Assessing profits and margins in the fossil fuel value chain for companies with activities within the EU member states

March 2025

Table of Contents

List of figures

List of acronyms

Bbl	Barrel of oil (unit), equivalent to approximately 159 litres of oil
Bcm	Billion cubic meters (unit), often used for natural gas volumes units
CO_2	Carbon dioxide (molecule)
EUR	Euro (currency)
EU / EU-27	European Union (this study refers to the 27 member states of the European Union)
GDP	Gross Domestic Product
LNG	Liquified Natural Gas
LPG	Liquified Petroleum Gas
MWh	Mega Watt per hour (unit)
Mtoe	Million tons of oil equivalent (unit)
Mboe	Million barrels of oil equivalent (unit)
NGL	Natural Gas Liquids
PJ	Peta Joule (unit)
T	Ton (unit)
TSO	Transport System Operator
USD	United States Dollar (currency)
WTI	West Texas Intermediate. It is a grade of crude oil and one of the three primary benchmarks in oil pricing.

Purpose of the study

This study aims at **assessing the net profits** and **net profit margins** generated along the different segments of the value chain of a selection of fossil fuels **for the years 2021, 2022 and 2023**. The commodities analysed are **oil** (and refined oil products, except shale oil and bituminous oil when the difference was identified), **natural gas** (excluding biogas and shale gas) and **coal** (hard and brown, when the difference was identified). The reason for excluding oil shale and oil sands, as well as biofuels, lie in their relatively small part in the total energy supply within the EU [1].

The value chain of each fossil fuel in scope is broken down into **upstream** (i.e. exploration and production), **midstream** (i.e. transportation, processing and storage) and **downstream** (i.e. refining, distribution, marketing, wholesale and retail) activities. All sub-activities are not always relevant for every fossil fuel (i.e. refining is applicable to oil only). In some cases (i.e. oil and coal) upstream and midstream activities also had to be combined due to the vertical integration of those activities for the main players studied and a low number of individual companies considered in the study.

The objective of this work is to find out where profits stemming from the value chain of every type of fossil fuel in scope are mostly concentrated. The work carried by PwC consists of (1) retrieving the net profits and net profit margins from a representative sample of companies operating within the EU-27, (2) extrapolate these data for each of the selected fossil fuels' value chains' segments to provide an overview of what could be the net profits and net profit margins generated at the EU-27 level.

Given the scope of the analysis, data availability, methodological assumptions, and differences in reporting requirements and segment definitions across companies, the figures in this study aim to provide the best possible estimates of the years in scope and should be interpreted as indicative rather than exact representations of actual sector performance.

All collected data have been gathered in local currencies, usual scientific nomenclature and original volume units. Those data were subsequently converted using standard units, allowing for the harmonisation of the dataset and facilitating data comparison. As such, all financial amounts in this study are expressed in euros, while quantities and volumes follow the metric system.

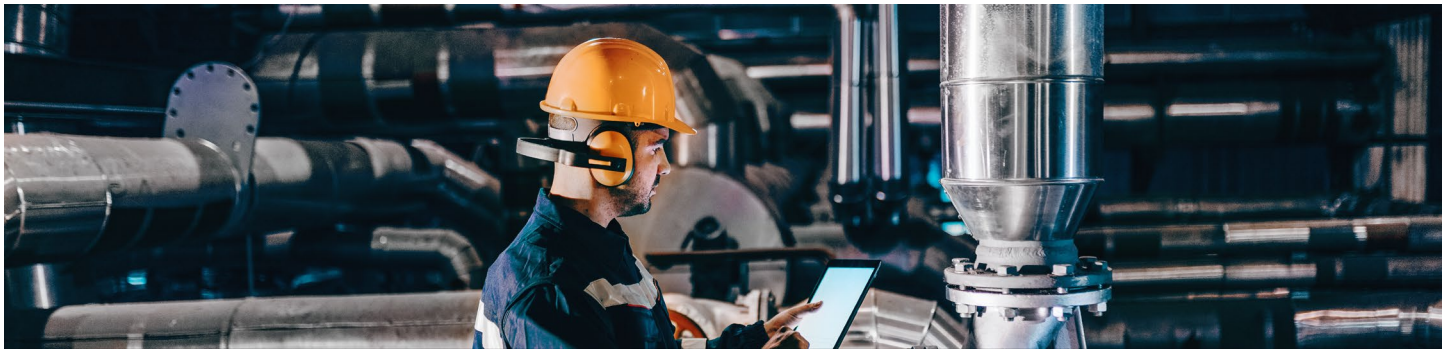
[1] Rationale behind the exclusion of certain specific fuel types for this study:

