implementation, as all required parameters are available, i.e. corporations regularly declare their profits and losses. In addition, corporations have less scope to

[13] See Hebous et al. (2022) for a review of past windfall profit taxes.

[14] In particular, the discussion on the perception of unfair profits could partly explain the historically extraordinary high tax rates of up to 95% for windfall profits, see Deutscher Bundestag (2021).

[15] Often governments relied on a hybrid version to define windfall taxes by assessing the windfall, e.g. the British and New Zealand war profit taxes, see Vosslamber (2019), p. 83.

manipulate the parameters (only profit/losses and not also capital)[16]. Yet, both approaches suffer from the risk of profit shifting, as both refer to taxable profits defined under national tax law.

The timing of an excess profit tax is an important consideration. If, for example, the government announced today that it would be applying the tax at some point in the future, then companies could change their behaviour and so reduce or negate the economic efficiency benefits of an excess profit tax. Thus, a one-off windfall profit tax that is based on past behaviour and that is introduced in response to an unforeseen external event is more economically efficient than an increase in the general corporate tax rate after the unforeseen event. Taking for given that it will be a one-off tax, a well-designed retrospective windfall profit tax is relatively easy to impose on businesses, easy for businesses to comply with, and hard to avoid as investment decisions have already been made. This results in relatively predictable tax revenues.

Francois et al. (2022) propose an alternative mechanism to redistribute windfall profits by taxing the rise in the stock market capitalization of the respective industry, which is defined to make windfall profits. Considering the increase in the stock market capitalization as a tax base reduces the risk of profit shifting activities of multinational enterprises to avoid the windfall profit tax. The authors argue that their proposal has two main advantages relative to standard excess profit taxes. This mechanism is easier to enforce as stock market capitalizations are observable and hard to manipulate. In addition, it could easily capture all rents earned by publicly traded companies. Assuming that markets correctly price in the windfall profit tax, risks of double taxation are limited as the valuation of companies hit by the windfall profit tax should decrease and thus the proposed tax base. Therefore, the authors see their proposal as an additional instrument to existing windfall profit taxes based on corporate profits (i.e. a minimum effective windfall profit tax ensuring that companies in specific sectors pay a minimum amount of additional tax as long as their stock price rose, even if they shifted their profits to a third country). To cover not only companies headquartered in the EU, the authors propose to rely on an apportionment based on the fraction of global sales made in the EU. Yet, there remain liquidity concerns as the tax refers to market capitalization and not current profits[17].

[16] Dubinina et al. (2021), p. 8.

[17] Francois et al. (2022), p. 7.

3. EU PROPOSAL FOR EXCESS PROFIT TAX

KEY FINDINGS

Companies active in the oil and gas industry faced pronounced increases in profits in 2022. This is in line with the argumentation of the Council of the EU that these companies benefited from excess profits that do not correspond to any regular profit that they could have expected to obtain.

Within the proposed framework of the regulations, Member States have some leeway for implementing the revenue cap and the solidarity contribution. The comparison of national implementations shows that Member States indeed use their leeway.

We observe that Member States frequently use their ability to implement a stricter **cap on market revenues** from inframarginals. In addition, several countries rely on different caps depending on the underlying technology used to generate electricity. Implementation is mostly dated to the 1st of December 2022. The application phase in most countries expands to the end of 2023.

Most EU Member States follow the proposed average earnings method to define the tax base for the **solidarity contribution** for the fossil fuel sector. Still, we find some variation in the implemented tax bases. The applicable tax rate ranges from the minimum tax rate of 33% to 75% in Ireland. Largest variation exists in the respective application period of the solidarity contribution.

3.1. Economic Background of the Power Sector

3.1.1. Electricity as a Commodity on the Internal Market

Wholesale prices for electric power have surged after the Russian invasion in Ukraine and in conjunction with unexpected capacity downtimes in several EU Member States. Electricity is produced from a diverse set of technologies and not all installations have been subject to cost increases comparable to those of natural gas fired plants. Thus, operators of less-affected plants have made unexpectedly large financial gains over the past months. In essence, these gains are structurally comparable to the gains of i.e. fossil fuel producing and refining companies who have seen their selling prices rise while not facing comparable increases in production costs. Nevertheless, the power market has some specific design features that are quickly blamed for excess profits of so-called "inframarginal" plants[18]. The very same characteristics, however, also allow for very specific measures to skim-off excess returns from power producers that have not experienced dramatic cost increases like the one proposed by the Council. The following paragraphs briefly introduce the industry structure and corresponding markets before moving on to the explanation the functioning of the market revenue cap.

Electricity is traded as a commodity, similar to copper, oil and grain. However, the instantaneous nature of the physical phenomenon gives rise to more dimensions of scarcity that need to be addressed. Important terms for understanding electricity as a commodity are (i) "power", measured in Watt, giving the rate at which energy is flowing in a specific moment, (ii) "capacity", the electric power that a unit can provide at its maximum, and (iii) "electric energy", measured in Watt hours, which results from having power over a certain period. Different markets exist for different types of services, which jointly form the electricity industry.

The most prominent electricity markets are those for the delivery of electric energy, the so-called "energy-only-market" (EOM). The traded good is specified by the time and the location of delivery. The

[18] See ACER (2022a), for a thorough discussion on these issues.

value of electric energy therefore very much depends on the following three aspects of its provision or consumption[19]:

- **Location**: Transmission of electric energy is capacity constraint with the risk of cascading failures when flows exceed these limits. Thus, the value of electricity varies over space.
- **Time**: Storage of electric energy is scarce and costly, so the value of electricity depends on the time of provision.
- **Flexibility**: In light of the previous two points, it is evident that the ability to change the generation or consumption of electric energy on short notice has a value on its own to prevent imbalances that lead to cascading failures and an overall blackout.

The current market design is the result of 30 years of experience with a decentralised power sector. It addresses several, yet not all of the relevant scarcities of electric energy, generation and transmission capacity, and flexibility.

For location, the European internal market is split into a number of "bidding zones" (see Figure 3). Wholesale prices are the same within each bidding zone, but can vary between zones. Price differences can occur when there is a lack of inter-connector capacities to allow for sufficient cross-border trade[20]. Imbalances or bottlenecks within a bidding zone, on the contrary, are not reflected in corresponding price differentials and thus need to be addressed by counteracting measures of the transmission system operators (TSOs).

Figure 3: Bidding zones in the European Economic Area

Source: ACER (2022b).

[19] See i.e. https://fsr.eui.eu/electricity-markets-in-the-eu/ (last access 14th February 2023) for a slightly more detailed, yet accessible explanation of these dimensions and the different layers of electricity markets.

[20] For further details, see https://www.entsoe.eu/network_codes/cacm/implementation/sdac/.

For the coordination of generation and consumption over **time**, there are multiple layers of markets for the delivery of electric energy at a specific moment in the future. Table 1 illustrates the sequence of markets in power wholesale. Trading starts years ahead with "electricity futures" or "forward" contracts. One day ahead of delivery, there is a "day-ahead" auction that provides the possibility to trade the constant delivery of electric power for separate hours of the following day. After the day-ahead auction different forms of intraday trading follow that allow market participants to adjust their net-positions to latest changes in generation and consumption schedules. Parallel (at least partly) to the intraday market, TSOs hold auctions to procure balancing reserve capacities that are activated in case of imbalances on the grid due to unexpected events or significant deviations from the predetermined schedules. All of these latter markets (from the day-ahead auction onward) implicitly or explicitly provide a remuneration for **flexibility**.

Table 1: Sequence of markets in power wholesale

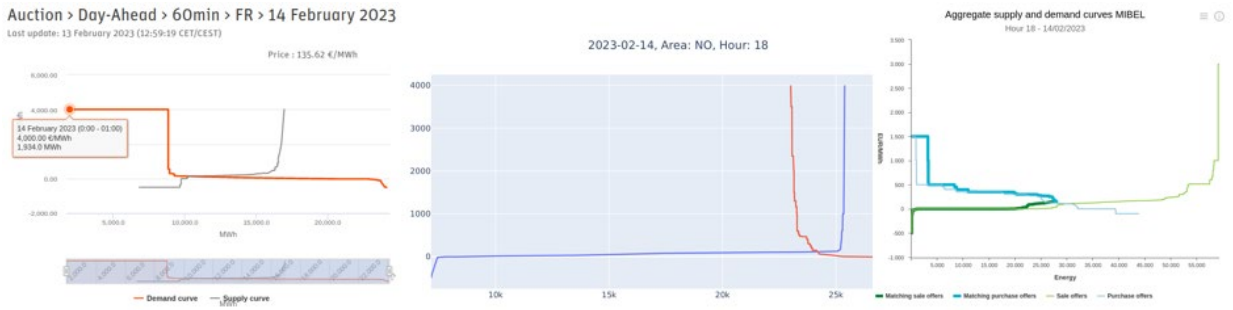
Time to delivery (underlying delivery period)	Markets	Settlement, delivery
Years, quarter, months, weeks, ahead (peak and baseload)	Exchange based futures Bilataral forward trading	Financial settlement or physical energy delivery
Day-ahead (hourly or half-hourly slots)	**Exchange based auction**	**Physical delivery, energy**
Intraday auction & continuous trading	Mainly exchange based	Physical delivery, energy
At delivery, instantaneous to 60 min.	TSO Reserve capacity auction	Physical capacity and energy

Source: Authors' own elaboration.

In terms of **trading volume**, forwards and future contracts are the most important product. However, they are settled at maturity against the day-ahead auction. A future contract is settled financially such that the buyer of the contract can buy the corresponding energy on the day-ahead market and is entirely hedged against the price risk. A physical forward contract transforms at the time of maturity in the delivery of electric power, just as if the buyer of the contract would have bought the same amount of energy on the day-ahead market. The day-ahead auction thus serves as the underlying for the larger forward markets. While having lower trading volumes, it clearly provides the economically most important price signal for the entire market.

Price formation in the day-ahead auction depends on the physical situation in the system. It is the first market exclusively for market participants that are actually interested to physically demand or supply electric energy. Every participant is required to submit a supply or demand schedule that consist of several price-quantity pairs, indicating the amount of electric energy the participant is willing to buy or to sell at the indicated price. Such bids can be amended by constraints on production or consumption schedules across different hours. The auctioneer then aggregates supply and demand schedules and solves for the market-clearing price for every hour. Figure 4 illustrates this principle for the Scandinavian, the Central-European, and the Iberian power exchanges. As usual for most markets of homogenous goods, all producers receive the same price, independent of their own cost. In auction design, such a setting is referred to as a "sealed-bid multi-unit uniform price auction".

Figure 4: Illustration of supply and demand schedules for France, the Northern Countries, and the Iberian Peninsula



Source: EPEXSpot, Nordpool, OMIE, retrieved online February 2023.

3.1.2. Marginal Pricing, Allocative Efficiency and the Merit Order

Auctions are optimally designed when they implement market rules before trading takes place, which ensure allocative efficiency ex-post. Allocative efficiency on the supply side is achieved, when production costs are minimised, not only within an individual firm but also across firms in the aggregate. Allocative efficiency on the demand side ensures that consumers are served in the order of their appreciation (typically: willingness-to-pay) for the product. Overall economic efficiency requires – on top of efficient production and consumption – an output level such that no consumer has a willingness-to-pay for another unit exceeding the marginal cost of producing this additional unit.

For power generation, short-run supply side efficiency is achieved when power plants are dispatched according to the so-called "merit-order", meaning that the available generation capacities are called into service in increasing order of their marginal cost. The costliest plant that is still required to clear the market is the so-called "marginal plant" (see e.g. Wolak, 2021). If this most costly plant is offered at a price that just allows to break even, the overall market price is equivalent to the marginal cost of the marginal plant, which is the relevant price signal for an efficient coordination of supply and demand. An efficient power market design therefore has to incentivise a dispatch of power plants across firms strictly according to the system's merit order, and should ideally provide price signals that reveal the marginal cost of the marginal plant.

Sealed-bid uniform price auctions with many suppliers typically give strong incentives to offer power generation according to the merit order. The price bid of the most expensive plant that is still needed to cover demand is paid to all producers with accepted bids. Plants with low marginal costs thus have an incentive to bid correspondingly low prices to ensure that they are in business, still earning the higher price of the more expensive marginal plant. Unfortunately, this argument does not necessarily hold true for oligopolies. A firm, owning a significant share of the capacity needed to cover demand might have incentives to withhold capacities, risking to lose a part of its potential sales but increasing revenue for those plants that are still in the market. Isolated short-run power markets are often plagued by these issues (see e.g. Green and Newbery, 1992), but liquid and competitive forward markets provide strong counter-incentives. When generators sell important parts of their generation forward (which is empirically very much the case for the EU markets), they have significant negative financial exposure to the spot price once the date of delivery approaches, limiting their appetite to exert market power. In summary, forward trading induces generators to bid more competitively, thus closer to their actual costs, in the day-ahead auction, thereby minimising the potential for distortions due to capacity withholding (see e.g. Newbery, 1998, Green, 1999, Wolak, 2007 amongst many others). The increased competitiveness due to forward markets also implies more pronounced and thus truthful cost

pass-through (see i.e. for emission allowances: Fabra and Reguant, 2013, Hintermann, 2016).

The dominating design feature of the EU internal market is the principle of sealed bid uniform price auctions on the short-run energy only market, which is predated by a long period of forward trading. In the recent discussion on power market design, this has sometimes been put less accurate as "merit-order pricing". This specific feature: uniform pricing with pronounced cost pass-through is also at the root of the enormously increased returns of power producers when natural gas prices spiked after the Russian invasion in Ukraine. Having flexible, yet expensive natural gas fired power plants often at the margin, their high marginal costs determine the market price for many hours throughout the year. While these very high returns might be necessary for gas fired plants to stay online, they translate into enormous windfall profits for those power plants that rank earlier in the merit order, the so-called "inframarginal plants"[21]. The market revenue cap that the council agreed upon seeks to skim-off a significant share of such windfall profits from generation technologies that can reasonably be considered to be inframarginal.

3.1.3. The Internal Market and the Need for Coordination in Times of Crisis

Over the past 20 years there has been proceeding liberalisation of national electricity markets across Europe and their integration into a single European market, the EU's Internal Electricity Market. Within this internal market, a large variety of companies organise the production, trading, marketing, transmission and supply of electricity. The dominating design feature of the EU internal market is the principle of sealed bid uniform price auctions on the short-run energy only market, which is predated by a long period of forward trading, just as described in the previous paragraphs. When competition works and firms sell the major part of their output forward, price formation can be approximated by the merit-order, which is why the current price-formation mechanism has sometimes been put less accurate as "merit-order pricing". This specific feature: uniform pricing with pronounced cost pass-through is also at the root of the enormously increased returns of power producers when natural gas prices spiked after the Russian invasion in Ukraine. Having flexible, yet expensive natural gas fired power plants often at the margin, their high marginal costs determine the market price for many hours throughout the year. Whereas these very high returns might be necessary for gas fired plants to stay online, they translate into enormous windfall profits for those power plants that rank earlier in the merit order, the so-called "inframarginal plants"[22]. The Council agreed upon a market revenue cap that the seeks to skim-off a significant share of windfall profits from generation technologies that can reasonably be considered to be inframarginal. While a more detailed discussion of the proposal is reserved for the next section, a note is required already at this point on the need for coordination of such revenue caps.

Cross-border flows of electricity are efficiently managed for the largest part of the internal market by a "market coupling" algorithm. All producers and consumers bid solely for electricity within the market where they are located. In case of price differentials between neighbouring bidding zones, the auctioneers at the power exchanges include bids for cross border trade into their order books until either (i) both markets clear at the same price, or (ii) the implied power flow from the lower price market to the higher price market is exhausting the physical interconnector capacities. This ensures a highly efficient use of the given interconnector capacities all across Europe. It becomes clear now that differential price or revenue caps between neighbouring markets has an enormous potential to mis-direct power flows where low cost capacities but capped capacities in one market are substituted by high-cost but uncapped capacities in a neighbouring market. ACER therefore concludes, that the

[21] European Commission (2022), p. 10 (23).

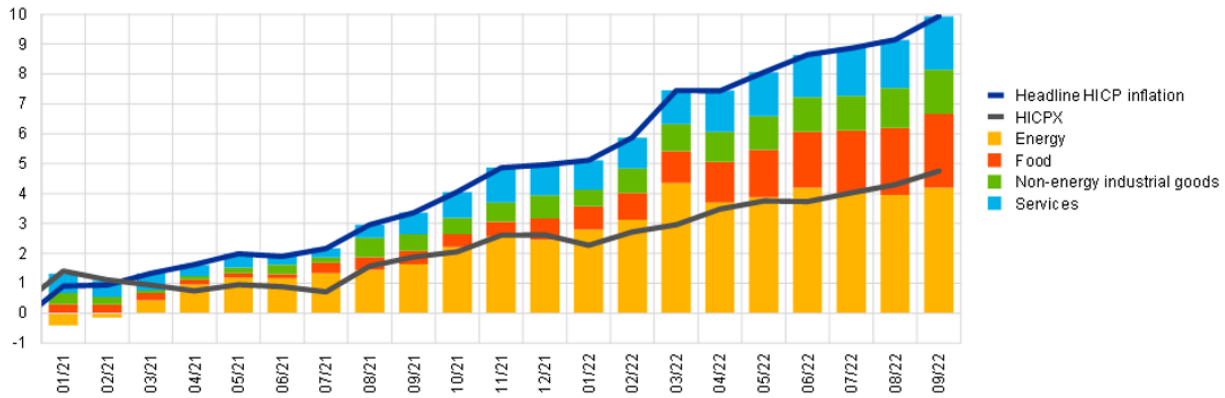
[22] European Commission (2022), p. 10 (23).

alignment and coordination of national policies and rules is key to ensure competitive prices, security of supply and decarbonisation[23]. Heusaff et al. (2022) stress the need for a joint European solution. Otherwise, several uncoordinated national measures could create uneven conditions for companies and undermine the integrity of the EU internal market for electricity.

3.1.4. Impacts on General Economy and Distributive Effects

The stark increase in energy prices is substantially contributing to general inflation[24] in the euro area, reduced purchasing power households and industry competiveness. Ultimately slowing down economic growth in the EU. Furthermore, rising energy prices and the Russian invasion of the Ukraine as well as droughts led to increasing food prices, which further accelerates inflation (see Figure 5 for a detailed composition of headline inflation).

Figure 5: Headline inflation and its main components as of September 2022 (annual percentage changes, percentage point contribution)



Source: European Central Bank (2022).

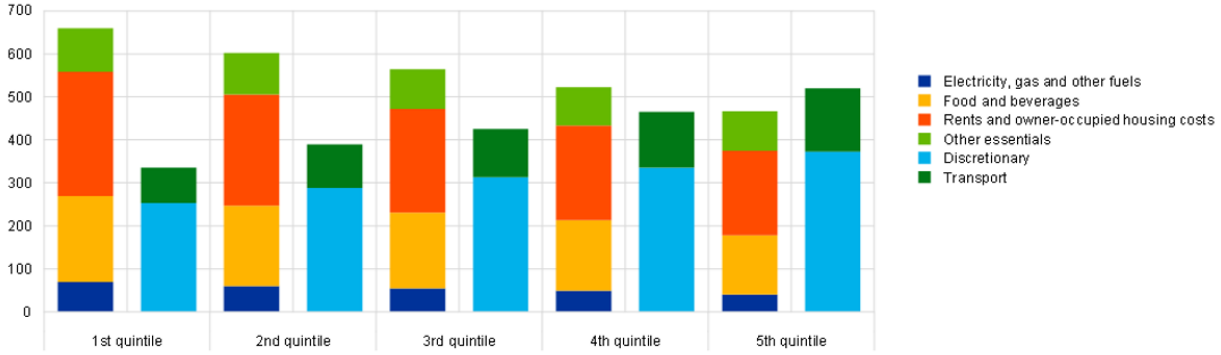
The increase (even if only temporarily) in both main drivers is critical and could lead to severe distributional effects for many reasons. Rising inflation hits low-income households usually harder, as they lack savings[25] and face liquidity constraints to smooth their consumption over time. In addition, they are more vulnerable to the current price increases, as they spend proportionally more of their total consumption expenditure on essentials such as food, electricity, natural gas and heating (see Figure 6).

[23] ACER (2022a), p. 18.

[24] We refer to the Headline HICP inflation.

[25] Data from the 2017 wave of the Household Finance and Consumption Survey (HFCS) show that households at the bottom of the income distribution have the lowest median value of liquid financial assets, whereas households in the top income percentiles have the highest. In addition, the savings they do have are often held in cash or in very low interest rate bank accounts that are not shielded from inflation (while richer segments of the population often hold stocks or inflation-linked bonds, for instance).

Figure 6: Euro area consumption baskets by income quintile as of 2015
(share of total expenditure, scaled to 1'000)



Source: European Central Bank (2022).

With rising prices on energy and food low-income households are forced to further increase the share of their total expenditure on essentials (e.g. to heat their home, for commuting), and thus inflation-driven inequality between low- and high income households could increase[26]. Another reason for distributional effects could be the lower bargaining power of low-income/low-skilled workers that can lead to lower real wages if inflation outpaces pay rises. Thus, low-income households have in general a lower capacity to absorb sharp, inflation-driven increases in living costs.

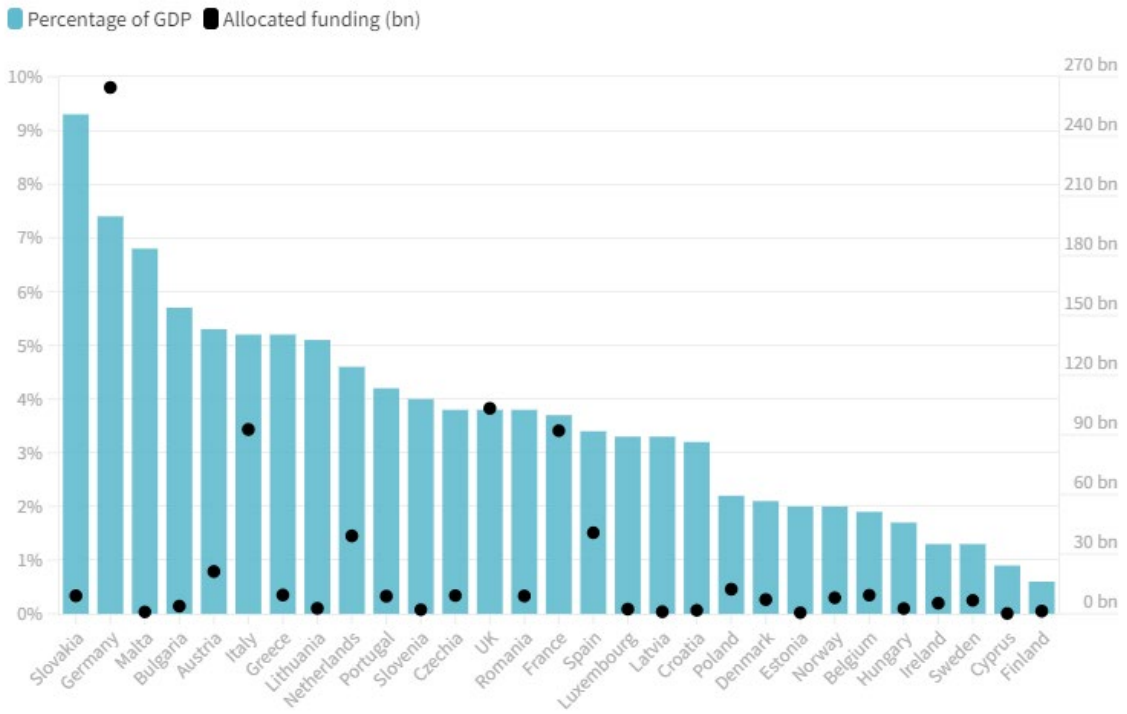
3.2. Key Elements of the Regulation Proposing Windfall Profit Taxes

3.2.1. The Council Regulation on an Emergency Intervention to Address High Energy Prices

The current energy crisis and the disruption of Russian gas supplies affects all Member States negatively, albeit to a different extent. Still, all Member States can contribute to limiting the economic harm caused by such disruption by appropriate demand reduction measures. However, not all of them can support consumers financially to the same extent due to limited financial resources (see Figure 7); while at the same time, some electricity generators may continue enjoying significant surplus revenues.