Oil shale and oil sands

Except in Estonia, there is no production of shale oil and sands (Eurostat: Energy statistics - an overview). Oil shale and oil sands account for 3.5 Mtoe (or 0.2% of total supply of oil in the EU) and in steep decrease year-on-year (Eurostat - Energy production and imports).

Natural Gas – Biomethane

According to the IEA, «Biomethane represents about 0.1% of natural gas demand today» and «Currently around 3.5 Mtoe of biomethane are produced worldwide». 3.5 Mtoe is about 1% of the total natural gas supplied in Europe, as computed. Hence, it remains fairly small, while the process is completely different than Natural Gas.



Disclaimer

This report has been prepared in accordance with the engagement letter signed between the European Federation for Transport and Environment AISBL and PricewaterhouseCoopers Enterprise Advisory bv / srl on 24 May 2024.

By reading this report you accept and subscribe to the following terms, you acknowledge and understand that the work performed by PricewaterhouseCoopers Enterprise Advisory bv / srl was performed (i) exclusively in accordance with instructions provided by our client and the agreement signed by that client and (ii) exclusively for our client's sole benefit and use.

Any person gaining access to our report other than on the basis of an agreement with PricewaterhouseCoopers Enterprise Advisory bv/ srl:

- Does so entirely on his or her own responsibility;
- Agrees that PricewaterhouseCoopers Enterprise Advisory bv / srl, its partners, employees and agents neither owe nor accept any obligation, duty or responsibility to any other person than its client, and shall not be liable, whether in contract or in tort (including without limitation, negligence and breach of statutory duty), in respect of any loss, damage or expense of whatsoever nature which is caused by any use you may or may not choose to make of this report, or which is otherwise consequent upon the gaining of access to the report by you;
- Agrees that this report (i) is not to be referred to or quoted in any other agreement, publication or document and (ii) is not to be distributed, communicated or provided, in any way whatsoever, in whole or in part, to any person without the prior written consent of PricewaterhouseCoopers Enterprise Advisory bv / srl.

1 Value chains overview

1 Value chains overview

This section aims to provide a simplified overview of the main activities taking place along the value chain of each fossil fuel in scope of this study.

Overview of activity segments

While activities are relatively similar across the different types of fossil fuels studied, some important differences are observed and explained in the presentation of each related commodity.

In this simplified overview provided the three main streams of the fossil fuel industry are represented in chronological order within the value chain: upstream, midstream and downstream activities [2].

Upstream activities

Upstream activities refer to the early stages of the value chain, focusing on the exploration and production of oil, gas or coal. Production is used as a generic term and represents the different ways of extracting fossil fuels, such as drilling, extracting, mining, etc.

Those activities are usually the most technological and capital-intensive parts of the value chains. They can be executed onshore or offshore (for oil and gas), depending on the fields of interest. They are solely onshore for coal mining, due to the nature of the element (solid, in opposition to gaseous or liquid for oil and gas).

Midstream activities

Midstream activities involve the processing of raw products for impurities removal, transportation, storage and trading [3] of fossil fuels. All these activities act as a bridge between the upstream and downstream segments of the fossil fuel value chains. The trading activity represents a profitable sub-segment of the market [4] and is considered in the overall value chain in an integrated way, rather than a separate sub-segment.

Natural gas' midstream activities include the processing, which involves separating impurities and natural gas liquids (or "NGLs") from the raw natural gas to produce pipeline-quality dry gas and marketable liquid hydrocarbons.

Downstream activities

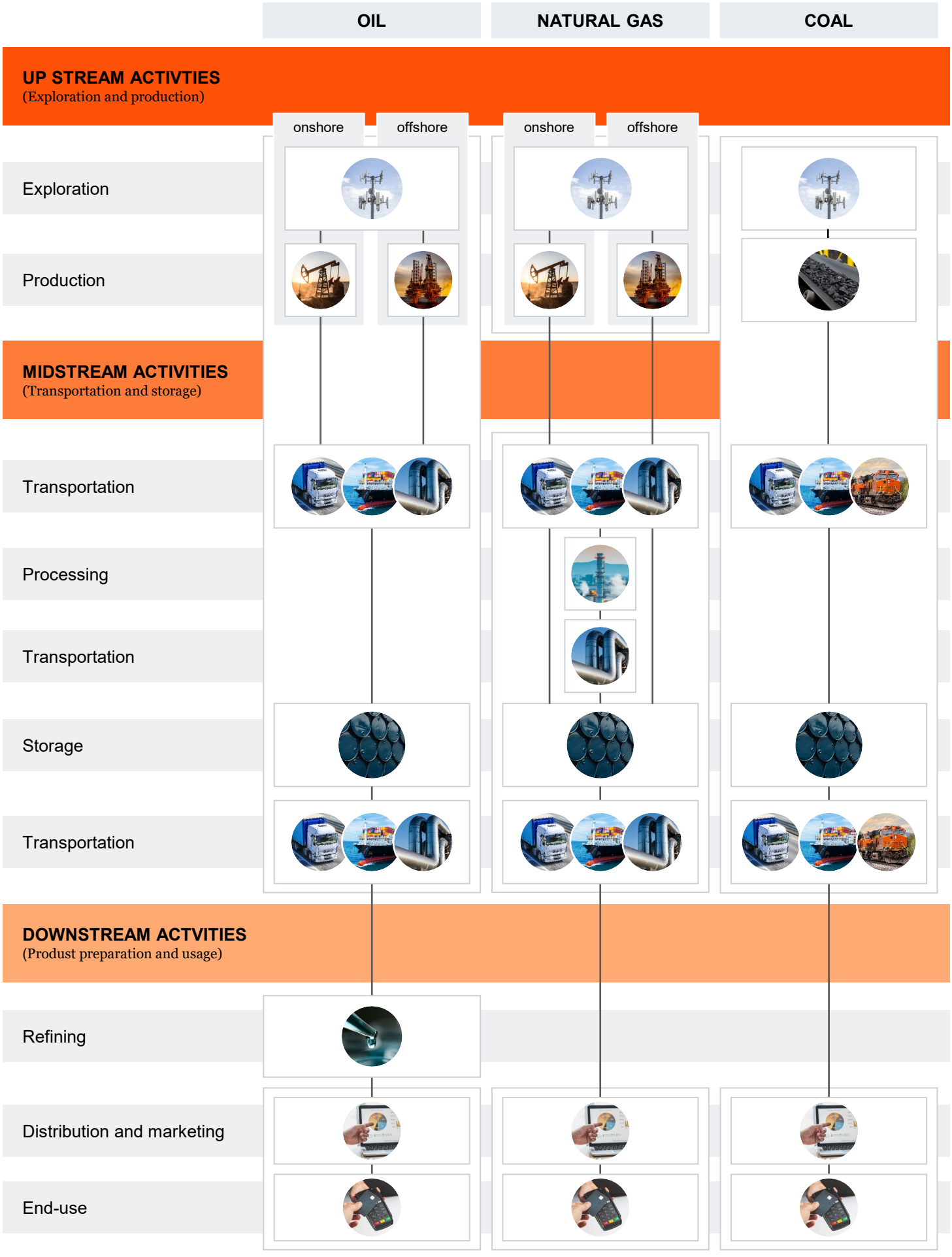
Downstream activities include the transportation of the final (refined and/or processed) product, distribution, marketing and sale of fossil fuels to end-consumers. Consumers are either retail or wholesale. In the case of oil, those activities also include refining activities (which involve transforming crude oil into refined products like gasoline, diesel, jet fuel, etc. through processes such as distillation, cracking, and blending). It must be noted that transformation of oil into petrochemicals is out of scope for this study.