[26] Inflation inequality (the fact that inflation is different for low- and high-income households) can evolve for two reasons. First, changes in the inflation rates of particular consumption goods can drive inflation inequality, given that these goods have different weights in the consumption baskets of different groups. Second, behavioural changes in reaction to rising prices might differ from one group to another. For instance, if low-income households have a harder time smoothing their consumption given rising energy prices, the relative importance of energy in total expenditure will rise faster for low-income households, increasing inflation inequality.

Figure 7: Government funding to shield households and firms from the energy crisis as of September 2021 until January 2023 (% GDP)



Source: Sgaravatti et al. (2023).

Note: The blue bars refer to the percentage of GDP. The black dots refer to the allocated funding in bn EUR. Bruegel only includes measures that are provisional and motivated by the energy crisis while they exclude pre-existing ones. Estimated numbers include funding earmarked but not allocated.

The "Council Regulation on an emergency intervention to address high energy prices"[27] which was adopted on 30 September 2022, therefore, proposed the introduction of windfall profit taxes - the so-called revenue cap on inframarginal technologies and a solidarity contribution for the fossil fuel sector - based on Article 122 (1) of the Treaty on the Functioning of the European Union (TFEU)[28]. Article 122 (1) TFEU states:

"*Without prejudice to any other procedures provided for in the Treaties, the Council, on a proposal from the Commission, may decide, in a spirit of solidarity between Member States, upon the measures appropriate to the economic situation, in particular if severe difficulties arise in the supply of certain products, notably in the area of energy*."

In 2022, Member States faced severe disruptions of natural gas supplies, and reduced availability of certain power plants due to maintenance outages or droughts, leading to rising prices for natural gas and electricity. The Council of the EU argues that this situation constitutes a severe difficulty in the

[27] European Commission (2022).

[28] The assessment of the European Commission's approach to this regulation and the justification with Article 122(1) TFEU is not the focus of this study. However, especially in the context of the discussion on an extension to other sectors and a permanent introduction of excess profits taxes, it should be borne in mind that the proposed excess profits taxes are income taxes for which the principle of unanimity in the Council of Ministers and the obligation to involve the European Parliament apply. Regularly, directives define the framework for new types of income taxes. A regulation is a binding legal act that all EU countries must implement in full. In contrast, a directive is a legal act that sets a target to be achieved by all EU countries. However, it is up to individual countries to enact their own legislation to achieve this goal. For more information on the different types of legislation, see European Union (2022), available at: https://european-union.europa.eu/institutions-law-budget/law/types-legislation_en.

supply of gas and electricity energy products within the meaning of Article 122(1) TFEU[29]. In particular, the regulation aims to avoid uncoordinated national measures that could affect the functioning of the internal energy market due to the coupled electricity market, endangering security of supply and leading to further price increases in the Member States that are most affected by the crisis. The commitment to common excess profit taxes on surplus revenues should avoid significant distortions between generators in the EU. Furthermore, the revenue of both instruments should help to finance Member States' measures in support of electricity consumers (e.g., households, small- and medium-sized enterprises (SMEs) and energy intensive industries). Yet, these measures aim to preserve the price signals on the market across Europe and cross-border trade[30]. The Council states that this coordinated effort is required to ensure that the current crisis does not lead to lasting harm for consumers and the economy, while preserving the sustainability of public finances[31]. Yet, the proposed regulations on the profit cap and the solidarity surcharge are of a general nature. They contain optional measures for the Member States and, similar to directives, leave the Member States national leeway in many respects.

3.2.2. Cap on market revenues for inframarginals

3.2.2.1. Proposed regulation for cap on market revenues for inframarginals

The Council agreed to cap the market revenues at a minimum of 180 EUR per MWh for electricity generators, including intermediaries that use so-called infra-marginal technologies to produce electricity, such as renewables, nuclear and lignite (brown coal). For the case of inframarginals, turnover (minus a small exempted amount) is a good approximation of current profits, as the marginal costs for non-fossil fuel fired electricity generators are typically constant and relatively low. The market revenue cap applies to the realised market revenues of electricity producers in all electricity markets, i.e. the day-ahead, intraday and balancing power markets as well as the reserve market of the grid operator[32]. The EU regulation allows for national variation by Member States implementation, which may be necessary to account for specific aspects of the production mix and cost structure. According to the regulation, Member States can set a higher market income cap for producers whose investment and operating costs exceed the proposed cap for security of supply reasons.

Revenues exceeding the pre-defined threshold are defined as the windfall profit and could be collected up to 100%. However, governments have the option to collect only 90% of the windfall profits to preserve the profitability of the operators and not to dampen investments in renewable energies[33]. As discussed later, leaving some share of the windfall profit (i.e. 10%) to the power generators also helps to reduce a potential adverse effect of this regulation, which is an increased incentive for capacity withholding in already tight markets.

To account for national specificities and to facilitate the application, Member States have the discretion to decide whether to apply the cap on market revenue either when the settlement of the exchange of electricity takes place or thereafter. The application of the cap on market revenues at the time when the transactions are settled may be more efficient, it might not always be possible, for instance due to differences in the way the wholesale electricity markets are organised in the Member States and across different timeframes[34].

---

29 European Commission (2022), p. 4 (7).

30 European Commission (2022), p. 6 (10).

31 European Commission (2022), p. 4 (6).

32 Yet, the market revenue cap does not cover market revenues due to a contractual obligation (e.g., renewable electricity purchase contract, price hedge), even if the revenue is above the respective revenue cap (e.g. 180 EUR/MWh).

33 European Commission (2022), p. 14 (37ac).

34 European Commission (2022), p. 12 (31).

The regulation proposes an application period at least from December 1, 2022 until June 30, 2023. Table 2 summarizes the key design characteristics of the cap on market revenue for inframarginals.

Table 2: Summary Cap on market revenue for inframarginals

Scope	**Businesses covered**: producers and intermediaries participating in electricity wholesale markets on behalf of producers, regardless of the market timeframe in which the transaction takes place and of whether the electricity is traded bilaterally or in a centralised marketplace **Technologies covered**: wind, solar, and geothermal, hydropower (without reservoir), biomass (excluding bio-methane), waste, nuclear, lignite, crude petroleum products, peat **Options**: separate cap for hard coal; limit market revenues of other actors (e.g., including traders)
Base	**Definition of revenue**: Market revenue of producers obtained from the generation of electricity **(Minimum) windfall profit**: revenue exceeding 180 EUR per MWh of electricity produced **Options**: technology specific market price caps
Rate	**Minimum rate**: 90% of windfall profit
Use of proceeds	collect and redirect the surplus revenues towards supporting and protecting final electricity customers Option to use measures that further limit market revenues
Application period	1 December 2022 until 30 June 2023

Source: Authors' own elaboration.

3.2.2.2. National implementations

Within the proposed framework of the regulations, Member States have in particular the option to apply a different cap on market revenues (given a minimum of 180 EUR/MWh) and a 10 percentage points lump-sum deduction of revenues exceeding the cap. The latter results in an effective tax rate of 90% on the windfall profits.

Based on the already implemented or announced cap on market revenues for inframarginals, we observe that Member States frequently use their ability to implement a stricter cap as shown in Table 3. In addition, several countries (e.g. Belgium, Bulgaria, Czech Republic, France, Germany, Greece, Poland and Slovakia) rely on different caps depending on the underlying technology used to generate electricity. Within the EU, Spain (67 EUR/MWh) and Romania (92 EUR/MWh) apply the strictest cap on market revenues, yet both approaches deviate from the general framework of the proposed regulation. In contrast, the Czech Republic for example deviated from the required minimum market revenue cap of 180 EUR/MWh by introducing a cap at 240 EUR/MWh for the power production fuelled by gas from biomass[35]. The majority of EU Member States introduces the lump-sum deduction of 10 percentage points.

Among all EU Member States, Austria is the only country that combines the applicable market revenue cap with an incentive to invest in activities for the transition towards renewable technologies. If

[35] See Table 9 in Annex 1 for an overview on applicable market revenue caps.

companies invest during the period 31.12.2021-01.01.2024, they are able to increase the applicable market revenue cap from 140 EUR/MWh to 180 EUR/MWh depending on the investment volume.

To quantify the respective windfall profit, Germany does not only apply technology-specific caps but further relies on hypothetical revenues and costs ("Referenzkostenmethode"). As the legislator depends on industry information to calculate the reference costs of each technology, this method could be more prone to tax avoidance than a fixed electricity price level.

Table 3: Overview on applicable caps on inframarginals and the tax rate implemented in the EU

Price cap	180 €/MWh	> 180 €/MWh	Technology-specific caps
	Croatia, Denmark[36], Ireland (except wind/solar), Italy, Lithuania[37], Slovenia, Sweden[38]	Austria (140 EUR/MWh), Ireland (wind/solar: 120 EUR/MWh), Netherlands (130 EUR/MWh), Romania (92 EUR/WWh), Spain (67 EUR/MWh)	Belgium[39] (130-180 EUR/MWh), Bulgaria[40], Czech Republic (70-240 EUR/MWh), France[41] (90-175 EUR/MWh), Germany, Greece, Poland[42], Slovakia[43]

Source: Authors' own elaboration based on https://www.pwc.nl/en/insights-and-publications/tax-news/other/energy-emergency-measures--solidarity-charge-and-revenue-cap.html.

Note: Austria provides the option for a higher revenue cap up to 180 €/MWh if investments in renewable energy resources take place between 31.12.2021-01.01.2024. Cyprus plans to introduce a special fee on windfall profits of businesses trading energy generated from renewables despite the received derogation in respect of the EC' regulation. France further includes gas power plants with a revenue cap of 40€/MWh. At the time of writing of this study, there is limited publicly available information released by the national governments of Estonia, Latvia, Luxembourg, and Portugal. The Maltese Government has negotiated a derogation from the EU regulation that imposes mandatory reductions in energy consumption. Finland does not introduce a market revenue cap for inframarginals; instead, it introduces a windfall profit tax on the electricity sector. Hungary introduced a windfall profit tax at a tax rate of 65% on electricity producers. . Greece has imposed a 90% retroactive tax on power producers' windfall profits from the wholesale electricity prices from October 2021 to June 2022 based on the excess gross profit. As of July Greece implemented an ex-ante cap on payments to power producers which is different for each technology to reflect their real production costs.

The regulatory framework allows Member States to deviate from the proposed regulation if they ensure that the impact of their national windfall profit tax is equivalent to the market revenue cap. Finland makes use of this option by introducing a general windfall profit tax of 30% on the electricity sector. The Finnish windfall profits tax, in contrast to the proposed regulation, refers to annual gross profits (defined by the Corporate Tax Act) instead to market revenues. Following the intent of the lump-sum deduction, Finland grants a tax-free return of 10% (measured as 10% annual return on equity) to stimulate investments in power generation. As the national windfall profit tax is not

36 Based on information available on https://kpmg.com/dk/en/home/insights/2023/02/taxation-of-windfall-profits.html.

37 Law of the Republic of Lithuania on the implementation of Regulation (EU) 2022/1854, No. XIV-1680, available at: https://www.e-tar.lt/portal/en/legalAct/754cc070828c11ed8df094f359a60216.

38 Based on information available on https://www.regeringen.se/contentassets/44adb2655f9c40389394d4ec87a92cb3/tillfallig-skatt-pa-vissa-elproducenters-overintakter.pdf.

39 Based on information available at: https://www.ey.com/en_be/tax/tax-alerts/2022/energy-alert-further-measures-to-deal-with-the-exploding-energy-prices.

40 Law on the implementation of provisions of the Law on the State Budget of the Republic of Bulgaria for 2022, the Law on the State Public Insurance Budget for 2022 and the Law on the Budget of the National Health Insurance Fund for 2022. DECREE No. 312. Available on https://dv.parliament.bg/DVWeb/showMaterialDV.jsp?idMat=182628.

41 Based on information available on https://www.pwcavocats.com/fr/assets/files/pdf/2023/01/french-finance-act-for-2023.pdf.

42 Based on information available on https://conventuslaw.com/report/poland-revenue-caps-for-energy-producers/.

43 Based on information available at: https://www.reuters.com/business/energy/slovakia-sets-price-caps-power-plants-by-type-fuel-2023-01-31/.

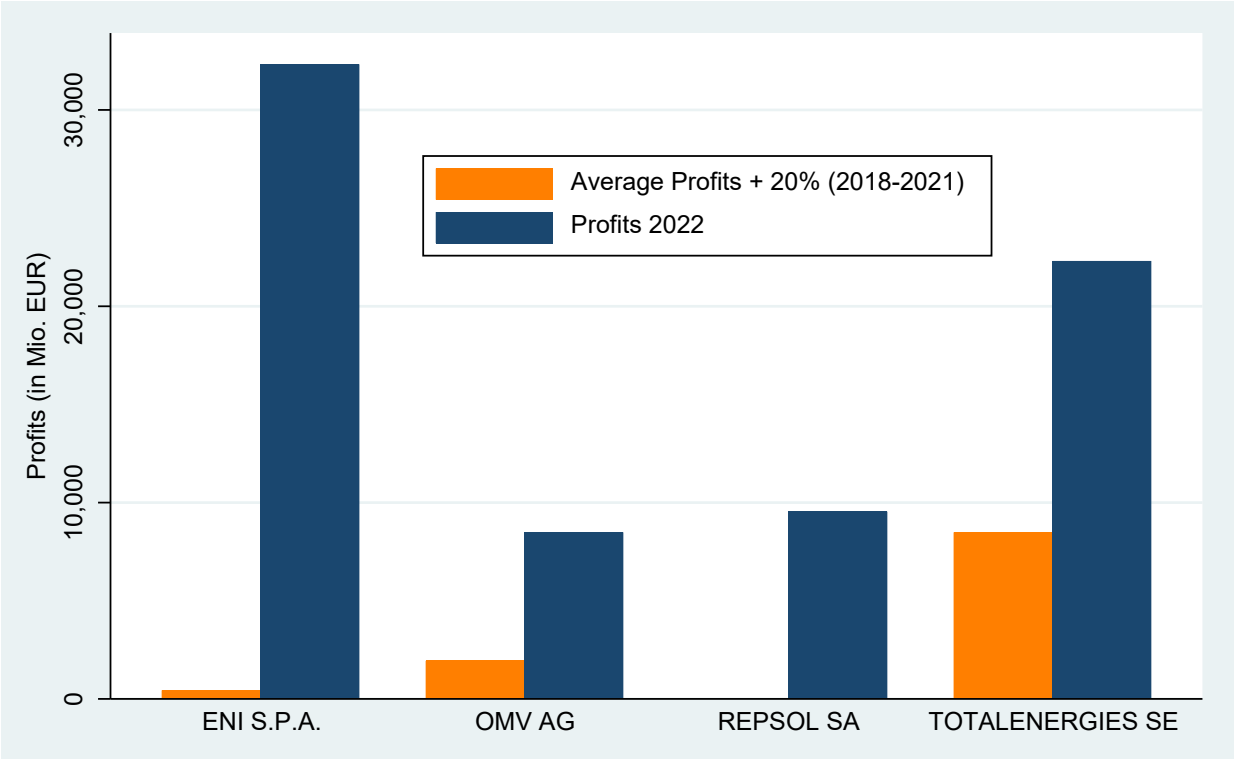
introduced alongside the market revenue cap, but as an equivalent substitute, there is no risk of double taxation[44]. In addition, the Romanian system deviates in several aspects from the proposed regulation. It is yet to be seen whether the existing regime could be considered an 'equivalent regime' for purposes of the emergency measures regulation.

3.2.3. Solidarity contribution for fossil fuel sector

3.2.3.1. Proposed elements of the Council Regulation

The Council Regulation imposes the obligation to introduce a mandatory temporary solidarity contribution on profits of companies and permanent establishments established in the EU that are active in the crude petroleum, natural gas, coal and refinery sectors. Precisely, these companies have to realize at least 75% of their annual turnover through activities related to the production of oil and natural gas, mining activities, refining of petroleum or coke oven products[45]. The Council argues that these companies benefited from excess profits, that do not correspond to any regular profit that these entities would or could have expected to obtain in normal circumstances would the unpredictable events in the energy markets not have taken place[46]. Figure 8 highlights the increased profits of selected firms in our sample for the year 2022.

Figure 8: Windfall profits in the oil and gas industry in 2022



Source: Authors' own elaboration based on company information available in Orbis.

Note: The profits displayed are accounting profits extracted from ORBIS. We calculate the average profits +20% as shown in Chapter 4.1.2. In line with the rules for the solidarity tax, we display a four-year average of zero for REPSOL SA, as the average profit for the period 2018-2021 is -566.25 Mio. EUR.

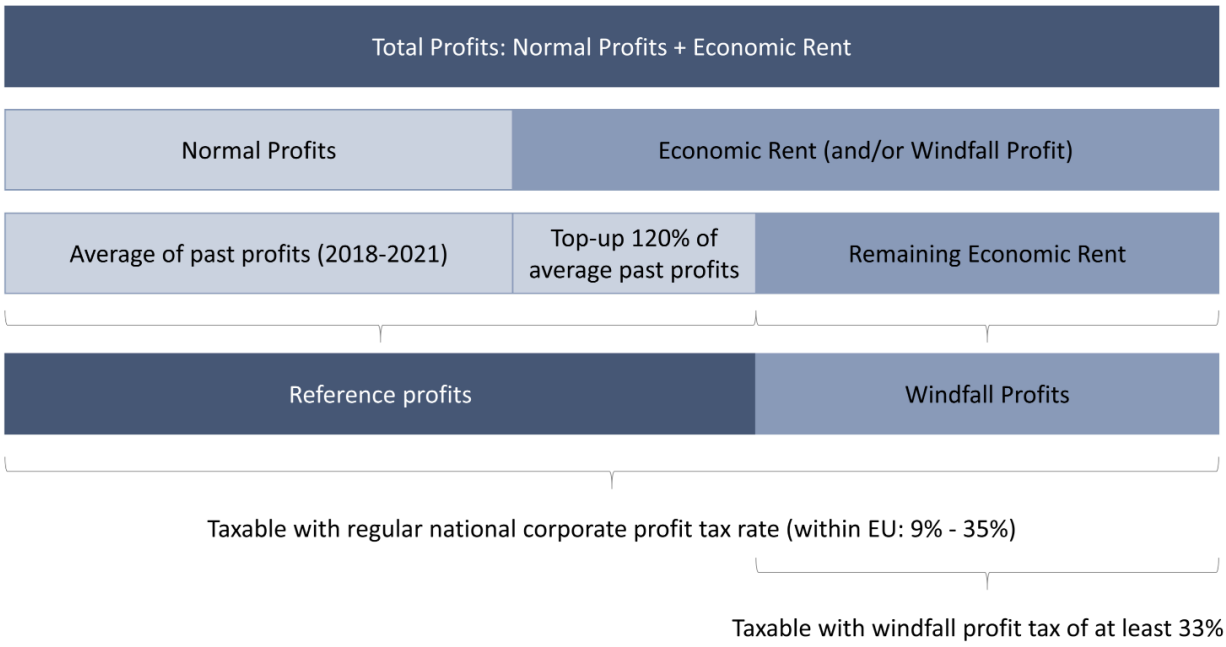
[44] For further information on the Finnish windfall profit tax, see Eduskunta Riksdagen HE 320/2022 vp, available at: https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Sivut/HE_320+2022.aspx.

[45] European Commission (2022), p. 17 (44).

[46] European Commission (2022), p. 7 (13).

To define the windfall profit of the aforementioned sectors, the Council relies on the **average earnings method** that considers a specific part of the annual taxable corporate profits as the tax base of the solidarity contribution (see Figure 9 for an illustration). Thereby, taxable profits are determined under Member States national tax law for the fiscal year starting on or after 1 January 2022 *and/or* 1 January 2023[47]. The reference profit, used to calculate the windfall profit, reflects the average profit generated in the fiscal years 2018, 2019, 2020 and 2021[48]. Member States could implement an upward adjustment of the reference profit by up to 20% to compensate companies for a natural expected growth as well as for firm- or location-specific rents. Any profits, which are above a 20% increase on the reference profit, are subject to a tax rate of *at least* 33% on taxable profits[49]. The solidarity contribution applies simultaneously to the regular corporate income taxes of each Member States.

Figure 9: Breakdown Total Profits and Solidarity contribution



Source: based on Hebous et al. (2022), adapted by the authors.

In addition, the measure should ensure that only a share of profits that were actually made is collected. Furthermore, the Council Regulation states that Member States can keep national measures that are equivalent to the solidarity contribution if they are compatible with the objectives of the regulation and generate at least comparable proceeds[50]. Table 4 summarizes the key parameters of the solidarity contribution for the fossil fuel sector.

[47] Estonia and Latvia, which tax only distributed profits, should apply the solidarity contribution to the calculated profit irrespective of their distribution, see EC (2022), p. 18.

[48] European Commission (2022), p. 18.

[49] European Commission (2022), p. 18 (48).

[50] European Commission (2022), p. 21 (55a).

Table 4: Summary Solidarity contribution for fossil fuel sector

Scope	**Businesses covered**: companies and permanent establishments that are resident in an EU Member State for tax purposes **Sectors covered**: activities in the oil (crude petroleum), gas, coal and refinery sectors with at least 75% of turnover generated in the field of the extraction, mining, refining of petroleum or manufacture of coke oven products
Base	**Definition of tax taxable profits**: national tax rules **Windfall profit**: profits exceeding 20% of the reference profits **Reference profit**: average taxable profits of the 3 fiscal years starting on or after January 1, 2018; negative reference profit == 0
Rate	**Minimum rate**: 33% on surplus profits Surcharge to regular national corporate profit taxes and levies of a Member State
Application period	fiscal year starting on or after 1 January 2022 and/or 1 January 2023

Source: Authors' own elaboration.

3.2.3.2. National implementation

The majority of EU Member States follows the proposed average earnings method to define the windfall profits for the fossil fuel sector. Still, we find some variation in the implemented tax bases. Italy restricts the top-up of the reference profits to 10%. In Spain and Slovakia, we observe larger deviations from the proposed regulation. Slovakia introduced a tax of 55% on the overall profit (i.e. no limitation to surplus profits), whereas Spain refers to the net turnover of the targeted firms.

In addition, the proposed tax rate represents a minimum tax rate and Member States are free to apply a higher rate. Table 5 shows the broad range of applicable tax rates of the solidarity contribution within the EU, ranging from the minimum tax rate of 33% to 75% in Ireland. As Spain taxes net turnover, the applicable tax rate of 1.2% is not comparable to the other windfall profit taxes that refer to profit.

We observe the largest variation in the respective application period of the solidarity measure. Most EU Member States followed the proposed regulation by introducing the solidarity contribution retroactively for 2022. In the remaining Member States, the tax will only apply for the tax year 2023. The Czech Republic is a special case, as the tax will be levied beyond 2023 until 2025.

Table 5: Overview on applicable tax rate on windfall profit taxes implemented in the EU

Rate	33%	> 33%	Specific
	Belgium[51], Bulgaria[52], Croatia, Cyprus, Denmark[53], Finland[54], France[55], Germany, Lithuania[56], Netherlands, Portugal[57], Slovenia, Sweden	Austria (40%), Czech Republic (60%), Ireland (75%), Italy (50%), Romania[58] (60%), Slovakia (55%)	Spain (1.2% on net turnover)

Source: Authors' own elaboration mainly available at: https://www.pwc.nl/en/insights-and-publications/tax-news/other/energy-emergency-measures--solidarity-charge-and-revenue-cap.html.