[2] The grey boxes in Figure 1 (see next page) represent the way activities have been grouped for the purpose of this study.

[3] Trading refers to the trading of commodity products. In other words, the "International trade in primary goods. Such goods are raw or partly refined materials whose value mainly reflects the costs of finding, gathering, or harvesting them; they are traded for processing or incorporation into final goods." (Britannica, 2025)

[4] (Yahoo! Finance, 2024)

Figure 1 – Value chain and activity segments of the oil, natural gas and coal fossil fuels



Brief description of fossil fuel value chains

Fossil fuels, regardless of their form, go through several key stages from extraction to consumption. Each step involves specific processes and industries, contributing to a complex and globally interconnected value chain. The below overview is intended to provide a general understanding of the main concepts. It does not encompass the full intricacies and complexities of the actual processes involved.

Oil

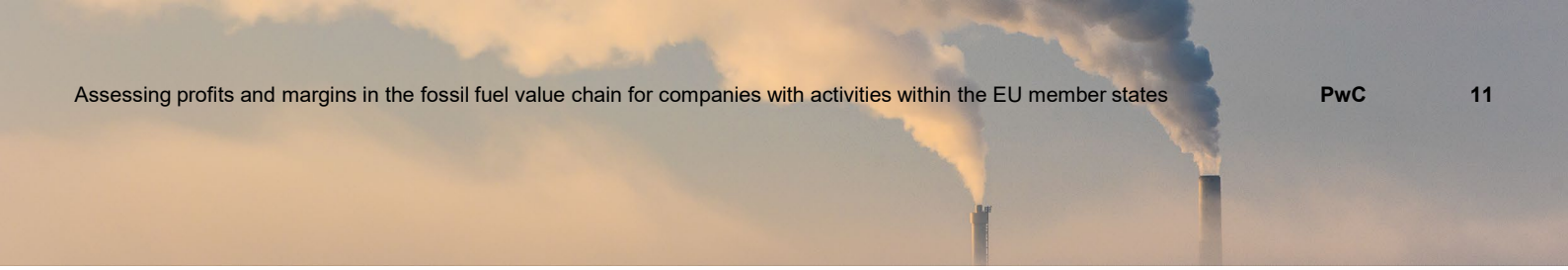
The oil value chain begins with exploration [5]. Companies engage in geological surveys, seismic studies and test drilling to identify potential reserves of oil located deep underground or offshore. This phase involves assessing the geological structures where oil might be found as well as estimating the economic feasibility of extraction. Once a viable oil deposit is identified, drilling operations begin. Wells are drilled to access the underground oil, which is later pumped to the surface. In offshore environments, specialised extraction platforms are utilised. This stage also involves maintaining production facilities and monitoring the wells' output.

The extracted crude oil must be processed (separated from water, removed of impurities and gases) before being transported from the production sites to refineries, often over long distances. Transportation typically involves pipelines, oil tankers, or rail, requiring robust infrastructure and stringent safety protocols to prevent spills and accidents. Once transported, crude oil is stored in large tanks or underground caverns. Storage facilities help manage supply and demand fluctuations, providing a buffer in times of market volatility and high uncertainty.

After storage, crude oil is transported to refineries for processing. This phase might involve further pipelines or tankers, depending on the distance from storage to the refinery. At refineries, crude oil is processed into usable products like gasoline, diesel, jet fuel, lubricants and petrochemicals through complex chemical processes such as distillation, cracking, and reforming.

Refined oil products are later transported (same process as transport activity explained above) and/or stored at various distribution centres and terminals. The distribution of refined products involves two main segments: (1) a wholesale market where large suppliers manage storage facilities and pipelines, reselling products to retail gasoline stations, and transportation mainly by pipeline and rail, with trucks used less frequently due to cost efficiencies. The final products are consumed by various sectors, including transport (e.g. vehicles, ships, planes), industry (e.g. machinery, chemicals), heating, and electricity generation, as well as (2) households - mainly for heating and cooking.