Note: Poland stopped the implementation of the solidarity contribution with a tax rate of 50%. Hungary introduced a special tax on petroleum product manufacturers at a tax rate of 95%[59]. At the time of writing of this study, there is limited publicly available information released by the national governments of Estonia, Greece, Latvia, and Luxembourg. The Maltese Government has negotiated a derogation from the EU regulation that imposes mandatory reductions in energy consumption.

[51] Based on information available at: https://www.ey.com/en_be/tax/tax-alerts/2022/energy-alert-further-measures-to-deal-with-the-exploding-energy-prices.

[52] Based on information available on https://dv.parliament.bg/DVWeb/showMaterialDV.jsp?idMat=181204.

[53] Based on information available on https://kpmg.com/dk/en/home/insights/2023/02/taxation-of-windfall-profits.html.

[54] Based on information available on https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Sivut/HE_320+2022.aspx.

[55] Based on information available on https://www.pwcavocats.com/fr/assets/files/pdf/2023/01/french-finance-act-for-2023.pdf.

[56] Law of the Republic of Lithuania on the implementation of Regulation (EU) 2022/1854, No. XIV-1680, available at: https://www.e-tar.lt/portal/en/legalAct/754cc070828c11ed8df094f359a60216.

[57] Assembleia da República Decreto N. 25/X, available at: https://www.parlamento.pt/ActividadeParlamentar/Paginas/DetalheDiplomaAprovado.aspx?BID=33778.

[58] Emergency ordinance Romanian Government, available at: https://mfinante.gov.ro/documents/35673/5553347/proiectougreglenergie_28122022.pdf?mc_cid=a440e8c38c&mc_eid=cd1f92f96c.

[59] The special tax is based on the price difference between the world market price of crude oil originating in the Russian Federation calculated in line with the Government Decree, and the quantity of crude oil in barrels originating in the Russian Federation purchased during the reference month, see Decree No. 496/2022, Official Gazette No. 201/2022, available at: https://magyarkozlony.hu/dokumentumok/ddc43c6b4ec1a604be33a8f39004da233a5e3bab/megtekintes.

4. QUANTIFICATION: LEVEL OF EXPECTED TAX REVENUES GENERATED

KEY FINDINGS

To identify firms that are potentially subject to the **solidarity contribution**, we use financial accounting data extracted from Bureau van Dijk's Orbis database. The sample consists of 293 firms. The quantification shows that, based on the data selection process and our calculation assumptions the calculated tax revenue for the solidarity contribution amounts to 4.4 bn EUR based on 2021 profits (pre-crisis). Revenues based on 2022 profits are supposedly higher due to the additional rise in energy prices. For non-retroactive implementations, however, tax avoidance (cross-border profit shifting) presumably reduces revenue expectations.

For the calculation of tax revenue from the **revenue cap**, we rely on day-ahead prices and actual generation per production type provided by the ENTSO-E Transparency platform covering the period 01.01.2022-31.12.2022. In total, based on our assumptions the calculated tax revenue from the market revenue cap for inframarginals amounts to 106 bn EUR. For the proposed application period, however, falling electricity prices in early 2023 indicate a substantially smaller tax revenue.

4.1. Temporary solidarity contribution on excess profit

4.1.1. Data and identification of taxable firms

The solidarity contribution is levied on firms' profits. Hence, we quantify the tax revenue at the micro-level based on a firm sample extracted from Bureau van Dijk's Orbis database. According to the EU proposal, the temporary solidarity contribution applies to firms with the following criteria:

- **Geography**: EU companies and permanent establishments including those that are part of a consolidated group merely for tax purposes.
- **Activity**: Firms that carry out activities in the field of crude petroleum, natural gas, coal and refinery sectors and generate at least 75% of their turnover from these activities.

To identify firms that are potentially subject to the solidarity contribution we use financial accounting data extracted from Bureau van Dijk's Orbis database. In Table 6 we describe our sample selection procedure to approximate the number of firms liable to the temporary solidarity contribution. This is necessary as the allocation of turnover to the activities of crude petroleum, natural, gas, coal and refinery is not observable from available data sources.

Table 6: Procedure of our sample selection

	Crude petroleum	Natural gas	Coal	Refinery
Step 1	Search in Orbis in all active European companies for those that mention "crude oil" in their *Brand names*, *Full overview*, *Main activity*, *Membership of network*, *Primary business line*, *Primary national activity*, *Product and services*, or *Trade description*	Search in Orbis in all active European companies for those that mention "natural gas" in their *Brand names*, *Full overview*, *Main activity*, *Membership of network*, *Primary business line*, *Primary national activity*, *Product and services*, or *Trade description*	Search in Orbis in all active European companies for those that mention "coal" in their *Brand names*, *Full overview*, *Main activity*, *Membership of network*, *Primary business line*, *Primary national activity*, *Product and services*, or *Trade description*	Search in Orbis in all active European companies for those that mention "refinery"in their *Brand names*, *Full overview*, *Main activity*, *Membership of network*, *Primary business line*, *Primary national activity*, *Product and services*, or *Trade description*
Step 2	Keep firms that have a full dataset of profit information for the years 2017-2020	Keep firms that have a full dataset of profit information for the years 2017-2020	Keep firms that have a full dataset of profit information for the years 2017-2020	Keep firms that have a full dataset of profit information for the years 2017-2020
Step 3	Only keep firms with NAICS 2017 Core Code "2111" (Oil and Gas Extraction)	Only keep firms with NAICS 2017 Core Code "2111" (Oil and Gas Extraction)	Only keep firms with NAICS 2017 Core Code "2121" (Coal Mining)	Only keep firms with NAICS 2017 Core Code "2111"(Oil and Gas Extraction) and "3241" (Petroleum and Coal Products Manufacturing)
Step 4	The four samples are joined together and if firms show up several times the duplicates are dropped. This is mostly the case for oil and gas companies			
Step 5	To make sure that the sample companies fit the criteria of the solidarity contribution, we by hand research all firms on the internet to verify their line of service. It was not possible to confirm that the firms generate at least 75% of their turnover from these activities. Most of the firms were dropped for the following reasons: • Refineries are mostly sorted out if they produced lubricants or other related products but are no "classical" petroleum refineries; • Oil and Gas are mostly sorted out if they only provided services/ construction/ logistics related to oil or gas extraction or the core business of the company was not possible to determine; and • Coal mostly sorted out if the core business was mining of other materials than coal or the core business of the company was not possible to determine.			

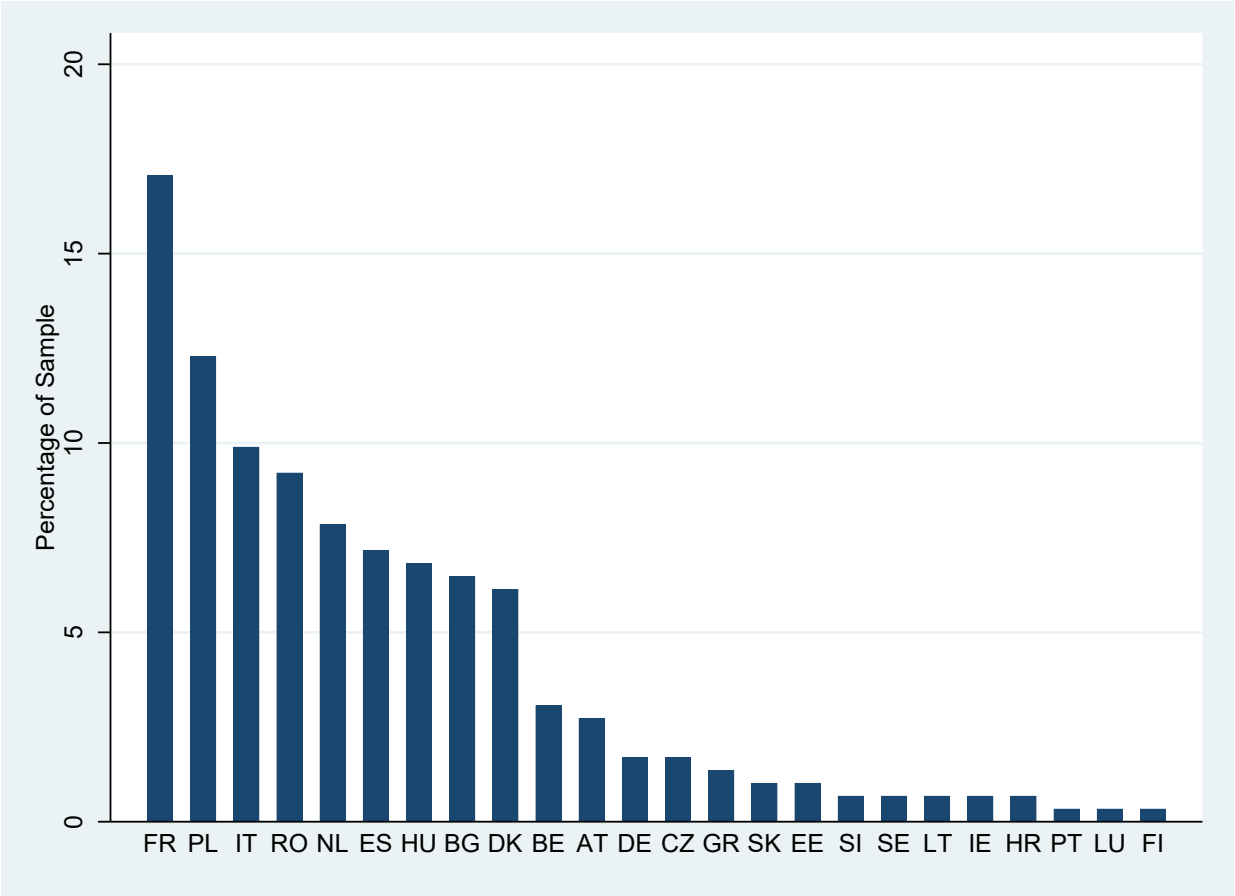
Source: Authors' own elaboration.

The selection mechanism described above leaves us with a sample of 293 companies. A list of those companies we display in Table 13 in Annex 2. When requiring information on total assets or additional years of information on firm profits, the number reduces but does not drop below 200 firms. Please note, that the resulting structure of the sample reflects both the selection mechanism as written down

and the structure of the Orbis database with hinges on national disclosure requirements. Bajgar et al. (2020) provide a detailed discussion on the coverage and representativeness of Orbis data. The authors emphasize that Orbis data do not form a representative sample of the firm population but firms in Orbis are on average, larger, older and more productive. Still, they acknowledge the role of Orbis as important source for firm-level data for investigating the role of policies across countries.

The following figures depict the sample composition across countries and sectors. Figure 10 shows the distribution of the sample firms across countries. The biggest share of the sample firms is located in France, followed by Poland, Italy, Romania and the Netherlands. Hereby, the high number of sample firms in France and the Netherlands stems from TotalEnergies and ENI being divided into many sub-companies respectively.

Figure 10: Distribution of sample firms over EU countries

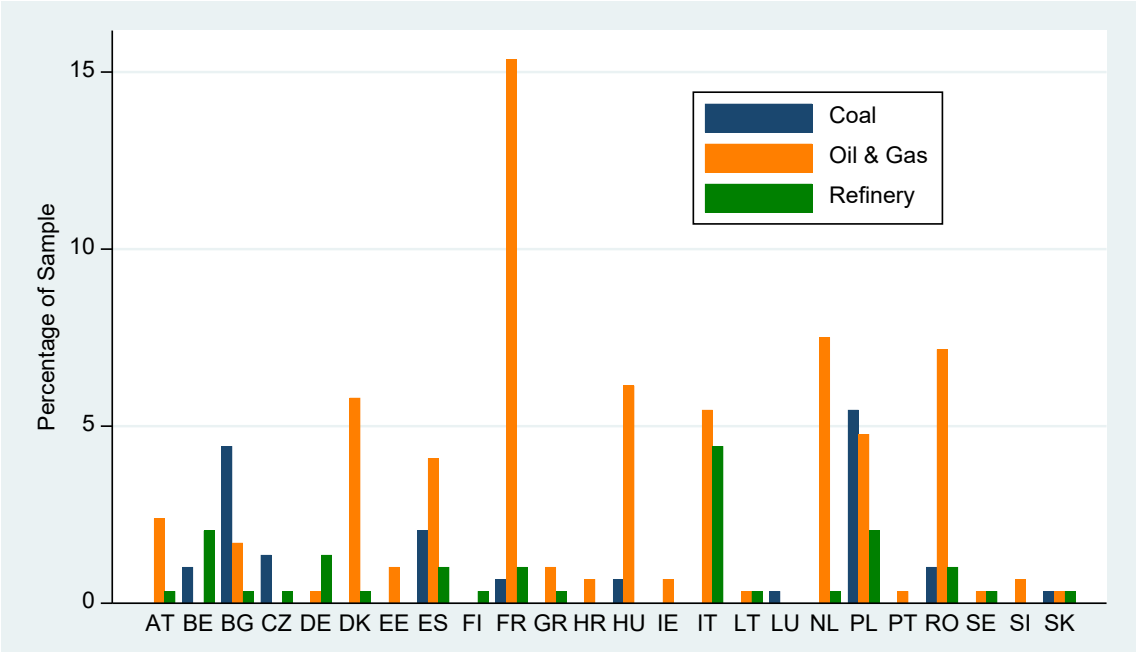


Source: Authors' own elaboration.

Note: Our sample includes a total of 293 companies. We extract all company Information from ORBIS for the year 2021.

In Figure 11, we additionally split up the sample according to sectors. The respective prevalence of firms that carry out activities in the field of crude petroleum, natural gas, coal and refinery sectors is quite heterogeneous across European countries. This is likely driven by location specific characteristics. The division of big players like OMV, Repsol, Total Energies and ENI in several sub-companies causes the high number of oil and gas companies in comparison to coal companies and refineries.

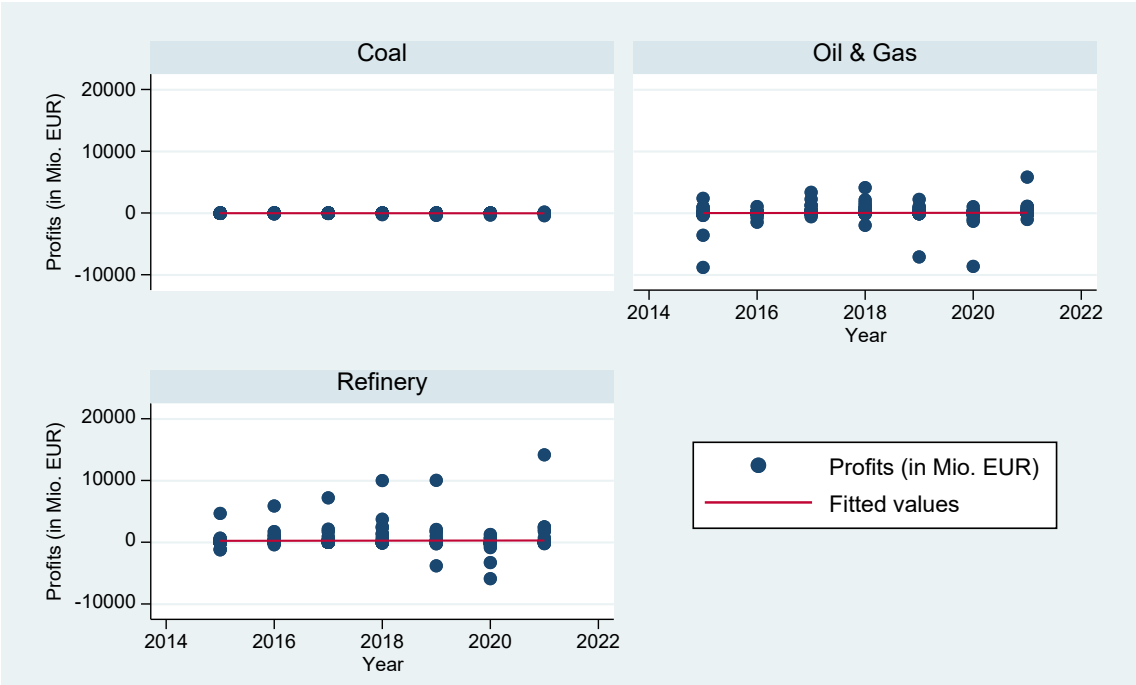
Figure 11: Distribution of sample firms over EU countries and sectors



Source: Authors' own elaboration.

Note: The Sample includes a total of 293 companies. We extract all company information from ORBIS for the year 2021. The categorization into *Coal*, *Oil & Gas*, and *Refinery* is undertaken during the filtering process of the firms as shown above. Firms from the coal sample are labelled as *Coal*, firms from the crude petroleum and natural gas samples are labelled as *Oil & Gas*, and firms from the refinery sample are labelled as *Refinery*.

Figure 12: Development of firms profits across different sectors

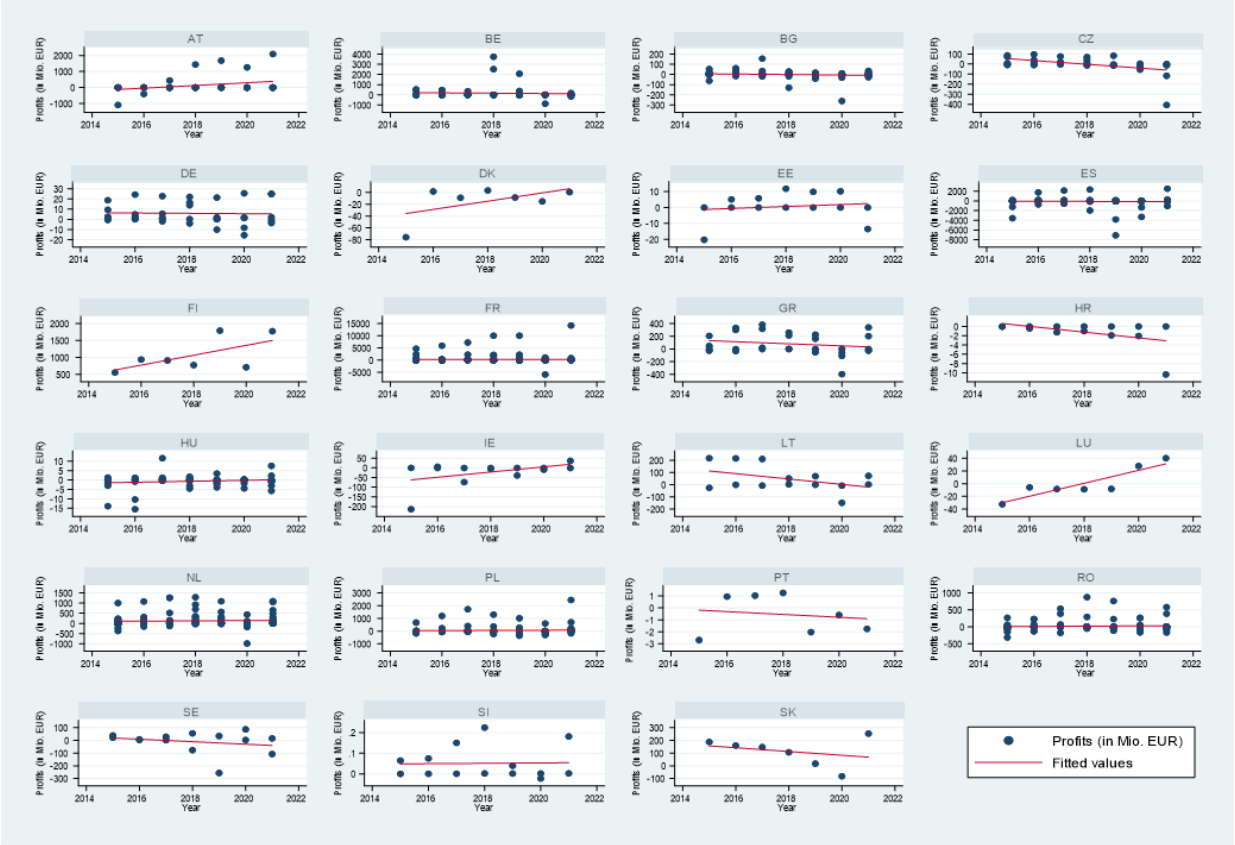


Source: Authors' own elaboration.

Note: The profits displayed are accounting profits extracted from ORBIS. We split the sample by industry. The categorization into Coal, Oil & Gas, and Refinery is undertaken during the filtering process of the firms as shown above. Firms from the coal sample are labelled as Coal, firms from the crude petroleum and natural gas samples are labelled as Oil & Gas, and firms from the refinery sample are labelled as Refinery. All three graphs have the same scale.

Figure 12 illustrates the evolution of profits in the three sectors from 2015 to 2021. While profits are low in the coal sector across the entire period, there is more variation in profits across time for the oil and gas and the refinery sector. The covered firms report sizable losses for 2020 due to the pandemic. According to Figure 13 the development of profits from 2015 to 2021 has been quite stable across countries, with the exception of France, Italy and Spain.

Figure 13: Development of profits across countries



Source: Authors' own elaboration.

Note: The profits displayed are accounting profits extracted from ORBIS. We split the sample by ISO Country Codes. Every graph has its own scale to account for the countries´ unique profit spans.

4.1.2. Calculation of the solidarity contribution for fossil fuel sector

In our calculations, we consider the EU Proposal and not the implemented or approved national solidarity contributions of the EU Member States. As shown in Chapter 3.2.3.2., this mainly affects the applicable tax rates. However, due to data availability issues, **we have to rely on the year 2021** (*t*) as the data available for 2022 is very limited in the Orbis database. Thus, we further adjust the reference period by one year, capturing the period 2017-2020 instead of 2018-2021. In addition, we rely on book profits to approximate the taxable profits determined by the national tax law.

As we rely on data from 2021 and not from 2022, the results presented are only an approximation for the potential revenues of the implemented solidarity contribution. This has several implications. First, the proposed four-year average of firm´s profits (2018-2021) is driven down significantly by the limited demand for oil and gas products in 2020. In a sensitivity analysis, we capture this effect in our adjusted reference period 2017-2020. Second, the oil, gas and coal prices increase sharply in 2022 due to Russia's Invasion of the Ukraine. Even though this effect is not captured in our sample, the oil, gas and coal prices already started to rise in 2021 as global natural gas demand bounced back to pre-pandemic

levels and outstripped supply. In the proposal the higher price increase in 2022 is compared to a four-year average that is driven up by higher prices in 2021, whereas in our calculation the lower increase in 2021 is compared to a lower four-year average. Therefore, the data from 2021 can provide an approximation of tax revenues for 2022, even though we expect to estimate a lower bound of tax revenues.