[5] (American Petroleum Institute, 2015)



Oil remains a key part of the energy mix in the EU. According to Eurostat. it accounts for about 35% of the total energy consumption (on top of its use in other industries not requiring it for energy generation). Most of the oil extracted in the EU is crude oil. However, the EU remains heavily reliant on imports, with around 98.6% of oil being imported from outside territories such as Russia, the United Kingdom, Norway, and the United States. While the EU has tried reducing its dependency on imports, recent geopolitical events have only increased it. Consequently, import dependency in the EU increased from almost 92% to 98% between 2021 and 2022 [6]. Most of the oil imports consist of crude oil (59% in 2022), followed by refined products (31%, such as gasoline, diesel and naphtha [7]) and lubricants, waxes and other industrial applications (10%). In 2022, Germany held the lead of the total final EU consumption of oil and petroleum products for energy and non-energy purposes (with a 21.3 % share), followed by France (15.3 %), Spain (10.7 %) and Italy (10.6 %) [8]. The EU's focus has increasingly shifted toward reducing oil dependency due to climate change targets and recent changes in the geopolitical situation, but it still plays a crucial role, particularly in the transport sector.

Natural Gas

The first step in the natural gas value chain is **exploration**, which involves identifying potential gas reservoirs. This usually begins with seismic surveys performed to detect natural gas reserves beneath the Earth's surface. Once promising locations are identified, exploratory wells are drilled to assess the presence of gas, its pressure, and the volume of the reservoirs. This phase also evaluates the feasibility and cost of production.

Natural gas is **produced** (or extracted) from onshore and offshore wells under either one of the three possible methods: (1) conventionally ("conventional natural gas" refers to the gas extracted from subsurface rock formations through conventional wells), (2) unconventionally ('unconventional natural gas" refers to the extraction of gas trapped in shale rock layers, coalbeds or hardly retrievable) or (3) associated ("associated gas" refers to the by-product of oil production). Onshore wells collect gas through low-pressure, small-diameter pipelines that gather production from multiple wells. Offshore wells, which are in bodies of water, present additional challenges in both drilling and production [9]. The gathering systems for offshore wells are typically installed on the seabed and use highly engineered, remotely operated equipment. In both cases, it would be impractical to connect everyone well directly to the main transportation grid. Instead, the gas is gathered at a central collection point within the production field.

Before entering major pipelines, the gas undergoes a **processing** stage to ensure it meets market and pipeline quality standards. Those operations treat the gas to make it a marketable commodity. The composition of natural gas at the wellhead varies depending on the characteristics of the reservoir. This includes removing liquid hydrocarbons, solids, water vapour, and contaminants such as hydrogen sulphide, carbon dioxide, mercury, and nitrogen. Initially, any water and gas condensate is removed, and wastewater is either treated and returned to the well or sent off-site for disposal. Gas plants also recover valuable Natural Gas Liquids (NGLs), such as propane, butane, and pentanes, which are later stored and transported to LPG and petrochemical markets.

[6] (Eurostat, 2024)

[7] Naphtha is a flammable liquid hydrocarbon mixture, generally a fraction of crude oil even if it can also have its origin from other sources.

[8] (Eurostat, 2024)

[9] (EKT Interactive, 2024)

Once purified, the natural gas is compressed and prepared for **transportation** via high-pressure pipelines, which move it over long distances and across borders. In Europe, the supply of gas is unbundled from its transport [10]. In other words, the company operating and/or owning the network system is kept independent to promote competition and avoid vertically integrated companies to use this advantage against the competition. Moreover, it provides all suppliers with a fair and equal access to the gas transmission network. Natural gas is often **stored** underground in depleted reservoirs, aquifers, or salt caverns to balance seasonal fluctuations in demand. Depleted reservoirs are the most cost-effective storage option, as they utilize existing geological knowledge and extraction infrastructure. Well-placed gas storage allows transmission systems to maintain a steady supply, even during peak demand periods. Natural gas can also be liquefied ("LNG" or liquefied natural gas) to be transported over tankers before being converted back to a gas form in terminals.

The natural gas **distribution** system consists of small-diameter, low-pressure pipelines that deliver gas to end users, such as residential and commercial customers. Unlike the steady flow of gas in long-distance transmission pipelines, distribution networks supply gas on an as-needed basis. Large consumers, like power plants, take delivery directly from transmission pipelines, as they require a steady and significant flow of gas.

Natural gas represents approximately **23%** of the EU's total energy consumption [11]. The types of natural gas used in the EU include both **"dry" natural gas** and **liquefied "wet" natural gas (LNG)**. Domestic production is relatively low, with key producers being the Netherlands and Romania. Most of the natural gas is mainly imported from Russia, the United States and Norway [12]. Natural gas is critical for electricity generation in the EU, representing **almost 20% of the electricity produced** [13]. Recently, the EU has focused on diversifying its gas supply sources and increasing LNG imports to enhance energy supply security. The scarcity was caused by geopolitical events involving Russia in the course of 2022, leading Gazprom to reduce exports of natural gas to the EU from 40% of EU total imports of natural gas in 2021, to 8% in 2023 [14].

To balance the volumes of natural gas not supplied to the EU (Russia's pipelined natural gas to the EU decreased by 75% between 2022 and 2023), larger volumes of LNG were imported from the United States, North Africa and even Russia [15]. Though 2025 marks a stop of the Russian gas flowing through Ukraine pipelines [16], the second quarter of 2024 has seen Russian LNG exports to the EU reach record-high levels (from an average of 3.3 bcm per quarter in 2021 to 5.31 bcm in 2024), and imports from the United States getting reduced due to Russian LNG being priced at a discount.

[10] Under the Third Energy Package of the EU (European Union, 2009) repealed by (European Union, 2024), the conditions for access to the natural gas transmission networks were set. They stipulated that transmission and distribution networks must be unbundled from supply of natural gas. Three models are pushed forward: (1) Ownership Unbundling ("OU", where the transmission network must be completely separated from supply and production activities), (2) independent System Operator ("ISO", when full ownership is not feasible, companies can retain ownership of the network but operation is conducted by an independent system operator), and (3) Independent Transmission Operator ("ITO", the same company owns and operated the system, with strict rules to ensure its independence to avoid discrimination against other market participants).

[11] (Eurostat, 2024)

[12] (European Council, 2025)

[13] (European Council, 2024)

[14] (European Council, 2025)

[15] (Bruegel, 2024) (The Guardian, 2025)

[16] (The Guardian, 2025)

Coal

Coal, unlike oil and gas, is a dense and solid fossil fuel which affects its extraction process, transport, and usage. Despite a declining prominence in Europe, it remains a significant energy source for some countries such as Czechia, Germany, Bulgaria and Poland, particularly for electricity generation. As such, coal accounted for less than 16% of EU electricity generation in 2022. In that year, coal consumption for electricity generation peaked, going against the constant decline observed since 2007 [17].

As with oil and gas, the first step of the coal value chain is **exploration**. Companies proceed to perform geological surveys and core drilling to locate coal seams, which are deposits of coal buried underground. Once a coal seam is identified, **mining** operations begin. Coal can be mined through surface mining (i.e. open pit) or underground mining [18] depending on the depth, location of the coal deposit and type of coal (e.g., lignite is always open pit mined).