We calculate the potential tax revenue by multiplying the windfall profit WP_i by the proposed tax rate τ, which represents the applicable tax rate of the EU proposal, i.e. 33%. To account for the increase of 20%, we multiply the average $\overline{P_i}$ by 1.2. In detail, we calculate the expected tax revenue (TR_C) for each country c as follows:

$$TR_c = \sum_i \ WP_i * \tau, \text{ with} \quad (1)$$

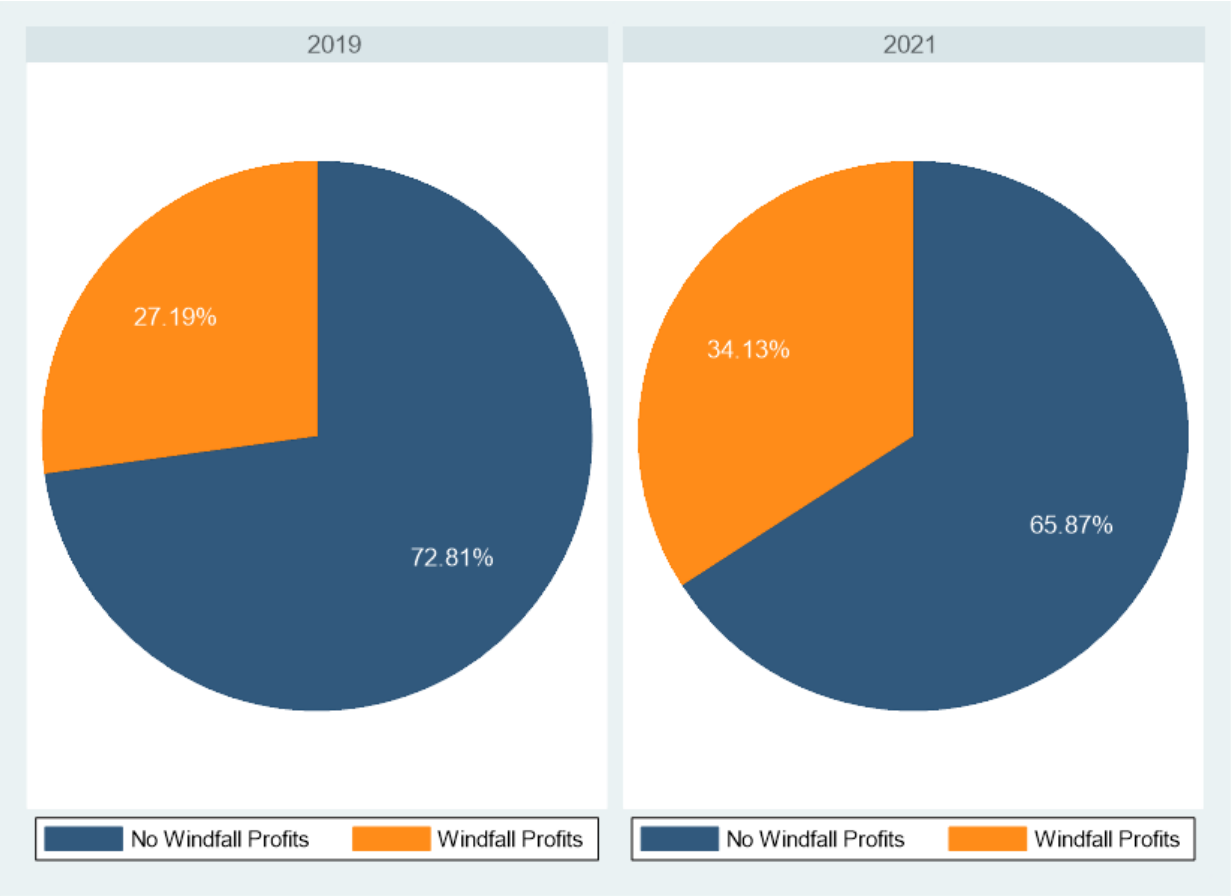
$$WP_i = max\left(P_{i,2021} - \overline{P}_i * 1.2, 0\right) \quad (2)$$

$$\overline{P_i} = \frac{P_{t-1} + P_{t-2} + P_{t-3} + P_{t-4}}{4}, t = 2021 \quad (3)$$

where WP_i is the windfall profit for company i; $P_{i,2021}$ is the profit of firm i in 2021. $\overline{P_i}$ is the average profit of company i during the 2017-2020 period, which we replace it by zero, if $\overline{P_i}$ is negative. We set the tax base equal to zero if we observe either a loss in 2021 or a negative difference ($2021 - \bar{\pi}$). In both cases, the corporation does not earn extraordinary high profits.

In a next step, we identify the share of firms in the sample that would be liable to the solidarity contribution as their profits exceed 120% of the reference period. That share amounts to 34.13% (Figure 14). For comparison, in 2019 (i.e. prior to the pandemic and the Russian invasion in Ukraine) the share of taxable firms only amounted to 27.19%. This illustrates that the number of firms realizing excess profits (as defined for the solidarity contribution) is larger compared to a pre-crisis scenario. This increase is, however, not that drastic, showing that the threshold for excess profits (exceeding 120% of average past profits) is not defined at an extraordinary high level unseen before the energy crisis.

Figure 14: Share of firms in our sample subject to the solidarity contribution

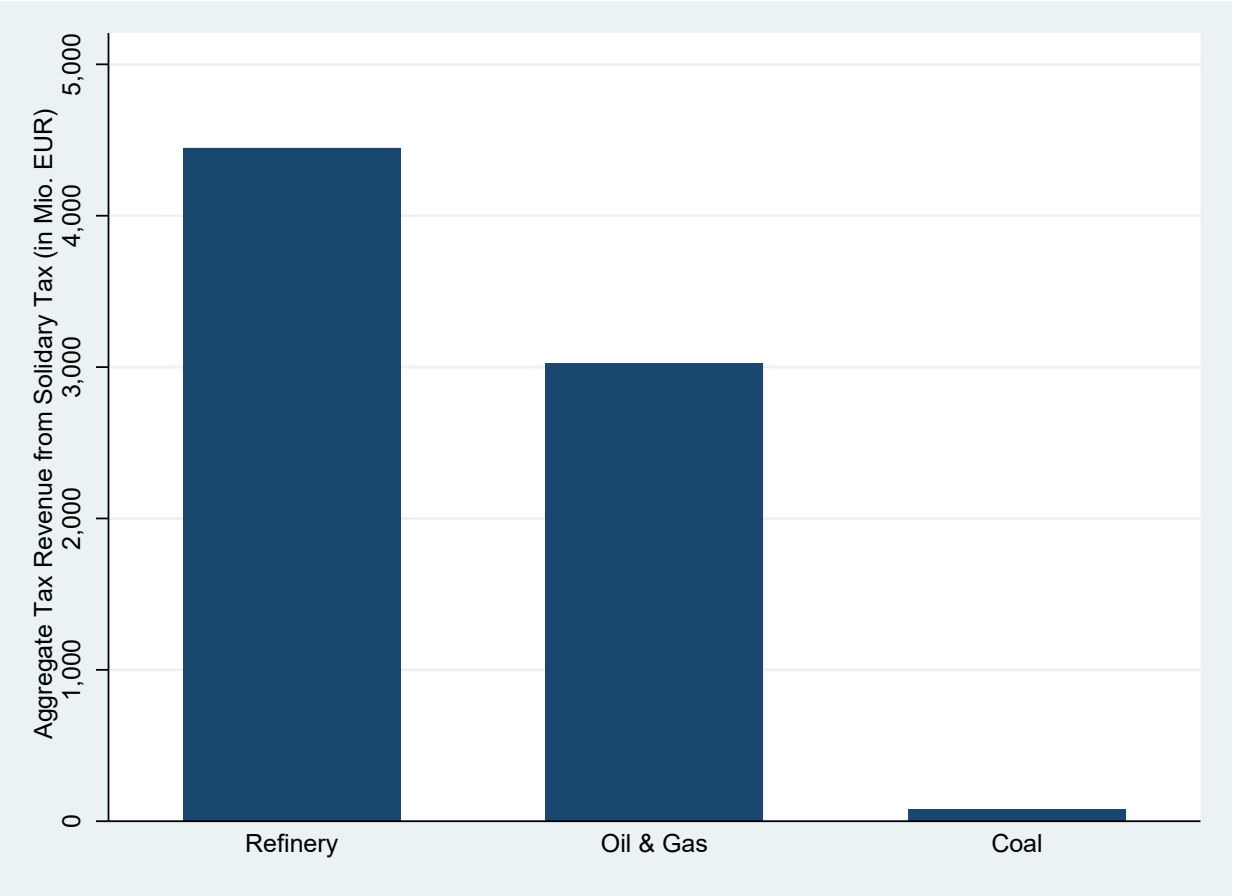


Source: Authors' own elaboration.

Note: We calculate windfall Profits as shown in Chapter 4.1.2 for 2021 with the four year average between 2020 and 2017 and for 2019 with the four year average between 2018 and 2015. Firms that have windfall profits as defined under the solidarity tax are counted under Windfall Profits, firms that do not have windfall profits as defined under the solidarity tax are counted under No Windfall Profits.

In line with the development of the profitability distribution, Figure 15 illustrates that based on the sample firms and 2021 profits (2017-2020 reference profits) the calculated tax revenue from solidarity surcharge is highest in the refinery sector.

Figure 15: Calculated total solidarity surcharge revenue by sector

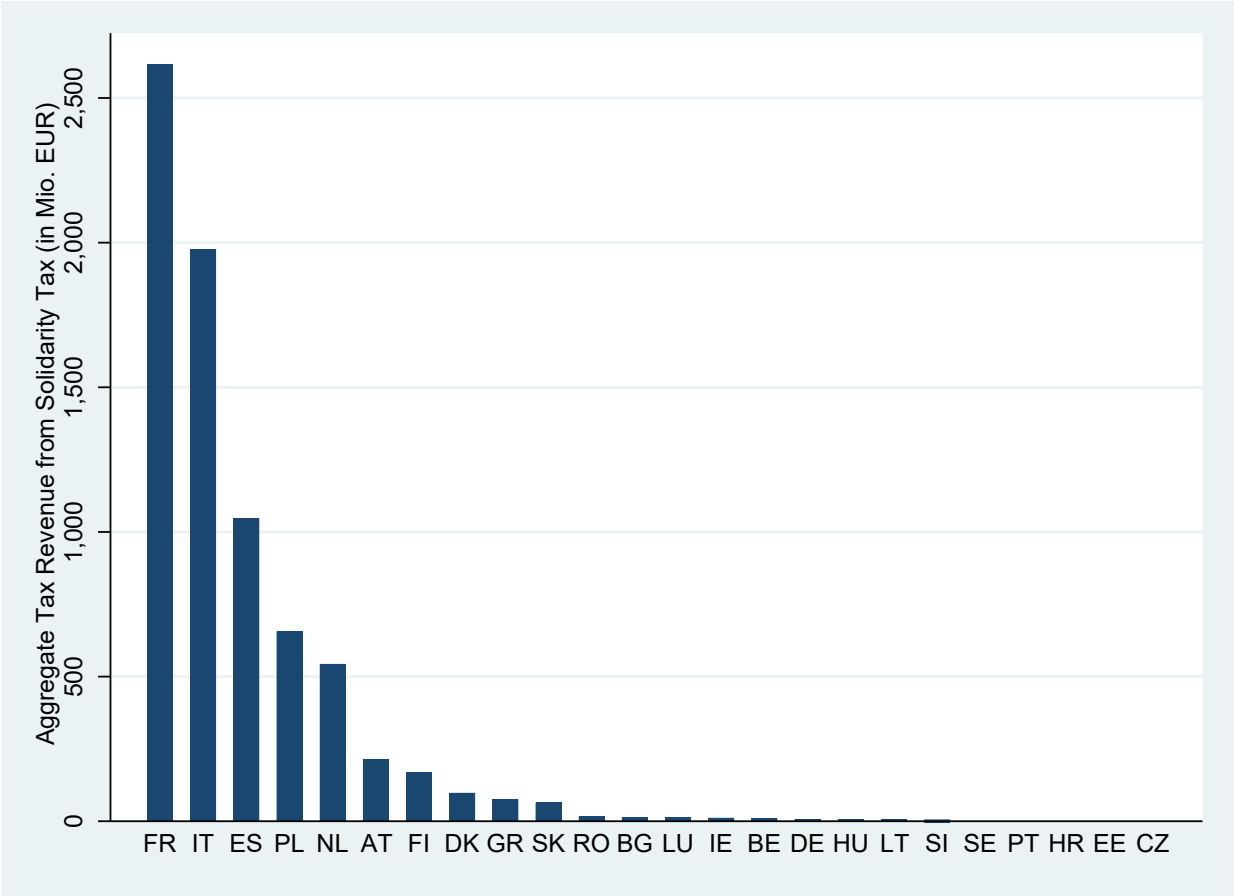


Source: Authors' own elaboration.

Note: We calculate the solidarity tax as shown in Chapter 4.1.2 for 2021 with the four-year average between 2020 and 2017. All company Information is extracted from ORBIS. The categorization into *Coal*, *Oil & Gas*, and *Refinery* is undertaken during the filtering process of the firms as shown in Chapter 4.1.1. Firms from the coal sample are labelled as *Coal*, firms from the crude petroleum and natural gas samples are labelled as *Oil & Gas*, and firms from the refinery sample are labeled as *Refinery*. The aggregate tax revenue is the sum of total tax revenue from the solidarity tax per industry.

Figure 16 illustrates the distribution of the calculated aggregate tax revenue from the solidarity contribution across countries. The distribution of revenue mirrors the distribution of firms in the sample and the fact that highest revenues are collected in the refinery and oil & gas sector.

Figure 16: Calculated total tax revenue from solidarity surcharge across countries

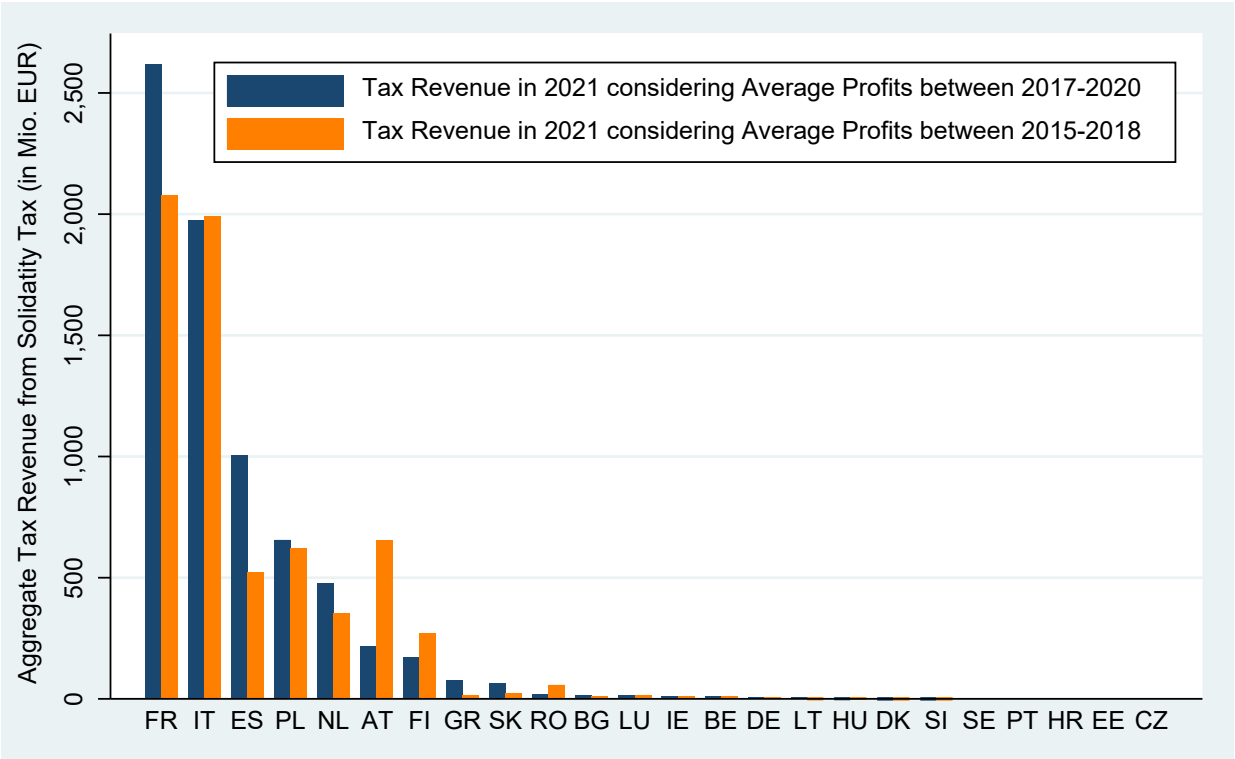


Source: Authors' own elaboration.

Note: We calculate the solidarity tax as shown in Chapter 4.1.2 for 2021 with the four-year average between 2020 and 2017. We extract all company Information from ORBIS. The aggregate tax revenue is the sum of total tax revenue from the solidarity tax per country.

As the solidarity surcharge relies on the average earning method the windfall profits depend on the respective reference period. We, therefore, show in Figure 17 the sensitivity of windfall profits to the chosen reference period by calculating a hypothetical scenario considering the years 2015-2018 as a reference. In doing so, we do not include the crises years capturing the losses caused by the COVID-19 pandemic. If the reference period includes the crisis years this drives down the average reference profit and thus increases the amount of excess profit liable to the solidarity contribution. Our sensitivity analysis shows, especially for France, that the potential revenue from the solidarity contribution would be much smaller.

Figure 17: Calculated total tax revenue from solidarity contribution with reference profits 2015-2018



Source: Authors' own elaboration.

Note: We calculate the solidarity tax as shown in Chapter 4.1.2 for 2021. To show the sensitivity to the reference period we calculate the four-year average for the period 2017-2020 and 2015-2018. We extract all company Information from ORBIS. The aggregate tax revenue is the sum of total tax revenue from the solidarity tax per country.

Table 7 summarizes the calculated aggregate tax revenue for the EU for the considered sample of firms. For the solidarity contribution it amounts to 4.4 bn EUR, this is 1.35% of the aggregate corporate income tax statistic[60], which of course includes the entire population of firms. Tax revenues based on 2022 profits are supposedly higher due to the additional rise in energy prices. For non-retroactive implementations (see Annex 1 for Member States' implementation details), however, tax avoidance (cross-border profit shifting) presumably reduces revenue expectations.

Table 7: Calculated tax revenue from solidarity contribution based on 2021 profits

Calculated Tax Revenue	Solidarity Contribution	For Comparison: CIT (Statistic)	Sol Contribution in % of CIT
Aggregate EU 2021	4.40692 bn EUR	327.5778 bn EUR	1.35

Source: Authors' own elaboration.

Note: We calculate the solidarity tax as shown in Chapter 4.1.2 for 2021 as an aggregate of the tax burden calculated for the sample firms. For comparison, the table also reports the corporate income tax revenue (for the entire population of corporations) as disclosed in the OECD Statistics – Global Revenue Statistics Database.

[60] OECD Statistics, Dataset: Global Revenues Statistics Database, Tax revenue on corporate profits, 2021, Unit: Domestic Currency (recalculated to EUR by exchange rate if necessary).

4.2. Temporary revenue cap

4.2.1. Underlying assumptions and data

To approximate the potential volume of tax revenues generated by the introduction of the temporary revenue cap (as of December 1, 2022 until June 30, 2023) we rely on the data provided by the ENTSO-E Transparency Platform. In detail, we use the (hourly) day-ahead prices (EUR/MWh) per bidding zone[61] for the period 01.01.2022-31.12.2022. The data from ENTSO-E Transparency Platform includes (hourly) day-ahead prices per bidding zone and actual generation per production type per bidding zone. Actual generation data is available for the energy types biomass, lignite, fossil coal derived gas, fossil gas, fossil hard coal, fossil oil, fossil oil shale, fossil peat, geothermal, hydro pumped storage, hydro run-of-river and poundage, hydro water reservoir, marine, nuclear, other, other renewable, solar, waste, offshore wind, and onshore wind.

To match data with prices, the production quantities have to be on an hourly basis. If the generation is given in 15min steps, the 4 quarters are summed up to give the hourly production quantities. We merge the price data and the production quantities by an ID consisting of the name of the bidding zone, the date, and the hour of the day.

The day-ahead prices in Europe increased with the beginning of the Russian invasion in Ukraine (see Figure 18). Most European bidding zones show a sharp rise in prices directly at the beginning of the invasion. In addition, we observe a second peak in August 2022 for most bidding zones. The Swedish and Norwegian bidding zones only show general positive trends. Portugal is the only country showing a slight downward trend. Due to overall similar patterns of the price developments in the EU, that are easily related with the deterioration of the natural gas supply, we consider power prices to be largely driven by this pan-European situation, not so much by country specific conditions like climate or weather.

[61] We cover the following bidding zones: AT, BE, BG, CZ, DE-LU, DK1, DK2, EE, ES, FI, FR, GR, HR, HU, IE, IT-Calabria, IT-Centre-North, IT-Centre-South, IT-North, IT-SACOAC, IT-Sardinia, IT-Sicily, IT-South, LT, LV, NL, NO1, NO2, NO2-NSL, NO3, NO4, NO5, PL, PT, RO, SE1, SE2, SE3, SE4, SI, and SK.

Figure 18: Development of average daily day-ahead prices (EUR/MWh) in 2022 across single bidding zones

Source: Authors' own elaboration.

Note: We take all energy price data for 2022 from ENTSO-E Transparency Platform. The prices displayed are Average Daily DAPs. We calculate the price by dividing the sum of all hourly DAPs per bidding zone on a certain day by 24 hours. The red line indicates the beginning of the Russian Invasion of Ukraine on February 24, 2022.

4.2.2. Calculation of the revenue cap

The cap applies to revenue from electricity generated from wind, solar, geothermal, hydropower without reservoir, biomass fuel, waste, nuclear, lignite, crude petroleum products and peat. We therefore split the production data into treated and non-treated energy sources.

We calculate the revenue generated as follows:

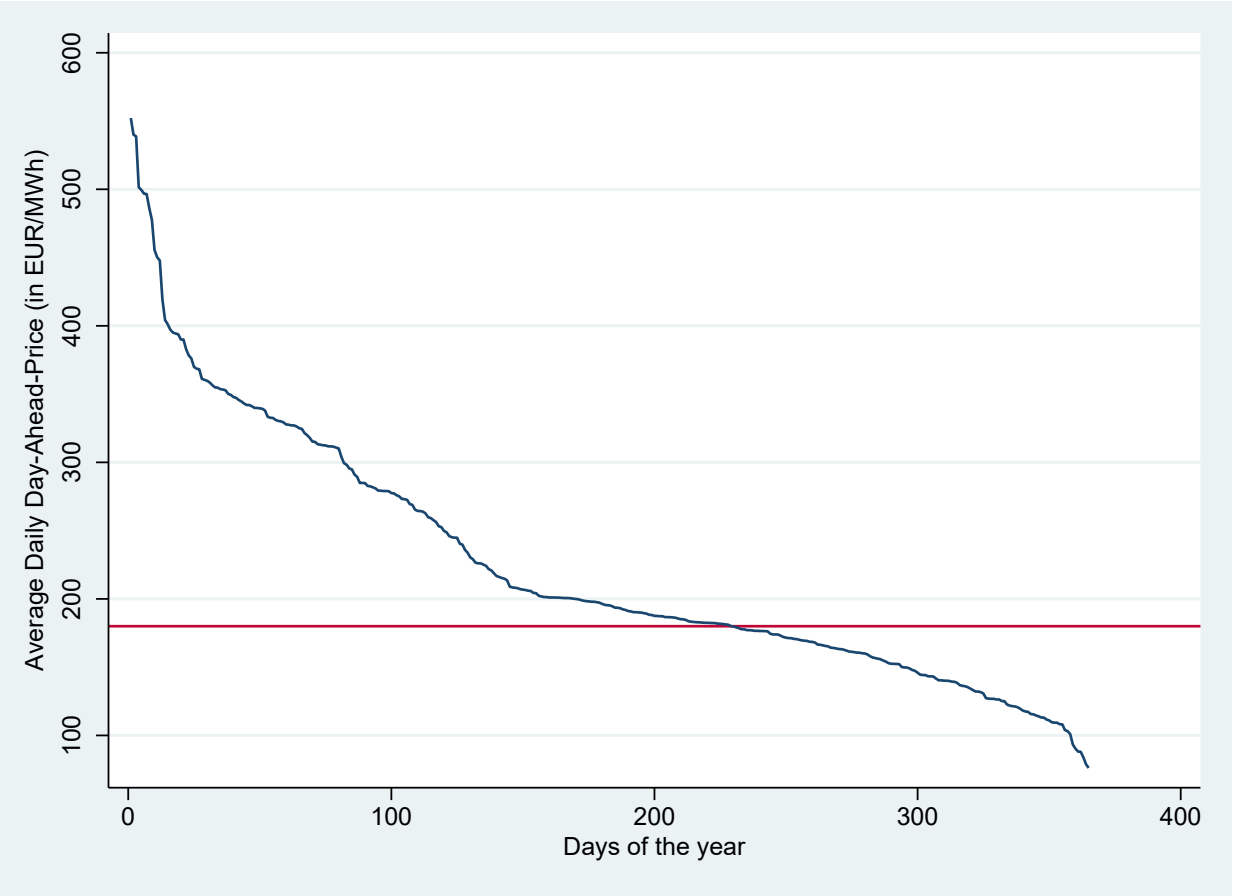
$$Rev_h = p_{€/\mathrm{MWh}} * \ q_{energy\ in\ MWh} \quad (4)$$

We quantify the expected tax revenue from the application as following (capturing 100% of excess market revenue), even though "Member States may decide that the cap on market revenues only applies to 90% of the market revenues exceeding the cap".

$$RevCap_h = (p_{>180\ €/\mathrm{MWh}} - 180) * q_{energy\ treated} \quad (5)$$

Figure 19 depicts the average day-ahead prices in 2022 ordered by size. It shows that the price even exceeded 500 EUR on some extreme days. Moreover, it becomes obvious that there are not only rare cases in which the cap applies because the price exceeds 180 EUR. On the contrary, there are many taxable events. More precisely, this was the case in more than 200 days in the last year.