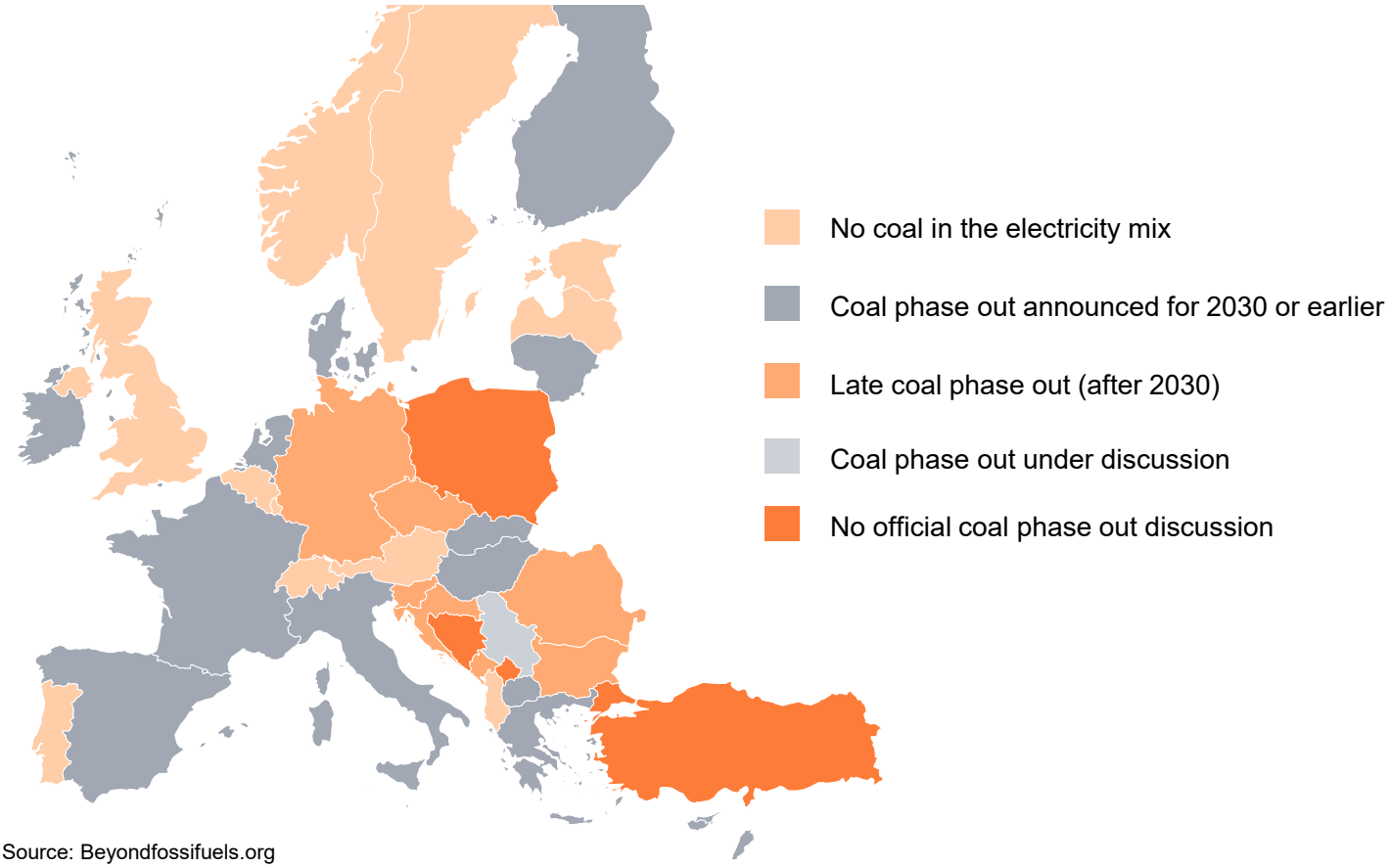
After extraction, coal is **transported** to processing and/or storage facilities, usually through rail, conveyor belts, or trucks. In some instances, barges or ships are used for long-distance transport. Coal can be **stored** at the mining site, ports, or power plants to ensure a steady supply. There are different ways to stock coal [19]: coal storage sheds, dead storage (or outdoor storage) and live storage (or active storage). After storage, coal is once again **transported** to end-users or exported to terminals. Transportation methods include rail, trucks or ships.