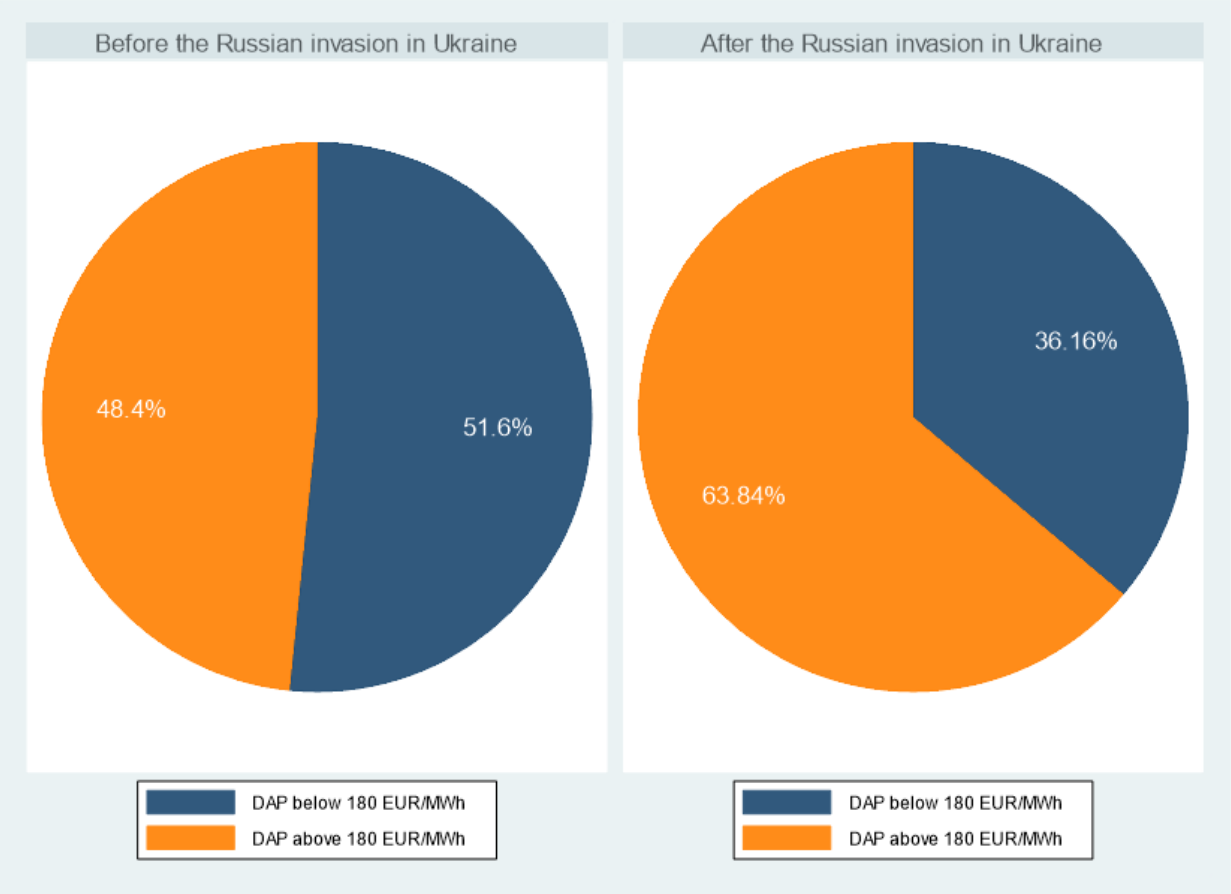
Figure 19: Average day ahead prices (EUR/MWh) across bidding zones ordered by size



Source: Authors' own elaboration.

Note: We take all energy price data for 2022 from ENTSO-E Transparency Platform. The prices displayed are Average Daily DAPs. We calculate prices by summing up all hourly DAPs on a certain day and dividing it by the total number of hourly DAPs over all bidding zones on that certain day. The Average Daily DAPs are ordered by size. The red line indicates an Average Daily DAP of 180 EUR/MWh.

Figure 20: Share of day-ahead prices above 180 EUR/MWh in the month before and after the Russian invasion in Ukraine



Source: Authors' own elaboration.

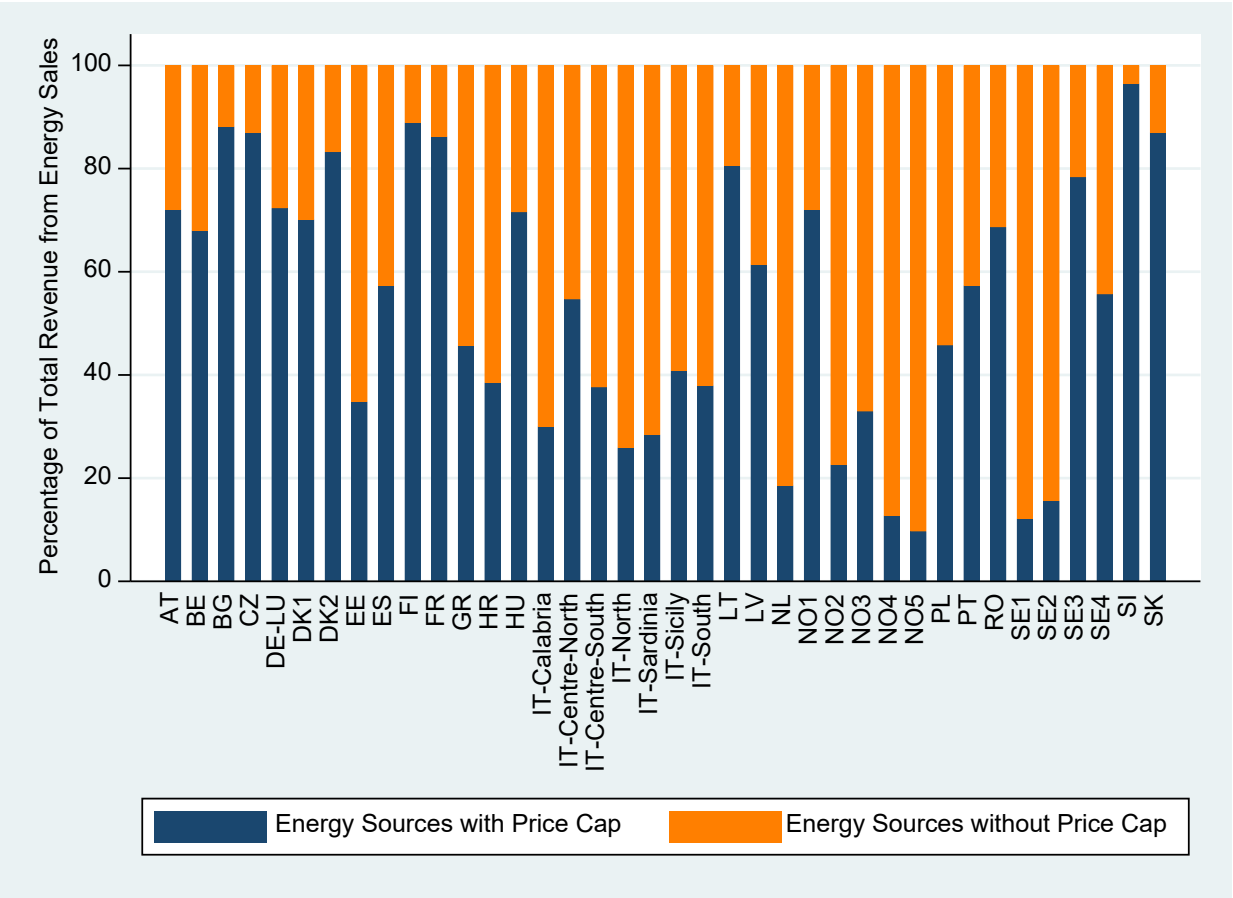
Note: We take all energy price data for 2022 from ENTSO-E Transparency Platform. To make the pie charts comparable the time periods observed before and after the Russian Invasion of Ukraine are of the same length. Before the Russian Invasion of Ukraine, we observe the hourly DAPs from January 1, 2022 to February 24, 2022 and after the Russian Invasion of Ukraine, we observe the hourly DAPs from February 25, 2022 to April, 2022.

The comparison in Figure 20 shows that the share of day-ahead-prices above the revenue cap of 180 EUR was at 48.2% prior to the Russian invasion in Ukraine and increased about 15 percentage points to 63.84% afterwards. This is a substantial increase but still, also on days before 24th of February 2022 prices over 180 EUR/MWh have not been rare. The graphs include the hourly day-ahead prices across the EU for 55 days before and after the beginning of the Russian invasion.

The price cap only applies if the energy is generated through wind, solar, geothermal, hydropower without reservoir, biomass fuel, waste, nuclear, lignite, crude petroleum products and peat[62]. Overall, the treated energy sources make up 60.36% of revenue and the non-treated ones 39.46%, but the spread is uneven over the bidding zones (The differences in the revenue are not only caused by price but also by the varying volumes of energy traded in the respective bidding zones.

[62] EU Council, Council Regulation, p. 32-33.

Figure 21: Revenue from energy sales in Mio EUR for energy source



Source: Authors' own elaboration.

Note: All energy price data and production quantities for 2022 are taken from ENTSO-E Transparency Platform. We calculate the percentages by dividing the revenues from energy sales from energy sources with a price cap or without a price cap by the total revenue from energy sales in 2022 in a certain bidding. The revenues from energy sales, we calculate by multiplying the aggregated quantity produced of an energy source in a certain hour by the hourly DAP in the specific bidding zone. Energy Sources to which the price cap applies are: offshore wind, onshore wind, solar, geothermal, hydro run-of-river and poundage, hydro pumped storage aggregate, biomass, other renewable, waste, nuclear, fossil brown coal/lignite, fossil oil, and fossil peat.

To get an intuition for the order of size of the additional tax burden introduced by the revenue cap, we also compute the corporate income tax (CIT) and the revenue cap on a MWh of electricity. As the CIT is levied on profits and not on revenues, we need to calculate the expected profits for the energy types. Kost et al. (2021) estimate the cost of generating electricity per energy unit from biomass, lignite, fossil gas, offshore wind, and onshore wind in 2021, which allows us to calculate a CIT proxy for electricity generated from these inputs. We take their lower bound estimates for costs (item levelized costs of electricity)[63]. The revenue cap is calculated as shown before for the single energy sources. We approximate the CIT in the following way:

$$CIT = (Q_{MWh} * DAP \ - Q_{MWh} * \text{cost}) * \text{tax} \qquad (6)$$

We use as a tax rate the Combined Corporate Tax Rate obtained from OECD Stats[64], which includes state-level taxes and local surcharges. DAP is the day-ahead-price.

[63] Kost et al. (2021) p. 37.

[64] OECD Statistics Database, Dataset: Statutory Corporate Income Tax Rates, Item: Combined Corporate Income Tax Rate, year: 2022, unit: percentage.

Figure 21 depicts the tax revenue from approximated CIT and the revenue cap for different energy sources. As shown by the figure, the top up generated by revenue cap is strong. This is particularly true for lignite as energy source but also for renewables such as onshore wind, offshore wind and biomass.

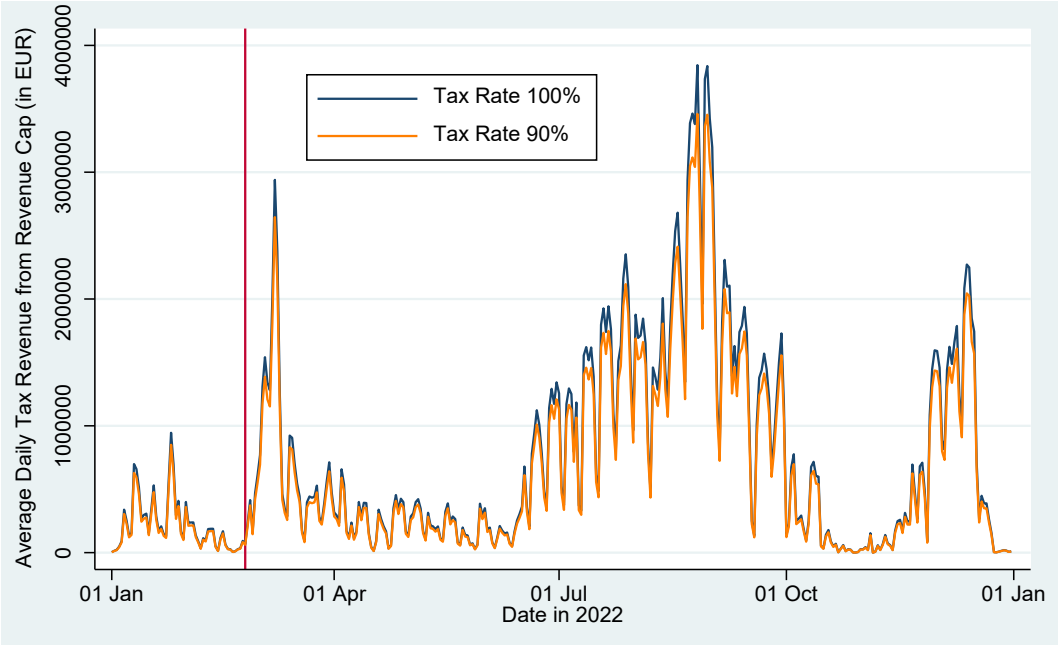
Figure 22: Calculated tax revenue generated from different energy sources in the EU

Source: Authors' own elaboration.

Note: We take all energy price data and production quantities for 2022 from ENTSO-E Transparency Platform. The CIT tax rates are the Combined Corporate Income Tax Rates from the OECD Statistics Database. To calculate the tax base for the CIT, the lower bound of production costs per MWh for the different energy sources is taken from Kost et al. (2021). We calculate the tax revenue from the CIT and the revenue cap as shown in Chapter 4.2.1. All graphs share a common scale.

Furthermore, to address the country specific implementations of the EU Member States we estimate the expected tax income from the revenue cap if the tax rate is only 90%. Figure 22 shows the average differences between the two cases. The effect of 100% only gets evident in periods with extremely high DAP prices whereas in moderate price setting there are mostly no differences in tax income.

Figure 22: Calculated tax revenue generated from different energy sources in the EU



Source: Authors' own elaboration.

Note: All energy price data and production quantities for 2022 are taken from ENTSO_E Transparency Platform. The tax income from the revenue cap is calculated as shown in Chapter 5.2 once with a tax rate of 100% and once with a tax rate of 90%. The tax income shown is a daily average value calculated from hourly tax income in all observed bidding zones. The red line indicates the beginning of the Russian Invasion of Ukraine on 24.02.2022.

Table 8 summarizes the calculated aggregated tax revenue from the revenue cap. In total, according to our calculations and based on our assumptions the tax revenue amounts to 106 bn EUR. Almost half of the revenue of the revenue cap stems from taxing windfall profit taxes on revenues from lignite (50.5 bn EUR), followed by onshore wind (30.9 bn EUR), biomass (16.7 bn EUR), offshore wind (7.9 bn EUR). The revenue estimation is closely linked to the enormous peaks in energy prices in 2022. Caution is warranted with respect to the absolute volume of expected tax revenues. Energy prices have been falling since December 2022.

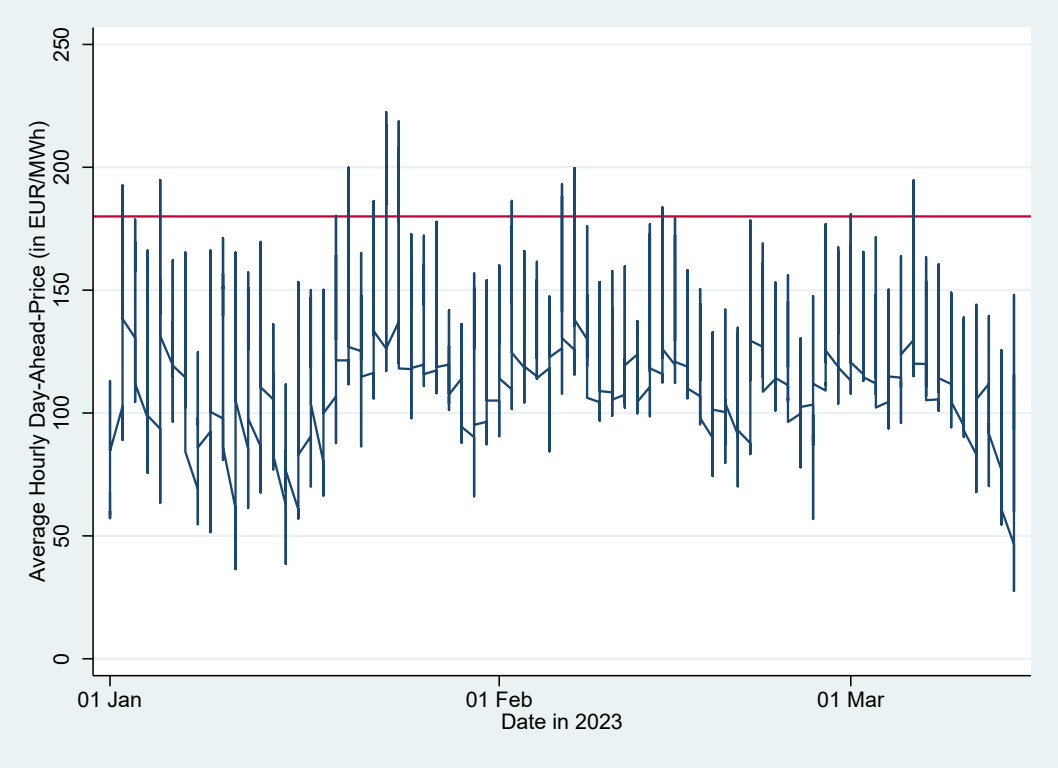
Table 8: Calculated aggregated tax revenue (in EUR) from revenue cap (total and per energy source)

Calculated Tax Revenue	Revenue Cap [EUR]
Annual Aggregate EU	106,000,000,000
Annual Aggregate EU per Energy Source	
Biomass	16,700,000,000
Lignite	50,500,000,000
Onshore Wind	30,900,000,000
Offshore Wind	7,956,889,000
Fossil Coal	0
Fossil Gas	0

Source: Authors' own elaboration.

Figure 23 and Figure 24 make evident that the number of taxable events from January to mid-March 2023 is substantially lower compared to 2022. This of course has strong implications on the revenue to be collected from that tax the revenue cap over the proposed application period.

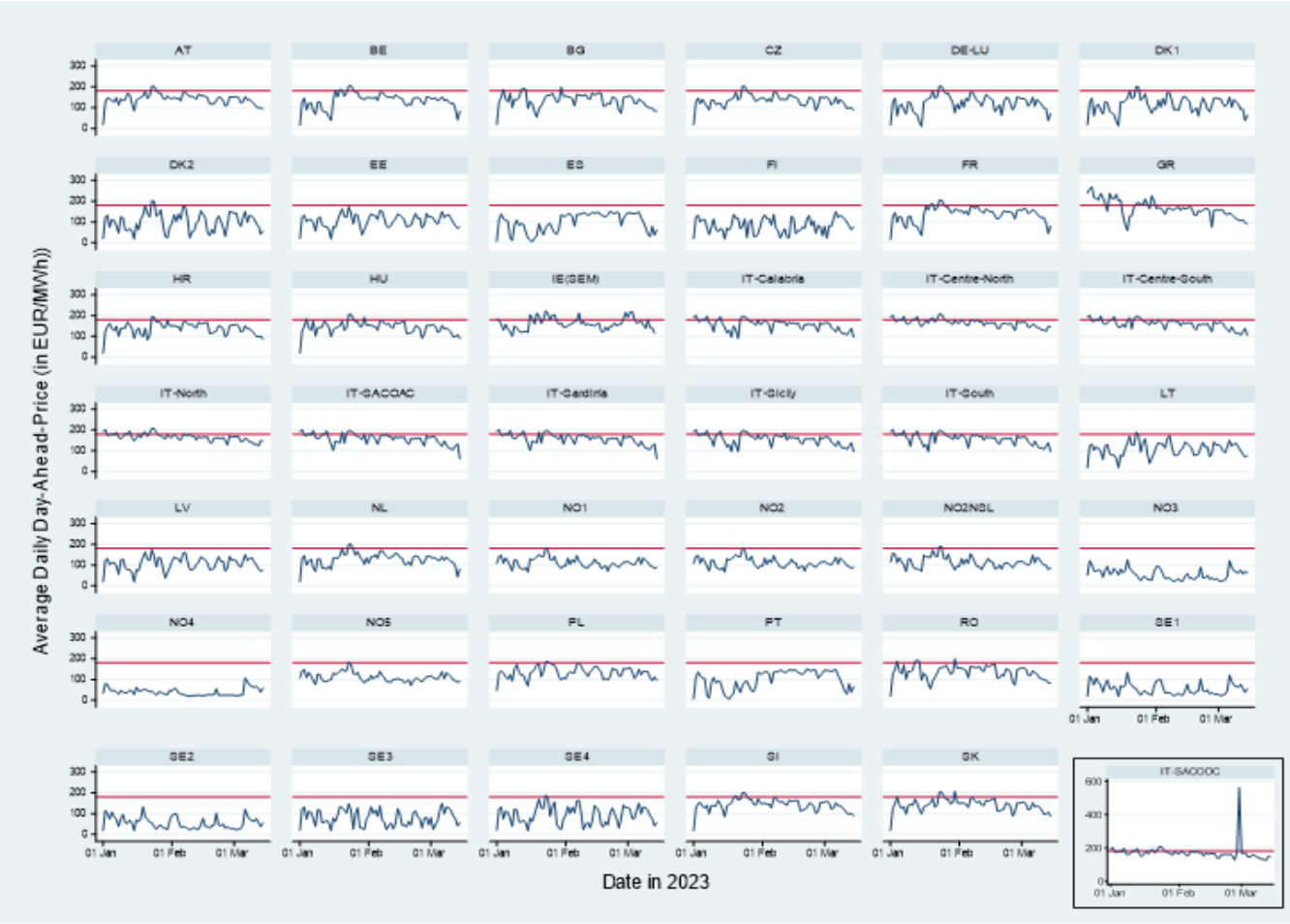
Figure 23: Average Hourly Day-Ahead-Price (in EUR\MWh)



Source: Authors' own elaboration.

Note: All energy price data is taken from ENTSO-E Transparency Platform for January to March 2023. The prices displayed are Average Hourly DAPs. Those prices are calculated by dividing the sum of all hourly DAPs at a certain hour of a day by the number of prices available across bidding zones in this hour of a day. The red horizontal line marks the price cap of 180 EUR/MWh.

Figure 24: Average daily day-ahead prices (in EUR/MWh) for January-March 2023



Source: Authors' own elaboration.

Note: All energy price data is taken from ENTSO-E Transparency Platform for January to March 2023. The prices displayed are Average Daily DAPs. Those prices are calculated by dividing the sum of all hourly DAPs per bidding zone on a certain day by 24 hours. The red horizontal line marks the price cap of 180 EUR/MWh. All graphs share a common scale, only the bidding zone "IT-SACODC" has its own scale due to peak prices in the beginning of March 2023.

5. CRITICAL ANALYSIS OF THE PROPOSED MEASURES

KEY FINDINGS

One of the most problematic aspects of (temporary) windfall profit taxes is that firms might anticipate the introduction of these types for example when implementation takes a long time and the tax is not retroactive. In that case, behavioural responses impede the efficiency of the tax. This is even more the case when an extension to other sectors is expected and the windfall tax is based on profits instead of revenues. When confidence into a reliable tax system is lost, uncertainty increases and affects future investments negatively.

In addition, excess profits can have an important signalling function. They highlight scarcity and provide an incentive for market entry or for expanding production capacities. Taxing excess profits reduces these incentives, which could be detrimental for the economy. In this vein, levying windfall profit taxes on renewables is not straightforward given the relevance of these energy sources for alleviating the crisis of energy supply and for facilitating decarbonisation.

Since the proposal is silent on the measure to be used or the respective allocation mechanism, Member States will be able to tailor the measures according to the specific needs of their households or affected firms. According to prior research, untargeted measures are a rather expensive way of reaching poor households. Moreover, incentives for reducing energy consumption should be restored as soon as possible.

From an allocative efficiency perspective, the proposed cap is not strategically neutral to market participants, but clearly superior to alternative measures that affect price formation overall, such as subsidies to marginal technologies or the abandonment of uniform pricing.

5.1. Assessment benchmark for the purpose of this study

The windfall profit tax proposed by the Council of the EU intends to raise revenue that can be redistributed to consumers and firms to mitigate the hardships by surging energy prices. The EU plans to levy windfall profit taxes from all firms that experienced exceptionally high profits due to surging energy prices.

Ideally, tax revenue should be raised as efficiently as possible. An efficient tax minimizes the cost of complying with the tax code because it minimizes economic distortions and at the same time is conveniently collected at low administrative burden. Therefore, a discussion of these distortions and and administrative considerations will be central to the analysis of the properties of the proposed windfall profit taxes in chapter 4.2.

5.2. Analysis of potential distortions arising from windfall profit taxes

The proposed solidarity contribution and the revenue cap both fulfil the objective of collecting tax revenue that can in a second step be redistributed according to the Member States' priorities to face specific hardship of the energy crisis. With regard to efficiency concerns, several arguments are put forward in the literature and will be summarized here. Where applicable, we highlight whether specific concerns apply to a particular design of a windfall profit tax.

Excess profits can have an important signalling function. They highlight scarcity and provide an incentive for market entry or for expanding production capacities. Consequently, they attract resources

to these activities. Taxing excess profits in this context removes the incentives where profit expectations are highest, with detrimental effect on the economy. In the energy sector, however, market entry is often not possible due to high entry costs. Here, a one-time excess tax could still be efficient[65]. Yet, the energy sector has always been a sector in which profits fluctuate strongly over time, e.g. due to unexpected geopolitical shocks that lead to massive price fluctuations. Companies anticipate these risks and take them into account in their decisions, even if they do not foresee what specifically will be the next cause of a price change. Similarly, imposing excess taxes impedes the competition for innovation because it taxes away part of the winning premium[66]. When it comes to natural resources that generate specific rents, optimal pricing of exploitations rights is one alternative option to collect part of the natural rents[67]. As will be shown in the quantitative part of this study, introducing windfall or excess profit taxes imposes a double taxation since the respective tax base of the proposed windfall taxes is part of the tax base of the corporate income tax. Consequently, Member States are also in the absence of windfall profit taxes collecting taxes on these excess profits via the corporate income tax. Double taxation is problematic because it amplifies the asymmetric taxation of profits and losses thus reducing investment and (risky) innovation incentives[68].

In the context of windfall profits in the COVID-19 pandemic, several authors make the point that policy makers should take firms' tax planning activities into account. Avi-Yonah (2020) argues that a windfall tax on a measure of taxable profits could easily be avoided by increasing deduction in the tax accounts or by splitting up activities. More generally, Christians et al. (2022) stress that when introduced nationally, governments should not expect raising huge amounts of revenue when capital is mobile. Still, the fact that the solidarity surcharge is levied on profit measures, it is implicitly impeded by cross-border profit shifting activities of multinationals which reduce profits via financing, transfer pricing or royalty payments. The tax planning argument becomes even more important when the implementation phase of the solidarity surcharge is long and if the tax is not only applicable to past periods. For example, the analysis on the implementation in the Member States (Chapter 3 and Annex 1) highlights numerous countries which implement the regulations for 2023 (and not retroactively for 2022). In that case, behavioural responses are likely to occur. With respect to profit based windfall profit taxes (such as the solidarity contribution) profit shifting to low tax jurisdiction may erode the base for the application of the windfall tax. Mechanism for this behaviour of multinationals are well known at least since the G20/OECD BEPS debate. Broad empirical evidence on multinationals' suggests that tax increases induces a partial reallocation of firms' profits to lower taxing jurisdictions[69] (or non-EU countries without windfall profit taxes).

One of the most problematic aspect of (temporary) windfall profit taxes is that firms might perceive the introduction of (temporary) windfall profit taxes as a threat to their confidence in the tax system. This is of course not a desirable outcome. In particular, not with respect to investments in renewable energy sources which are key to address the crisis of energy supply and to facilitate decarbonisation. It is not intuitive to deter firms from investing in renewables by taxing the earned profits with corporate income tax and a revenue cap. Hence, Maurer et al. (2022) suggest exempting renewables from the proposal. This is in contrast to the aim of the EU commission to introduce a technological neutral windfall profit tax. However, as our quantification shows, the current proposal also does not achieve technological neutral tax burden as the prerequisites are quite different.

---

65 Langenmayr (2023), p. 71.

66 BMF (2022), p. 10.

67 BMF (2022), p. 12.

68 Langenmayr and Lester (2018), p. 237.

69 Heckemeyer and Overesch (2017), p. 965.

The debate of extending the windfall profit tax to other sectors is critical in two regards. First, it negatively affects the investment climate in sectors expecting to face a windfall profit tax in the future. Second, as pointed out in Chapter 3, the specific characteristics of the power market make windfall profits easier to observe and to tax (in the form of a revenue cap as marginal costs are very low). For other sectors, however, it is much more difficult to observe excess profits and the windfall tax would have to follow the design of the solidarity contribution[70]. As such, it will be subject to avoidance strategies such as profit shifting which in return limits expectations on revenues to be raised from this tax.

Finally, administrative considerations play an important role. First, it is not straightforward how to fix the threshold for normal and excess profits. Based on the current EU proposal, Maurer et al (2022) put forward a number of constructive suggestions to improve the existing concept. In particular, their recommendations are linked to the specificities of the market which they would like to see been taken into account. Essentially, the revenue cap should explicitly address forward based contracts and calculate profits based on installed capacity to avoid that generators stop production as reaction to the tax. Furthermore, they suggest floating instead of fixed caps and to use metered volumes multiplied with day-ahead-prices to maintain the incentive to sell where value is highest.

5.3. Considerations on the distribution of collected revenues

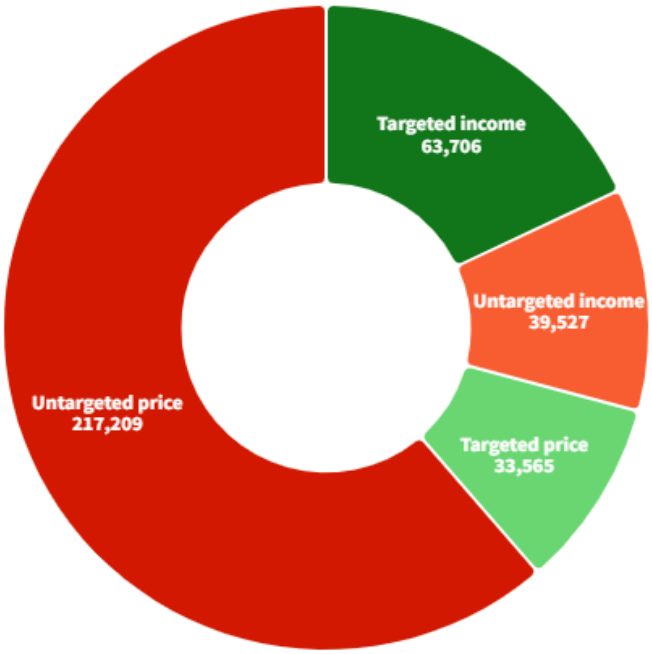
When it comes to distribution of collected revenues, the revenue gains from the solidarity contribution and the revenue cap provide some financial leeway to the Member States to address specific hardships of the energy crisis. Since the proposal is silent on the measure to be used or the respective allocation mechanism, Member States will be able to tailor the measures according to the specific needs of their households or affected firms. In principle, the available measures can be classified as targeted (vulnerable households/firms only) or untargeted (all households/firms) and they either reduce prices or support income. For example, providing lump sum vouchers to vulnerable households is a targeted approach affecting the income of eligible households. This approach has the strength, that households are still exposed directly or indirectly via a retail contract to the marginal price of electricity (thus maintaining the incentive for reducing energy consumption) without being faced with affordability issues. Despite this advantage, many countries rather favoured un-targeted price-distorting measure, e.g., cuts to excise duties and VAT, compared to income-support measures (see Figure 25 for an illustration)[71]. Given the fact that the absolute amount of revenue to be collected from the windfall profit tax could be smaller than expected (due to falling prices in 2023), it should be kept in mind that untargeted measures are a rather expensive way of reaching poor households[72]. However, as Arregui et al. (2022) acknowledge, implementing targeted reliefs promptly turned out challenging. They emphasize the need to replace distorting measures as soon as possible by non-distorting measures.

[70] Alternatively, Christians and Diniz Magalhaes (2020) put forward a global excess profits tax as a "third pillar" aligning the concept with the distinction between routine profits and residual profits as in the OECD "pillar 1" proposal.

[71] Sgaravatti et al. (2023).

[72] Warwick et al. (2022); a similar argument is made in Arregui et al. (2022).

Figure 25: Support measures taken to alleviate the consequences of the energy crisis covering the period September 2021 until January 2023 [EUR million]



Source: Sgaravatti et al. (2023).

Note: The amounts reported by the Sgaravatti et al. (2023) exclude the German package – Economic Defence Shield (EUR 200 billion).

5.4. Discussion of alternative approaches to limit the price surge in electricity markets

Several EU Member States have proposed or implemented other approaches to limit surging power prices in electricity wholesale. Among those are: (i) reducing energy tax levels on the consumer side or capping prices, (ii) capping the input cost/ subsidising fuels for marginal power plants, (iii) discarding the principle of uniform pricing. The following paragraphs provide a brief discussion thereof in a general form, not going into the details of specific proposals[73]. The focus is put on their effect on allocative efficiency and the comparison to the revenue cap introduced before.

A **reduction of energy taxes or VAT** on energy consumption is a straightforward measure to ease the strain on consumer budgets. Evidently, it conversely affects the government budget. For proportional taxes (e.g., VAT), reducing the rate on a surging tax base (energy prices) might still result in an overall stable or even increasing tax return, but only to the cost of the taxpayers/ consumers. When large financial volumes are absorbed by energy providers for actual fuel costs and windfall profits on top, a change in consumer taxes can typically just redistribute the other agents financial means, not clawing back crisis-driven excess profits from the industry.

The alternative to reduced VAT taxation of energy products could be a **cap on gas and electricity prices for consumers** either for their whole consumption (e.g. France) or only part of it (e.g. Germany). With a fixed price per kWh for all of their consumption, households and companies face a constant marginal cost for electricity and have fewer incentives to reduce their electricity demand. In absolute terms, the measure benefits high-energy consumption households, which are often high-income households, most. When the price cap applies only for a fraction of the energy used, the marginal price signal remains intact, but the distributive effect depends very much on how the capped fraction of energy consumption is determined (see Tovar and Wölfing, 2018, for a discussion). On the supply side, utilities need to be compensated by the government at least at the margin for the difference of the market price and the price cap to avoid imbalances. Several Member States implemented consumer price caps, possibly because they are a simple and straight forward measure to support households and businesses. However, they do potentially result in inefficiencies due to the distortion of prices and weigh heavily on the public budget if introduced without measures to claw back windfall profits.

A **cap on fuel cost for marginal plants** (i.e. a cap on the price for natural gas in the current crisis) has the potential to shrink electricity prices substantially with only limited financial means. Capping fuel costs requires a subsidy that needs to be paid for, either from public budgets or by electricity consumers through a general levy. If there are many low-cost power generating capacities serving the largest part of the market (i.e. wind, hydro, nuclear) and few very expensive plants that serve at the margin (i.e. natural gas plants), we can picture the merit-order to be 'half-u-shaped" with a flat bottom and a steeply rising branch to the right. Bending down this branch by subsidising just the marginal plants has the potential (when competition among suppliers at the margin works) to melt down the enormous profits of the inframarginal plants for the entire market. Therefore, electricity bills might decline even if electricity consumers pay the subsidies through a levy on top. However, the subsidy will unavoidably change production volumes in the market by distorting prices away from the level that reflects actual scarcity. Consumers will have fewer incentives to economise electricity or postpone consumption in times when the strain on the system is actually high. Such a measure will clearly deteriorate the overall economic efficiency of the system. Additional problems will arise during the implementation as the identification of what plants to subsidise is critical and prone to error.

[73] Please refer to Heusaff et al. (2022) for a more detailed discussion on alternative proposals for energy market intervention.

A **change in electricity market design** has been proposed by the President of the European Commission Ursula von der Leyen to "decouple the dominant influence of gas on the price of electricity"[74]. Without further detail, it was suggested that a deep reform should put an end on a market design, which is "based on [the] merit order". To clarify the terms, it should be noted that the "merit-order" is generally defined as the order of production capacities according to marginal costs. Employment according to the merit-order is a necessary condition for allocative efficiency. The current design is just one design, which attempts, while imperfectly, to achieve a situation where firms bid truthfully such that the order of bids reflects the underlying merit-order of marginal costs.

Proposals arguing against "merit-order pricing" usually aim on a shift away from uniform marginal pricing, also called "pay-as-clear", towards an auction mechanism that pays different prices to different bidders, a so called "discriminatory price auction". The classic discriminatory price auction is the pay-as-bid setting where each bidder sells at the price of the own bid. It is clear, that bidders then have a strong incentive to bid above their own marginal costs, making their bids non-reveiling and jeopardizing an efficient dispatch along the merit-order. For that reason, there is a strong opinion among many economists that pay-as-bid auctions are less efficient compared to other designs. Ausubel et al. (2014) show that this does not necessarily hold true for multi-unit auctions and that a strict order in terms of efficiency and consumer surplus between pay-as-bid- versus uniform price auctions is not possible. The reason for the ambiguity established by Ausubel et al. (2014) is the possibility to exert market power, which corresponds to capacity withholding in the case of electricity generation. As we have seen before, forward markets provide a strong instrument to foster competition, and help to mitigate some of the issues put forward by Ausubel et al. (2014).

Even the current system has markets that depart from the widely used uniform marginal pricing and the experience is not convincing[75]. Balancing reserves in Germany have been procured by TSOs through pay-as-bid auctions. The scheme has seen various reforms due to obvious flaws in price formation and incentives while not touching the pay-as-bid principle. These reforms lead to strikingly drastic changes in submitted price bids under otherwise comparable conditions, showing that incentives for truthful cost-based bidding are lacking in pay-as-bid-designs.

In comparison to the last two discussed proposals, the most striking difference of the **revenue cap** is that the latter attempts to work on the inframarginals alone, not affecting the uniform price mechanism or the marginal plant. Still acting on prices and with quantities as the tax base, such levies risk to distort production decisions, giving rise to allocative inefficiencies. A long-run risk is a distortion of investment incentives. The risk is limited by the restriction on inframarginal capacities with sunk investments, especially for coal plants where future investments are less of a concern. The risk might be more pronounced for renewable energies, having been built more recently and where more investment will be needed in the near future. The cap of 180 EUR/MWh, still allows for significant profits, so the risk lies rather in the perception of potential investors that policymakers might interfere again when profits are higher than usual. A short-run risk of the revenue cap would be an alteration of production decisions in response to the policy. Again, a cap at a level of 180 EUR/MWh and the focus on inframarginals gives ample opportunity for profit, limiting the risk of distortion. In markets with large producers with a diverse generation portfolio, however, the cap might lower the cost to withhold inframarginal capacities to raise overall prices and earn higher profits on non-capped installations. Possible counter measures are (i) close scrutiny by competition authorities and (ii) the collection of less than 100% of the excess revenues. From an allocative efficiency perspective, the proposed cap is not strategically neutral

[74] Ursula von der Leyen, President of the European Commission, State of the Union Address, 2022. Available at: https://ec.europa.eu/commission/presscorner/detail/ov/speech_22_5493.

[75] For more information, see Acer (2022a), p. 19.

to market participants, but clearly superior to alternative measures that affect price formation overall, such as subsidies to marginal technologies or the abandonment of uniform pricing.

6. CONCLUSION

For some companies, the surge of energy prices has come as an opportunity. Many energy firms have seen their profits and stock prices rise, earning rents from the increase in coal, oil and gas prices. Thus, the surge in fossil fuel prices has generated substantial windfall profits in the energy sector. This has benefited mainly firms that extract fossil fuels and for oil refineries. Yet, the increase in energy commodity prices, in particular for natural gas that is frequently fuelling the marginal plant, leads to exceptionally high prices in the day-ahead market which comes to the benefit of technologies with significantly lower marginal costs (e.g., renewables, nuclear, lignite).

Against this background, the "*Council Regulation on an emergency intervention to address high energy prices*" proposes the introduction of windfall profit taxes, i.e. a revenue cap on inframarginal technologies and a solidarity contribution for the fossil fuel sector, to avoid negative spillovers within the European energy market caused by uncoordinated national measures. The idea behind windfall taxes is that windfall profits derive from an unanticipated event that resulted not from direct actions at the initial investment decision of the companies but rather because of external changes in market circumstances. Thus, the beneficiaries of the current crisis should help to finance part of the financial burden to support vulnerable households and firms.

The aim of this study is to analyse the effectiveness of windfall profit taxes, in particular with respect to the Commission's recommendation to the Member States and to quantify the potential tax revenues. Moreover, the study briefly summarizes considerations on the distribution of collected revenues.

Companies active in the oil and gas industry faced pronounced increases in profits in 2022. This is in line with the Council's argumentation that these companies benefited from excess profits that do not correspond to any regular profit that they could have expected to obtain.

Within the proposed framework of the regulations, Member States have some leeway for implementing the revenue cap and the solidarity contribution. The comparison of national implementations shows that Member States indeed use their leeway.

We observe that Member States frequently use their ability to implement a stricter cap on market revenues from inframarginals. In addition, several countries rely on different caps depending on the underlying technology used to generate electricity. Implementation is mostly dated to the 1st of December 2022. The application phase in most countries expands to the end of 2023.

Most EU Member States follow the proposed average earnings method to define the tax base for the solidarity contribution for the fossil fuel sector. Still, we find some variation in the implemented tax bases. The applicable tax rate ranges from the minimum tax rate of 33% to 75% in Ireland. Largest variation exists in the respective application period of the solidarity contribution.

We find that the proposed solidarity contribution and the revenue cap both fulfil the objective of collecting tax revenue. Applying the selection criteria for the application of the solidarity contribution on the Orbis database results in a sample of 293 firms. Based on firms' profits for 2021 and adjusted reference period (2017 to 2020), the calculated tax revenue for the solidarity contribution amounts to 4.4 bn EUR for the selected sample of firms.

For the calculation of tax revenue from the revenue cap, we rely on (hourly) day-ahead prices and actual generation per production type per bidding zone provided by the ENTSO-E Transparency platform. To approximate the potential tax revenue, we rely on the period 01.01.2022-31.12.2022. Descriptive analysis shows that in more than 200 days in the last year, the average day-ahead price exceeded the market revenue cap of 180 EUR/MWh. In total, the hypothetical introduction of the proposed market revenue cap for 2022 would have raised tax revenues up to 106 bn EUR for the year 2022. This

estimation is closely linked to the enormous peaks in energy prices in 2022. Caution is warranted with respect to the absolute volume of expected tax revenues. Energy prices have been falling since December 2022. The number of taxable events is thus substantially lower in 2023 with direct effects on the potential tax revenue.

Introducing the solidarity contribution and the revenue cap imposes a double taxation since the respective tax base of both proposed windfall taxes is already part of the tax base of the corporate income tax. Consequently, Member States are also in the absence of windfall profit taxes collecting taxes on these excess profits via the corporate income tax. Double taxation is problematic because it amplifies the asymmetric taxation of profits and losses thus reducing investment and (risky) innovation incentives.

In theory, taxes on economic rents are efficient since they do not reduce investment. The tax applies only to returns above what is required to invest. Yet, empirical evidence finds that historical windfall taxes affected investment. The US excess profits tax on domestic oil production of the 1980s significantly reduced production of affected oil wells.

One of the most problematic aspects of (temporary) windfall profit taxes is that firms might anticipate the introduction of these types of taxes, for example when Member States use a later implementation date than stipulated in the Council regulation (for example, Denmark, Finland, Sweden for the solidarity contribution for the fossil fuel sector). This argument also holds when a political discussion includes an expansion of windfall taxes to other sectors. When confidence into a reliable tax system is lost, uncertainty increases and affects future investments negatively.

In addition, excess profits can have an important signalling function. They highlight scarcity and provide an incentive for market entry or for expanding production capacities. Taxing excess profits reduces these incentives, which could be detrimental for the economy. In this vein, levying windfall profit taxes on renewables is not straightforward given the relevance of these energy sources for alleviating the crisis of energy supply and for facilitating decarbonisation.

The extent to which the imposition of the current proposed windfall taxes changes the behaviour determines both the deadweight loss of such taxes and the effectiveness of tax collection. Other than investment, behavioural responses could include avoiding the applicability of the tax (e.g. by splitting up activities or reallocating profits to low tax jurisdictions). This, however, is not possible with retroactive windfall profit taxes. The current Council regulation is partly retroactive since it applies to profits earned in 2022 and partly prices realized in 2022. Still, the application periods implemented in the Member States vary (see Annex 1).

In view of global capital mobility, a coordinated introduction of excess profit taxes is preferable to reduce the scope for tax arbitrage. Moreover, uncoordinated national measures could affect the functioning of the internal energy market due to the coupled electricity market, endangering security of supply and leading to further price increases in the Member States most affected by the crisis.

The additional tax revenue collected from the proposed excess profits taxes can be redistributed to address the hardships of surging energy prices. Redistribution can be targeted specifically to groups that are hit hardest by the energy crisis. According to prior research, untargeted measures are a rather expensive way of reaching poor households. Moreover, incentives for reducing energy consumption should be restored as soon as possible.

From an allocative efficiency perspective, the proposed cap is not strategically neutral to market participants, but clearly superior to alternative measures that affect price formation overall, such as subsidies to marginal technologies or the abandonment of uniform pricing.

REFERENCES

- ACER (European Union Agency for the Cooperation of Energy Regulators), 2022a, *ACER's Final Assessment of the EU Wholesale Electricity Market Design*. Available at: https://www.acer.europa.eu/events-and-engagement/news/press-release-acer-publishes-its-final-assessment-eu-wholesale.
- ACER, 2022b, *Overview of European Electricity Wholesale Markets Trends in 2021*. Available at: https://www.acer.europa.eu/media/charts/overview-european-electricity-wholesale-markets-trends-2021 (last data update 01 February 2022).
- Arregui, N., Celasun, O., Iakova, D., Mineshima, A., Mylonas, V., Toscani, F., Wong, Y., Zeng, L., & Zhou, J. (2022). *Targeted, Implementable, and Practical Energy Relief Measures for Households in Europe*. IMF Working Papers, 2022/262. Available at: https://www.imf.org/en/Publications/WP/Issues/2022/12/17/Targeted-Implementable-and-Practical-Energy-Relief-Measures-for-Households-in-Europe-526980.
- Auerbach, A.J. and Hines Jr., J.R., 2002, *Chapter 21 – Taxation and Economic Efficiency,* Handbook of Public Economics Vol. 3: 1347-1421. Available at: https://doi.org/10.1016/S1573-4420(02)80025-8.
- Ausubel, L.M., Cramton, P., Pycia, M., Rostek, M. and Weretka, M., 2014, *Demand Reduction and Inefficiency in Multi-Unit Auctions*, Review of Economic Studies 81 (4): 1366-1400. Available at: https://doi.org/10.1093/restud/rdu023.
- Avi-Yonah, R.S., 2020, *Taxes in the Time of Coronavirus: Is It Time to Revive the Excess Profits Tax?*, University of Michigan Public Law Research Paper No. 671, University of Michigan Law & Econ Research Paper No. 20-008. Available at: http://dx.doi.org/10.2139/ssrn.3560806.
- Bajgar, M., Berlingieri, G., Calligaris, S., Criscuolo, C., Timmis, J., 2020, *Coverage and representativeness of Orbis data*, OECD Science, Technology and Industry Working Papers, No. 2020/06, OECD Publishing, Paris. Available at: https://doi.org/10.1787/c7bdaa03-en.
- Baunsgaard, T. and Vernon, N., 2022, *Taxing Windfall Profits in the Energy Sector*, IMF Note 2022/002, International Monetary Fund. Available at: https://www.imf.org/en/Publications/IMF-Notes/Issues/2022/08/30/Taxing-Windfall-Profits-in-the-Energy-Sector-522617.
- BMF, 2022, *The Advisory Board to the Federal Ministry of Finance, Translation of Report 03/2022 of 25 July 2022*. Available at: https://www.bundesfinanzministerium.de/Content/EN/Downloads/About/Advisory-Board/excess-profits-taxes.pdf?__blob=publicationFile&v=5.
- Busby, C., Creigthon, M. and Bernier, G., 2021, *Cost Estimate of an Excess Profits Tax*. Available at https://www.pbo-dpb.ca/en/publications/RP-2122-002-M--cost-estimate-an-excess-profits-tax--montant-estimatif-un-impot-benefices-exceptionnels.
- Christians, A. and Diniz Magalhães, T., 2020, *It's Time for Pillar 3: A Global Excess Profits Tax for COVID-19 and Beyond*, Tax Notes International, May 4: pp. 507-510, Available at: http://dx.doi.org/10.2139/ssrn.3882142.
- Dubinina, E., Garcia-Bernardo, J., and Janský, P., 2021, *Excess Profits Tax – Estimating the potential tax revenue gains for the European Union*. Available at: https://left.eu/content/uploads/2021/11/FISC-v1.pdf.

- European Central Bank, 2022, *Risk sharing in the euro area: a focus on the public channel and the COVID-19 pandemic*, Economic Bulletin Issue 7. Available at: https://www.ecb.europa.eu/pub/economic-bulletin/html/eb202207.en.html.
- European Commission, 2022, *Proposal for a COUNCIL REGULATION on an emergency intervention to address high energy prices*, COM/2022/473 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A473%3AFIN.
- European Union, 2022, *Types of legislation*. Available at: https://european-union.europa.eu/institutions-law-budget/law/types-legislation_en.
- Fabra, N., and Reguant, M., 2014, *Pass-Through of Emissions Costs in Electricity Markets,* American Economic Review 104 (9): 2872-99. Available at: https://doi.org/10.1257/aer.104.9.2872.
- Francois, M., Oliveira, C., Planterose, B., and Zucman, G., 2022, *A Modern Excess Profit Tax*, EU Tax Observatory Working Paper No. 5. Available at: https://www.taxobservatory.eu/wp-content/uploads/2022/09/EUTO_WP5_A_Modern_Excess_Profit_Tax-1.pdf.
- Green, R., and Newberry, D.M., 1992, *Competition in the British Electricity Spot Market*, Journal of Political Economy 100(5): 929-953. Available at: https://www.jstor.org/stable/2138629.
- Green, R., 1999, *The Electricity Contract Market in England and Wales*, The Journal of Industrial Economics 47: 107-124. Available at: https://doi.org/10.1111/1467-6451.00092.
- Hebous, S., Prihardini, D., and Vernon, N., 2022, *Excess Profit Taxes: Historical Perspective and Contemporary Relevance,* IMF Working Paper WP/22/187. Available at: https://www.imf.org/en/Publications/WP/Issues/2022/09/16/Excess-Profit-Taxes-Historical-Perspective-and-Contemporary-Relevance-523550.
- Heckemeyer, J.H., and Overesch, M., 2017, *Multinationals' Profit Response to Tax Differentials: Effect Size and Shifting Channels*, Canadian Journal of Economics, 50, 2017, 965-994. Available at: https://doi.org/10.1111/caje.12283.
- Heussaff, C., Tagliapietra, S., Zachmann, G., and Zettelmeyer, J., 2022, *An assessment of Europe's options for addressing the crisis in energy markets*, Policy Contribution 17/2022 Bruegel. Available at: https://www.bruegel.org/sites/default/files/2022-09/PC%2017%202022.pdf.
- Hintermann, B., 2016, *Pass-Through of CO_2 Emission Costs to Hourly Electricity Prices in Germany*. Journal of the Association of Environmental and Resource Economists 3(4): 857–891. Available at: https://doi.org/10.1086/688486.
- Kost, C., Shammugam, S., Fluri, V., Peper, D., Memar, A.D., and Schlegel, T., 2021, *Levelized Cost of Electricity – Renewable Energy Technologies*, Fraunhofer-Institute for Solar Energy Systems ISE. Available at: https://www.ise.fraunhofer.de/en/publications/studies/cost-of-electricity.html.
- Kydland, F.E. and Prescott, E.C., 1977, *Rules Rather than Discretion: The Inconsistency of Optimal Plans*, Journal of Political Economy 85(3): 473-792. Available at: https://doi.org/10.1086/260580.
- Langenmayr, D. and Lester, R., 2018, *Taxation and corporate risk-taking*, The Accounting Re-view 93: 237-266. Available at: https://doi.org/10.2308/accr-51872.
- Langenmayr, D., 2023, *Die Einführung einer Übergewinnsteuer – Übergewinnsteuern: Das falsche Instrument in der Krise, aber als langfristige Weiterentwicklung der Gewinnbesteuerung sinnvoll*, Steuer und Wirtschaft (1): 70-72. Available at: https://doi.org/10.9785/stuw-2023-1000109.

- Lazzari, S., 2006, *The Crude Oil Windfall Profit Tax of the 1980s: Implications for Current Energy Policy*, CRS Report for Congress. Available at: https://liheapch.acf.hhs.gov/pubs/oilwindfall.pdf.
- Maurer, C., Schlecht, I. and Hirth, L., 2022, *Six flaws in the EU Electricity Emergency Tool and how to fix them*, Euractiv. Available at: https://www.euractiv.com/section/energy/opinion/six-flaws-in-the-eu-electricity-emergency-tool-and-how-to-fix-them/.
- Milgrom, P. and Weber, R.J., 1982, *A Theory of Auctions and Competitive Bidding*, Econometrica 50: 1089-1122. Available at: https://doi.org/10.2307/1911865.
- Newbery, D.M., 1998, *Competition, Contracts, and Entry in the Electricity Spot Market*, RAND Journal of Economics 29(4): 726-749. Available at: https://www.jstor.org/stable/2556091.
- Oxfam America, 2020, *Pandemic Profiteers Exposed*, Oxfam Briefing Paper. Available at: https://www.oxfamamerica.org/explore/research-publications/pandemic-profits-exposed/.
- Plehn, C.C., 1920, *War Profits and Excess Profits Taxes*, The American Economic Review 10(2): 283-298. Available at: https://www.jstor.org/stable/1804867.
- Rao, N.L., 2018, *Taxes and US Oil Production: Evidence from California and the Windfall Profit Tax*, American Economic Journal: Economic Policy 10(4): 268-301. Available at: https://doi.org/10.1257/pol.20140483.
- Sgaravatti, G., Tagliapietra, S., Trasi, C., and Zachmann, G., 2023, *National policies to shield consumers from rising energy prices*, Bruegel Datasets (last updated: 13 February 2023). Available at: https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices.
- Thomas, W.A., 1978, *The Financing of British Industry, 1918-1976*, London: Methuen.
- Tovar, M., and Wölfing, N., 2018, *Household energy prices and inequality: Evidence from German microdata based on the EASI demand system,* Energy Economics, 70: 84-97. Available at: https://doi.org/10.1016/j.eneco.2017.12.002
- Vickrey, W., 1961, *Counterspeculation, Auctions, and Competitive Sealed Tenders*, Journal of Finance 16: 8-37. Available at: https://doi.org/10.2307/2977633.
- Vosslamber, R., 2019, *Tax failure: New Zealand's short-lived First World War Excess Profits Tax*, Accounting History Review 29(1): 79-102. Available at: https://doi.org/10.1080/21552851.2019.1590215.
- Warwick, R., Harris, T., Phillips, D., Goldman, M., Jellema, J., Inchauste, G., Goraus-Tańska, K., 2022, *The redistributive power of cash transfers vs VAT exemptions: A multi-country study*, World Development, 151. Available at: https://doi.org/10.1016/j.worlddev.2021.105742.
- Wissenschaftlicher Dienste des deutschen Bundestages, 2021, *Übergewinnsteuer – historische Hintergründe, aktuelle Diskussion und rechtliche Fragen*, WD 4-3000-023/21. Available at: https://www.bundestag.de/resource/blob/838958/eaa79ffafc735d702c68efccc5c12d40/WD-4-023-21-pdf-data.pdf.
- Wolak, F.A., 2007, *Quantifying the supply-side benefits from forward contracting in wholesale electricity markets,* Journal of Applied Economics 22: 1179-1209. Available at: https://doi.org/10.1002/jae.989.
- Wolak, F.A., 2021, *Wholesale electricity market design*, Chapter 4, p. 73-110 in Handbook on Electricity Markets, Edward Elgar Publishing. Available at: https://doi.org/10.4337/9781788979955.00010.

ANNEX 1: STATUS QUO OF NATIONAL IMPLEMENTATION

Table 9: Overview on EU Member States' implementation of the cap on market revenue for inframarginals

Country	Cap on market revenue	Tax rate/ 10% lump-sum deduction	Application period
EU Proposal	180 EUR/MWh	90% - 100%	1.12.2022 – 30.06.2023
Austria	140 EUR/MWh	90%	1.12.2022-31.12.2023
Belgium	130 EUR/MWh (regular); 180 EUR/MWh (biomass, municipal waste)	90%	01.08.2022-30.06.2023
Bulgaria	Technology-specific caps	90%	01.12.2022-30.06.2023
Croatia	180 EUR/MWh	90%	01.12.2022-30.06.2023
Cyprus	Derogation		
Czech Republic[76]	70-240 EUR/MWh	90%	01.12.2022-31.12.2023
Denmark	180 EUR/MWh	90%	01.12.2022-30.06.2023
Estonia	No decision/implementation of EU law yet		
Finland	windfall profit tax on the electricity sector for the tax year 2023		
France[77]	90-175 EUR/MWh	90%	01.07.2022-31.12.2023
Germany	Technology-specific caps	90%	01.12.2022-30.06.2023
Greece[78]	Gross profit	90%	01.10.2021-30.06.2022
Hungary	General windfall profit tax at a tax rate of 65% on electricity producers		
Ireland[79]	180 EUR/MWh (120 EUR/MWh wind/solar:)	100%	01.12.2022-30.06.2023
Italy[80]	180 EUR/MWh	.	01.12.2022-30.06.2023
Latvia	No decision/implementation of EU law yet		
Lithuania	180 EUR/MWh	90%	01.01.2023-30.06.2023

[76] Based on information available on https://danovky.cz/en/news/detail/1145. Technology-specific caps are set as follows: 70 EUR/MWh for nuclear energy; 100 EUR/MWh for waste (except biomass); 170-230 EUR/MWh for lignite depending on the type of power plant; 180 EUR/MWh for wind, solar, geothermal, hydropower, peat, mineral oils; 210 EUR/MWh for solid biomass and 240 EUR/MWh for gaseous biomass.

[77] Based on information available on https://www.pwcavocats.com/fr/assets/files/pdf/2023/01/french-finance-act-for-2023.pdf. Technology-specific caps are set as follows: 90 EUR/MWh for nuclear, 100 EUR/MWh for wind, 145 EUR/MWh for thermal waste treatment, and 175 EUR/MWh for biogas.

[78] Based on information available at: https://www.reuters.com/business/energy/windfall-tax-mechanisms-energy-companies-across-europe-2022-12-08/.

[79] Based on information available at: https://www.gov.ie/en/press-release/74f14-minister-ryan-announces-measures-to-address-windfall-gains-in-the-energy-sector/.

[80] Based on information available at: https://www.reuters.com/business/energy/italy-expects-raise-4-billion-euros-energy-companies-2022-12-05/.

Country	Cap on market revenue	Tax rate/ 10% lump sum deduction	Application period
Luxembourg	No decision/implementation of EU law yet		
Malta	Derogation		
Netherlands[81]	130 EUR/MWh (240 EUR/MWh biomass fuels)	90%	01.12.2022-30.06.2023
Poland[82]	Technology-specific caps	100%	01.12.2022-31.12.2023
Portugal	No decision/implementation of EU law yet		
Romania	92 EUR/MWh	100% on net sale revenues	09.2022 – 31.08.2023
Slovakia[83]	Technology-specific caps	90%	01.12.2022-31.12.2024
Slovenia[84]	180 EUR/MWh	100%	01.12.2022-31.12.2023
Spain	67 EUR/MWh	.	.
Sweden[85]	180 EUR/MWh	90%	01.03.2023-30.06.2023

Source: Authors' own elaboration mainly available at: https://www.pwc.nl/en/insights-and-publications/tax-news/other/energy-emergency-measures--solidarity-charge-and-revenue-cap.html.

Note: At the time of writing of this study (December 2022-February 2023), there is limited publicly available information released by the national governments on the respective legislation. Thus, the overview might not be comprehensive and prone to changes in legislation.

Table 10: Overview on EU Member States' national implementation of the solidarity contribution for the fossil fuel sector

Country	Definition of windfall profit	Tax rate	Application period
EU Regulation	profits exceeding 20% of the reference profits average taxable profits of the 3 fiscal years starting on or after January 1, 2018	33%	As of 01.01.2022 and/or 01.01.2023

[81] Based on information available on https://www.pwc.nl/en/insights-and-publications/tax-news/other/electricity-generation-income-capped-at-130-euro-per-mwh.html.

[82] Based on information available at: https://auroraer.com/wp-content/uploads/2022/11/Polands-power-market-revenue-cap_Dentons.pdf.

[83] Based on information available on https://www.euractiv.com/section/politics/news/slovak-government-adopts-windfall-tax-on-electricity-producers/ and https://www.reuters.com/business/energy/slovakia-sets-price-caps-power-plants-by-type-fuel-2023-01-31/. The respective price caps vary from 100 EUR/MWh for waste, 120 EUR/MWh for solar plants, 180 EUR/MWh for nuclear, hydro and wind to 230 EUR/MWh for coal plants.

[84] Based on information available on https://www.ey.com/en_si/ey-slovenia-tax-alerts/tax-news-february-2023.

[85] Based on information available on https://www.regeringen.se/contentassets/44adb2655f9c40389394d4ec87a92cb3/tillfallig-skatt-pa-vissa-elproducenters-overintakter.pdf.

Country	Definition of windfall profit	Tax rate	Application period
Austria[86]	same as EU regulation	40%	Retroactively as of 01.06.2022
Belgium[87]	same as EU regulation	33%	Retroactively as of 01.01.2022 & 2023
Bulgaria[88]	same as EU regulation	33%	Retroactively as of 01.01.2022 & 2023
Croatia[89]	same as EU regulation	33%	Retroactively as of 01.01.2022
Cyprus		33%	
Czech Republic[90]	same as EU regulation	60%	2023 until 2025
Denmark	same as EU regulation	33%	2023
Estonia	No decision/implementation of EU law yet		
Finland	same as EU regulation	33%	2023
France[91]	same as EU regulation	33%	Retroactively as of 2022
Germany	same as EU regulation	33%	Retroactively as of 2022 & 2023
Greece[92]	Oil refineries profit tax		Retroactively as of 2022
Hungary[93]	special tax on petroleum product manufacturers at a tax rate of 25%		
Ireland[94]	same as EU regulation	75%	Retroactively as of 2022 & 2023
Italy[95]	profits exceeding 10% of the reference profits	50%	Retroactively as of 2022
Latvia	No decision/implementation of EU law yet		
Lithuania[96]	same as EU regulation	33%	2023
Luxembourg	No decision/implementation of EU law yet		
Malta	Derogation		

86 Based on information available on https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2022_I_220/BGBLA_2022_I_220.pdfsig.

87 Based on information available at: https://www.ey.com/en_be/tax/tax-alerts/2022/energy-alert-further-measures-to-deal-with-the-exploding-energy-prices.

88 Based on information available on https://dv.parliament.bg/DVWeb/showMaterialDV.jsp?idMat=181204.

89 Based on information available on https://www.sabor.hr/en/press/news/parliament-adopts-law-excess-profit-tax.

90 Based on information available at: https://kpmg.com/us/en/home/insights/2022/11/tnf-czech-republic-windfall-profits-tax-fossil-sector-banks.html.

91 Based on information available on https://www.pwcavocats.com/fr/assets/files/pdf/2023/01/french-finance-act-for-2023.pdf.

92 Based on information available at: https://www.reuters.com/business/energy/greece-tap-oil-refineries-levy-fund-food-allowance-households-2022-12-19/.

93 Based on information available on Decree No. 496/2022, Official Gazette No. 201/2022. Available at: https://magyarkozlony.hu/dokumentumok/ddc43c6b4ec1a604be33a8f39004da233a5e3bab/megtekintes.

94 Based on information available at: https://www.gov.ie/en/press-release/74f14-minister-ryan-announces-measures-to-address-windfall-gains-in-the-energy-sector/.

95 Based on information available at: https://kpmg.com/xx/en/home/insights/2023/01/e-news-168.html and https://www.gazzettaufficiale.it/eli/id/2022/12/29/22G00211/sg.

96 Based on information available on https://www.e-tar.lt/portal/en/legalAct/754cc070828c11ed8df094f359a60216.

Country	Definition of windfall profit	Tax rate	Application period
Netherlands[97]	same as EU regulation	33%	Retroactively as of 2022
Poland[98]	No decision/implementation of EU law yet		
Portugal[99]	same as EU regulation	33%	Retroactively as of 2022 & 2023
Romania[100]	same as EU regulation	60%	Retroactively as of 2022 & 2023
Slovakia[101]	tax base same as the one for corporate income tax purposes	55%	Retroactively as of 2022
Slovenia[102]	same as EU regulation	33%	Retroactively as of 2022 & 2023
Spain[103]	Net turnover generated in 2022 and 2023	1.2%	Retroactively as of 2022 & 2023
Sweden	same as EU regulation	33%	2023

Source: Authors' own elaboration mainly available at: https://www.pwc.nl/en/insights-and-publications/tax-news/other/energy-emergency-measures--solidarity-charge-and-revenue-cap.html.

Note: At the time of writing of this study (December 2022-February 2023), there is limited publicly available information released by the national governments on the respective legislation. Thus, the overview might not be comprehensive and prone to changes in legislation.

[97] In addition, the Dutch government has proposed the introduction of a separate national instrument for the years 2023 and 2024 regarding excessive profits from the sale of natural gas, which would be taxed at a rate of 65 per cent of the price of the natural gas sold, exceeding 0.5 euros per cubic metre.

[98] Based on information available on https://wysokienapiecie.pl/82177-podatek-od-zyskow-firm-naftowych-i-weglowych/.

[99] Based on information available at: https://www.parlamento.pt/ActividadeParlamentar/Paginas/DetalheDiplomaAprovado.aspx?BID=33778 (Decreto da Assembleia de República 25/XV). In particular, the CST Energy applies if at least 37.5% of a taxpayer's turnover is generated from extraction, mining, oil refining, or production of coke oven products.

[100] Based on information available on https://www.pwc.ro/en/tax-legal/alerts/Solidarity-contribution-to-address-the-problem-of-high-energy-prices-GEO-no-186-2022.html. The contribution will co-exist with the domestic windfall profit tax on energy companies.

[101] Based on information available on https://kpmg.com/xx/en/home/insights/2023/01/e-news-168.html.

[102] Based on information available on https://www.ey.com/en_si/ey-slovenia-tax-alerts/tax-news-february-2023.

[103] Based on information available on https://kpmg.com/xx/en/home/insights/2023/01/e-news-168.html and https://www.boe.es/eli/es/l/2022/12/27/38 (Ley 38/2022, de 27 de diciembre, para el establecimiento de gravámenes temporales energético y de entidades de crédito y establecimientos financieros de crédito y por la que se crea el impuesto temporal de solidaridad de las grandes fortunas, y se modifican determinadas normas tributarias).

ANNEX 2: QUANTIFICATION

Table 11: Total Tax Revenue of Solidarity Tax and Revenue Cap by country (in Mio. EUR)

Country	Total Tax Revenue - Revenue Cap (Tax Rate 100%)	Total Tax Revenue - Revenue Cap (Tax Rate 90%)	Total Tax Revenue - Solidarity Tax	Total Tax Revenue (with Revenue Cap Tax Rate 100%)	Total Tax Revenue (with Revenue Cap Tax Rate 90%)
AT	15,519.2	13,967.3	214.8	15,734.0	14,182.1
BE	4,999.1	4,499.2	9.6	5,008.7	4,508.8
BG	4,376.2	3,938.6	13.3	4,389.5	3,951.9
CZ	6,161.9	5,545.7	0.0	6,161.9	5,545.7
DE	113,732.9	102,359.6	7.8	113,740.7	102,367.4
DK	1,375.4	1,237.8	98.1	1,473.5	1,336.0
EE	151.6	136.5	0.0	151.6	136.5
ES	1,314.8	1,183.3	1,047.4	2,362.3	2,230.8
FI	2,304.2	2,073.8	170.0	2,474.2	2,243.8
FR	37,539.5	33,785.5	2,616.3	40,155.7	36,401.8
GR	2,176.9	1,959.2	75.9	2,252.8	2,035.1
HR	527.5	474.8	0.0	527.5	474.8
HU	9,253.8	8,328.4	7.2	9,261.1	8,335.7
IE	-	-	11.9	11.9	11.9
IT	10,763.9	9,687.5	1,976.0	12,739.9	11,663.5
LT	277.7	249.9	6.5	284.2	256.4
LU	-	-	13.0	13.0	13.0
LV	181.3	163.2	0.0	181.3	163.2
NL	5,450.5	4,905.4	543.8	5,994.3	5,449.2
NO	1,069.2	962.3	0.0	1,069.2	962.3
PL	1,669.4	1,502.5	656.0	2,325.4	2,158.5
PT	582.9	524.6	0.0	582.9	524.6
RO	14,768.6	13,291.7	17.0	14,785.6	13,308.7
SE	1,810.3	1,629.2	0.0	1,810.3	1,629.2
SI	1,397.4	1,257.7	0.0	1,397.4	1,257.7
SK	2,264.5	2,038.1	64.8	2,329.3	2,102.8
Total	9,986.2	8,987.6	290.4	10,276.6	9,277.9

Source: Authors' own elaboration.

Note: The solidarity tax is calculated (see Chapter 5.1.2) for 2021 with the four-year average between 2020 - 2017. Company Information is extracted from ORBIS. The tax revenue from the revenue cap (see Chapter 5.2) with a tax rate of 100%/ 90%. Energy price data and production quantities for 2022 are taken from ENTSO_E Transparency Platform. To display the tax revenue on a country basis, bidding zones are aggregated as far as they belong to one country. In the case of Luxembourg all bidding zones are shared with Germany, wherefore it has to be considered that part of the income from the revenue cap in Germany is actually attributable to Luxembourg.

Table 12: Revenue generated in the energy market (in Mio. EUR)

Bidding Zone	Revenues from Energy Sources with Revenue Cap	Revenues from Energy Sources without Revenue Cap
AT	41,861.6	16,241.0
BE	14,944.5	7,028.4
BG	11,715.7	1,577.7
CZ	17,353.9	2,596.8
DE-LU	34,1387.4	130,630.3
DK1	3,209.9	1,366.9
DK2	1,599.0	322.8
EE	510.3	955.4
ES	51,332.3	38,228.0
FI	8,638.8	1,078.2
FR	10,0732.9	16,108.2
GR	5,874.8	6,980.6
HR	1,377.5	2,199.4
HU	24,514.3	9,743.5
IT-Calabria	1,350.4	3,149.0
IT-Centre-North	2,618.2	2,171.1
IT-Centre-South	3,597.1	5,964.5
IT-North	10,124.9	28,955.3
IT-Sardinia	1,043.6	2,631.7
IT-Sicily	2,147.0	3,109.2
IT-South	4,210.0	6,881.0
LT	784.5	189.8
LV	632.4	397.5
NL	18,187.8	7,9714.5
NO1	2,115.6	823.1
NO2	1,992.0	6,812.9
NO3	398.8	811.9
NO4	108.1	740.5

Bidding Zone	Revenues from Energy Sources with Revenue Cap	Revenues from Energy Sources without Revenue Cap
NO5	527.7	4,923.8
PL	12,546.1	1,4876.7
PT	4,299.8	3,199.1
RO	39,773.3	18,161.6
SE1	222.2	1,607.4
SE2	519.6	2,815.4
SE3	7,138.1	1,973.0
SE4	561.4	447.5
SI	3,421.7	124.8
SK	5,957.2	891.0
Total	749,330.2	426,429.2

Source: Authors' own elaboration.

Table 13: List of Firms used in the Quantification of the Solidarity Surcharge

Firm Name	Country	NAICS 2017 Core Code
OMV OFFSHORE BULGARIA GMBH	AT	2111
OMV (TUNESIEN) SIDI MANSOUR GMBH	AT	2111
RAG EXPLORATION & PRODUCTION GMBH	AT	2111
OMV RUSSIA UPSTREAM GMBH	AT	2111
OMV (YEMEN) AL MABAR EXPLORATION GMBH	AT	2111
OMV AKTIENGESELLSCHAFT	AT	2111
OMV MYRRE BLOCK 86 UPSTREAM GMBH	AT	2111
OMV (YEMEN) SOUTH SANAU EXPLORATION GMBH	AT	2111
SOCIETE DE GESTION MALE PLUME	BE	2121
TOTALENERGIES REFINERY ANTWERP	BE	3241
DETA-COMPOSITES	BE	3241
EXXONMOBIL PETROLEUM & CHEMICAL	BE	3241
LIMCOAL	BE	2121
TOTALENERGIES PETROCHEMICALS & REFINING	BE	3241
VAN RIJN GLOBAL TRADING	BE	4243
EURASPHALTE	BE	3241
OLEON BIODIESEL	BE	3241
PETROCELTIC BULGARIA EOOD	BG	2111
PETROL AD	BG	2111
MINI OTKRIT VAGLEDOBIV EAD	BG	2121
MINA STANIANCI EAD	BG	2121

Firm Name	Country	NAICS 2017 Core Code
MINI MARITSA IZTOK EAD	BG	2121
MIN INDUSRY EOOD	BG	2121
KLON RUDNIK TROYANOVO 1	BG	2121
PETROKELTIK LYUKSEMBURG	BG	2111
MINI MARITSA IZTOK KLON RUDNIK TROYANOVO SEVER	BG	2121
MINI MARITSA IZTOK KLON RUDNIK TROYANOVO 3	BG	2121
MINA CHUKUROVO LTD AD	BG	2121
MINA BELI BREG AD	BG	2121
VUGLEDOBIV CHERNO MORE OOD	BG	2121
FLY POWER EOOD	BG	2121
ARTANES MINING GROUP AD	BG	2121
MIN INVEST EOOD	BG	2111
LUKOIL NEFTOHIM BURGAS AD	BG	3241
SHELL INTERNATIONAL EXPLORATION AND DEVELOPMENT ITALIA S.P.A. BULGARIA BRANCH	BG	2111
MINA LEV OOD	BG	2121
SOKOLOVSKA UHELNA, PRAVNI NASTUPCE, A.S.	CZ	2121
SEVEROCESKE DOLY A.S.	CZ	2121
VRSANSKA UHELNA A.S.	CZ	2121
SEVERNI ENERGETICKA A.S.	CZ	2121
PARAMO, A.S.	CZ	3241
BAYERNOIL RAFFINERIEGESELLSCHAFT MBH	DE	3241

Firm Name	Country	NAICS 2017 Core Code
ETZEL GAS-LAGER GMBH & CO.KG	DE	3241
GUNVOR RAFFINERIE INGOLSTADT GMBH	DE	3241
DEUTSCHE ROHSTOFF AG	DE	2111
PCK RAFFINERIE GMBH	DE	3241
TOTAL E&P ETHIOPIA A/S	DK	2111
TOTAL E&P ALS A/S	DK	2111
INEOS E&P A/S	DK	2111
NORECO PETROLEUM DENMARK A/S	DK	2111
TOTAL OIL COLOMBIA A/S	DK	2111
P/F ATLANTIC PETROLEUM	DK	2111
INEOS ENERGY (SYD ARNE) APS	DK	2111
SHAMARAN SARSANG A/S	DK	2111
ELKO ENERGY A/S	DK	2111
PETROGAS DENMARK APS	DK	2111
INEOS E&P DK A/S	DK	2111
TOTALENERGIES EP DANMARK A/S	DK	2111
KALUNDBORG REFINERY A/S	DK	3241
TOTALENERGIES EP TPH A/S	DK	2111
GREENLAND GAS & OIL A/S	DK	2111
NORECO OIL DENMARK A/S	DK	2111
TOTALENERGIES EP ALGERIE BERKINE A/S	DK	2111
DANOIL EXPLORATION A/S	DK	2111

Firm Name	Country	NAICS 2017 Core Code
VKG KAEVANDUSED OU	EE	2111
BIOELEKTRI JA -SOOJUSENERGIA UHISTU	EE	2111
CORESTONE PRODUCTION OU	EE	2111
MECANIZACIONES CARBONIFERAS Y SERVICIOS SA	ES	2121
REPSOL EXPLORACION ARGELIA SA	ES	2111
REPSOL EXPLORACION PERU SA	ES	2111
PETROLEOS DEL NORTE SOCIEDAD ANONIMA	ES	3241
REPSOL INVESTIGACIONES PETROLIFERAS SA	ES	2111
REPSOL EXPLORACION MURZUQ SA	ES	2111
CEPSA E.P. ABU DHABI SL.	ES	2111
COMPANIA GENERAL MINERA DE TERUEL SA.	ES	2121
CARBONES Y DERIVADOS DEL NORTE SL.	ES	2121
LIGNITOS DE MEIRAMA SA	ES	2121
REPSOL EXPLORACION SA	ES	2111
REPSOL SA	ES	2111
CARBONES DEL CENTRO SL	ES	2121
WOODSIDE ENERGY IBERIA SA	ES	2111
CEPSA ALGERIE SL.	ES	2111
VALDELECINA MINERA, SOCIEDAD ANONIMA	ES	2121
CEPSA PERU SA	ES	2111
CEPSA EP ESPANA SL.	ES	2111
CNWL OIL ESPANA SA	ES	2111

Firm Name	Country	NAICS 2017 Core Code
CEPSA SURINAME SL.	ES	2111
REPSOL OCP DE ECUADOR SA.	ES	2111
NESTE OYJ	FI	3241
MABRUK OIL OPERATIONS	FR	2111
TOTALENERGIES UAE SERVICES	FR	2111
TOTAL E&P SOUTH PARS	FR	2111
TOTALENERGIES EP SALMANOV	FR	2111
IPC PETROLEUM GASCOGNE	FR	2111
TOTALENERGIES EP INDONESIA	FR	2111
IPC PETROLEUM FRANCE	FR	2111
MAUREL & PROM ANGOLA	FR	2111
SOC PETROREP	FR	2111
TOTALENERGIES EP NURMUNAI	FR	2111
TOTALENERGIES EP QATAR 2	FR	2111
TOTAL AUSTRAL	FR	2111
TOTALENERGIES EP RUSSIE	FR	2111
TOTALENERGIES EP COLOMBIE	FR	2111
BRIDGE ENERGIES	FR	2111
TOTALENERGIES EP VIETNAM	FR	2111
TOTAL E&P SYRIE	FR	2111
TOTALENERGIES EP SENEGAL	FR	2111
TOTALENERGIES GAS & POWER THAILAND	FR	2111

Firm Name	Country	NAICS 2017 Core Code
TOTALENERGIES EP STUDIES SERVICES KAZAKHSTAN	FR	2111
TOTAL SOUTH PARS 11 HOLDING	FR	2111
TOTAL EXPLORATION PRODUCTION VENEZUELA	FR	2111
TOTALENERGIES EP ANGOLA DEVELOPPEMENT GAZ	FR	2111
TOTAL E&P SOUTH SUDAN	FR	2111
TOTALENERGIES EP KOBLANDY	FR	2111
TOTAL PARS LNG	FR	2111
TOTALENERGIES EP BOLIVIE	FR	2111
TOTALENERGIES EP GOLFE	FR	2111
TOTALENERGIES EP QATAR	FR	2111
TOTALENERGIES HOLDINGS EUROPE	FR	2111
TOTALENERGIES EP THAILAND	FR	2111
TOTALENERGIES SE	FR	2111
TERCHARNOR	FR	2121
TOTALENERGIES EP DOLPHIN MIDSTREAM	FR	2111
TOTALENERGIES EP YAMAL	FR	2111
PETROORIENTAL S A	FR	2111
GEOPETROL	FR	2111
TOTALENERGIES EP ANGOLA BLOCKS 20 21	FR	2111
TOTALENERGIES EP AUSTRALIA	FR	2111
TOTALENERGIES EXPLORATION PRODUCTION NIGERIA	FR	2111
TOTALENERGIES EP ABU AL BU KHOOSH	FR	2111

Firm Name	Country	NAICS 2017 Core Code
TERRIL D'AVION	FR	2121
TOTAL SYRIE	FR	2111
TOTAL EXPLORATION TRINIDAD ET TOBAGO	FR	2111
TOTALENERGIES GAS & POWER BRAZIL	FR	2111
TOTAL E ET P INDONESIE	FR	2111
ELF PETROLEUM IRAN	FR	2111
TOTALENERGIES EP SOUTH EAST MAHAKAM	FR	2111
SOCIETE DE LA RAFFINERIE DE DUNKERQUE	FR	3241
TOTAL E&P CHINE	FR	2111
MOTOR OIL (HELLAS) CORINTH REFINERIES S.A.	GR	3241
ENERGEAN OIL & GAS AEGEAN ENERGY EXPLORATION & PRODUCTION OF HYDROCARBONS S.A.	GR	2111
HELLENIC PETROLEUM HOLDINGS SOCIETE ANONYME	GR	2111
HELLENIC PETROLEUM WEST PATRAIKOS EXPLORATION AND PRODUCTION OF HYDROCARBONS SINGLE MEMBER S.A.	GR	2111
VERMILION ZAGREB EXPLORATION D.O.O.	HR	2111
ED-INA D.O.O.	HR	2111
HHE DRAVAP CONCESSION LIMITED LIABILITY COMPANY; HHE DRAVAP CONCESSION LTD.	HU	2111
MOL OKANY-NYUGAT SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
HHE SARKAD KORLATOLT FELELOSSEGU TARSASAG	HU	2111
CSANAD SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111

Firm Name	Country	NAICS 2017 Core Code
MOL JASZAROKSZALLAS SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
MOL MEZOTUR SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
DBK-BRIKETTGYAR KORLATOLT FELELOSSEGU TARSASAG	HU	2121
MOL BUCSA SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
VERMILION HUNGARY EBES KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
TDE FIELD SERVICES ZARTKORUEN MUKODO RESZVENYTARSASAG	HU	2111
TXM OLAJ- ES GAZKUTATO KORLATOLT FELELOSSEGU TARSASAG	HU	2111
MOL ZALA-NYUGAT SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
TET-3 GAZKUT TERMELO ES KERESKEDELMI KORLATOLT FELELOSSEGU TARSASAG	HU	2111
VERMILION HUNGARY BATTONYA-DEL KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
LAKOCSA KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
TAPIO SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
MAGYAR HORIZONT ENERGIA KERESKEDELMI ES SZOLGALTATO KORLATOLT FELELOSSEGU TARSASAG	HU	2111
DUSZEN BANYASZATI ES SZOLGALTATASI KORLATOLT FELELOSSEGU TARSASAG	HU	2121
EMSZ ELSO MAGYAR SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
MOL BAZAKERETTYE SZENHIDROGEN KONCESSZIOS KORLATOLT FELELOSSEGU TARSASAG	HU	2111
SAN LEON ENERGY PLC	IE	2111

Firm Name	Country	NAICS 2017 Core Code
U.S. OIL AND GAS PLC	IE	2111
ENI MEDITERRANEA IDROCARBURI S.P.A. IN FORMA ABBREVIATA ENIMED S.P.A.	IT	2111
TAMOIL ITALIA S.P.A.	IT	3241
SOCIETA' PETROLIFERA ITALIANA S.P.A.	IT	2111
ISAB S.R.L.	IT	3241
EXPLOENERGY S.R.L.	IT	2111
DI NOIA PETROLI - S.R.L.	IT	2111
LAZZI GAS SOCIETA' A RESPONSABILITA' LIMITATA	IT	2111
ENI TIMOR LESTE S.P.A.	IT	2111
ENI ANGOLA S.P.A.	IT	2111
SOCIETA' A RESPONSABILITA' LIMITATA RAFFINERIA PADANA OLII MINERA LI S.A.R.P.O.M. S.R.L.	IT	3241
ROCKHOPPER ITALIA S.P.A.	IT	2111
SETTALA GAS SOCIETA' A RESPONSABILITA' LIMITATA IN FORMA ABBRE VIATA SETTALA GAS S.R.L.	IT	3241
ENERGEAN SICILIA SRL.	IT	2111
IPLOM S.P.A.	IT	3241
ENI S.P.A.	IT	2111
TERGAS KEROS - S.R.L.	IT	3241
PETROREP ITALIANA S.R.L.	IT	2111
SARLUX S.R.L.	IT	3241
SAN MARCO PETROLI S.P.A.	IT	3241
API RAFFINERIA DI ANCONA - SOCIETA PER AZIONI	IT	3241

Firm Name	Country	NAICS 2017 Core Code
LG INDUSTRIA E SERVIZI S.R.L.	IT	2111
SHELL INTERNATIONAL EXPLORATION AND DEVELOPMENT ITALIA S.P.A.	IT	2111
APENNINE ENERGY S.P.A.	IT	2111
SHELL ITALIA E&P S.P.A	IT	2111
TOTALENERGIES EP ITALIA S.P.A.	IT	2111
AQUILA SOCIETA' PER AZIONI	IT	3241
KUWAIT PETROLEUM ITALIA S.P.A.	IT	3241
PETROLCHIMICA PARTENOPEA S.R.L.	IT	3241
ALMA PETROLI - S.P.A.	IT	3241
AB LOTOS GEONAFTA	LT	2111
AB ORLEN LIETUVA	LT	3241
COAL ENERGY S.A	LU	2121
VPR ENERGY B.V.	NL	3241
DANA PETROLEUM NETHERLANDS B.V.	NL	2111
ENI ABU DHABI B.V.	NL	2111
GASTERRA B.V.	NL	2111
SPIRIT ENERGY NEDERLAND B.V.	NL	2111
ENI CHINA B.V.	NL	2111
NORTH CASPIAN OPERATING COMPANY N.V.	NL	2111
ENI ALGERIA PRODUCTION B.V.	NL	2111
AGIP CASPIAN SEA B.V.	NL	2111
ENI GAS & POWER LNG AUSTRALIA B.V.	NL	2111

Firm Name	Country	NAICS 2017 Core Code
KARACHAGANAK PETROLEUM OPERATING B.V.	NL	2111
IEOC PRODUCTION B.V.	NL	2111
ENI ANGOLA EXPLORATION B.V.	NL	2111
NEDERLANDSE AARDOLIE MAATSCHAPPIJ B.V.	NL	2111
AGIP KARACHAGANAK B.V.	NL	2111
ITOCHU OIL EXPLORATION (IRAQ) B.V.	NL	2111
ENI AUSTRALIA B.V.	NL	2111
ENI ALGERIA EXPLORATION B.V.	NL	2111
ENI IRAQ B.V.	NL	2111
IEOC EXPLORATION B.V.	NL	2111
SALYM PETROLEUM DEVELOPMENT N.V.	NL	2111
ENI NORTH AFRICA B.V.	NL	2111
SHELL NEDERLAND B.V.	NL	2111
SAN LEON SERVICES SP. Z O.O.	PL	2111
ENERGIA ZACHOD SP. Z O.O.	PL	2111
B8 SP. Z O.O. BALTIC S.K.A.	PL	2111
LOTOS OIL SP. Z O.O.	PL	3241
AURELIAN OIL & GAS POLAND SP. Z O.O.	PL	2111
TAURON WYDOBYCIE S.A.	PL	2121
JASTRZEBSKIE PRZEDSIEBIORSTWO ROBOT GORNICZYCH SP. Z O.O.	PL	2121
COAL HOLDING SP. Z O.O.	PL	2121
GLOBAL MINERAL PROSPECTS SP. Z O.O.	PL	2121

Firm Name	Country	NAICS 2017 Core Code
ECOLOGICAL MINERAL ENGINEERING SP. Z O.O.	PL	2121
PRZEDSIEBIORSTWO GORNICZE SILESIA SP. Z O.O.	PL	2121
CALENERGY RESOURCES POLAND SP. Z O.O.	PL	2111
KOPALNIA WEGLA BRUNATNEGO SIENIAWA SP. Z O.O.	PL	2121
POLSKA GRUPA GORNICZA S.A.	PL	2121
ZAKLAD GORNICZY SILTECH SP. Z O.O.	PL	2121
GWAREX SP. Z O.O.	PL	2121
RAFINERIA W JASLE SP. Z O.O.	PL	3241
WARTER FUELS S.A.	PL	3241
PAK KOPALNIA WEGLA BRUNATNEGO KONIN S.A.	PL	2121
BRZEZINKA SP. Z O.O. S.K.A.	PL	2121
ORLEN POLUDNIE S.A.	PL	3241
POLSKI KONCERN NAFTOWY ORLEN SA.	PL	3241
ORLEN UPSTREAM SP. Z O.O.	PL	2111
PD CO SP. Z O.O.	PL	2121
ENERGIA ZACHOD HOLDINGS SP. Z O.O.	PL	2111
UOS ENERGY SP. Z O.O.	PL	2111
BALTIC GAS SP. Z O.O. I WSPOLNICY SP.K.	PL	2111
BALTIC GAS SP. Z O.O.	PL	2111
WEST TRADE SP. Z O.O.	PL	2121
UGS-1 SP. Z O.O.	PL	2111
BRZEZINKA SP. Z O.O.	PL	2121

Firm Name	Country	NAICS 2017 Core Code
EX-COAL SP. Z O.O.	PL	2121
RAWICZ ENERGY SP. Z O.O.	PL	2111
LOTOS PETROBALTIC S.A.	PL	2111
GRUPA LOTOS S.A.	PL	3241
PNR SERVICES POLAND SP. Z O.O.	PL	2111
GALP MARKETING INTERNATIONAL, S.A.	PT	2111
SOCIETATEA NATIONALA DE GAZE NATURALE ROMGAZ S.A.	RO	2111
S.C. OMV PETROM S.A.	RO	2111
PETRO VENTURES EUROPE B.V. MAASTRICHT - SUCURSALA BUCURESTI	RO	2111
ADX ENERGY PANONIA SRL	RO	2111
HUNT OIL COMPANY OF ROMANIA SRL	RO	2111
REDOLAJ SRL	RO	2121
LUKOIL OVERSEAS ATASH B.V., AMSTERDAM, OLANDA SUCURSALA BUCURESTI	RO	2111
SERINUS ENERGY ROMANIA S.A.	RO	2111
EXXONMOBIL EXPLORATION AND PRODUCTION ROMANIA LIMITED NASSAU (BAHAMAS) SUCURSALA BUCURESTI	RO	2111
I OIL & GAS RESOURCES SRL	RO	2111
PETROTEL - LUKOIL SA	RO	3241
GAS PLUS INTERNATIONAL B.V. HAGA SUCURSALA BUCURESTI	RO	2111
ROMPETROL RAFINARE S.A.	RO	3241
PETRO VENTURES RESOURCES SRL	RO	2111
AMROMCO ENERGY SRL	RO	2111

Firm Name	Country	NAICS 2017 Core Code
PETROSANTANDER ROMANIA SRL	RO	2111
BRENT EXPLORATION & PRODUCTION SRL	RO	2111
ARMENIS ENERGY SRL	RO	2121
CLARA PETROLEUM SRL	RO	2111
OMV PETROM E&P BULGARIA S.R.L.	RO	2111
GAS PLUS DACIA SRL	RO	2111
FORA OIL AND GAS SRL	RO	2111
MAZARINE ENERGY ROMANIA SRL	RO	2111
ZENITH RESOURCES S.R.L.	RO	2111
ALPHA METAL OIL AND GAS SRL	RO	2111
RAFFLES ENERGY SRL	RO	2111
COMPANIA NATIONALA A HUILEI SA	RO	2121
TETHYS OIL AB	SE	2111
NYNAS AB	SE	3241
STARI CASI, OBNOVLJIVI VIRI D.O.O.	SI	2111
GEOENERGO, RAZISKAVE IN PRIDOBIVANJE SUROVE NAFTE IN ZEMELJSKEGA PLINA D.O.O.	SI	2111
SLOVNAFT, A.S.	SK	3241
HORNONITRIANSKE BANE PRIEVIDZA, A.S. V SKRATKE HBP, A.S.	SK	2121
ENGAS S.R.O.	SK	2111

Source: Authors' own elaboration based on Orbis sample.

This study analyses the design and functioning of windfall profit taxes for energy suppliers in the EU. Based on profit data from 2021, the estimated revenue gains from the solidarity contribution amount to 4.4 bn EUR for the selected sample of firms. Applying the revenue cap to power prices of 2022 suggests a tax revenue of 106 bn EUR. The actual tax revenue might diverge substantially from these numbers due to different energy price levels during the application period. The revenue can be redistributed according to the member states' priorities to face hardship of the energy crisis. Despite efficiency in theory, investment distortions might arise if investors expect the tax instrument to be extended to other sectors.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the Subcommittee on Tax Matters (FISC).

PE 740.076
IP/A/FISC/2022-05

Print ISBN 978-92-848-0388-0 | doi:10.2861/6787 | QA-04-23-351-EN-C
PDF ISBN 978-92-848-0389-7 | doi:10.2861/350233 | QA-04-23-351-EN-N