[17] (European Council of The European Union, 2024)
[18] (Energy, 2018)
[19] (ALCOX, 2019)

The two main types of coal produced in the EU are **hard coal** (bituminous and coking coal) and **brown coal** (almost exclusively lignite), which respectively represents 14.1% and 76.2% of the total production in the EU. Around 33.1% of final consumption comes from hard coal, while 59.3% comes from brown coal [20]. Other types of coal used in the EU are anthracite and sub-bituminous coal although both their production and consumption remain marginal. Hard coal is primarily consumed for electricity generation and in heavy industries such as steel production (coking coal) and cement manufacturing, while lignite is mainly used in power plants located near extraction sites. **Power plants** are the largest consumers of coal, burning it to generate electricity, with approximately 70% of coal usage directed towards electricity production. Electricity production from coal still represents today around 15% of the total energy supplied in Europe [21].

Coal is also used in industrial processes and, in some regions, it is still a source of residential heating and cooking. **Poland and Germany** are the largest producers and consumers of coal in the EU. Over the past years, coal consumption has been steadily decreasing due to the EU's transition to renewable energy sources and efforts to reduce carbon emissions. Consequently, several countries have already totally phased out their coal activities (production, transformation, energy generation). Most of the remaining countries plan on phasing it out before 2040, with the exception of Poland. Bulgaria's coal phaseout 2038 timeline is yet to become legally binding with the passing of the carbon neutrality roadmap part of the country's commitments in the National Recovery and Resilience Plan (NRRP).

Figure 2 – National coal phase out commitments



Source: Beyondfossifuels.org

[20] (Eurostat, 2024)
[21] (Eurostat, 2024)

2 Main concepts

2 | Main concepts

Our analysis spans a range of critical metrics and time frames to provide an in-depth view of the net profits and net profit margins generated by the fossil fuel industry. This short section aims to provide with a clear understanding of those important concepts as they are used in the context of this study, which will facilitate a better comprehension of the results presented in the subsequent section.

Net profit

The net profit is defined as the amount of total revenue remaining after all total expenses have been deducted [22]. Net profit indicates the profitability of a company after accounting for all costs, including operating expenses, interest, taxes, and other expenses.

$$\text{Net profit} = \text{total revenue} - \text{total expenses}$$

Net profit and net income are terms often used interchangeably, but there is a difference for companies with shareholders who earn dividends. Net income typically refers to the amount of profit remaining after accounting for all expenses, including distributions to shareholders, such as dividends. In contrast, net profit is the broader measure that doesn't necessarily account for shareholder distributions. Therefore, while net profit shows the overall profitability of the company, net income reflects what is left after these payouts.

For this study, our focus is on net profit, for which the drivers are:

- **Revenue, which is function of:**
  - Price at which all products/commodities are sold, and
  - Volumes.
- **Expense, which is function of:**
  - Costs of goods sold (materials, labour, overhead),
  - Operating expenses (wages, research and development, general & administrative, etc.),
  - Non-operating expenses (investments), and
  - Taxes.

The data collection part of this study focused on gathering income statement data, whenever available, while using proxies to estimate the final value for a specific year, geographical location and type of commodity. Proxies used are explained in the *Methodology Appendix*.

In limited instances (accounting for a low percentage of the total data gathered), such information was either not available or impossible to compute. Hence, certain workarounds were required to isolate the price and volume effects impacting the profits generated along the value chains [23]. The volume-based methodology used in these instances, as well as its limitations, are explained in the Appendix.

[22] The analysis of total expenses, which include both operational and capital expenditures, are not within the scope of this study. The operational expenditures represent mainly the cost that incurred in extracting, processing, and delivering each fossil fuel. These costs can include production costs, transportation, and other operational expenses. The capital expenditures, on the other hand, are costs incurred when investing or maintaining assets such as land, mining rights, equipment, and buildings. They are stable for a company investing low amounts and capitalising on its existing assets (maintain costs only) and the highest when companies invest in new solutions, mines, or expand their infrastructures. The most intensive expenditures are in the exploration and production, as well as the transport segments

[23] More details can be found in the methodology section available in appendix

Net profit margin

The net profit margin is a financial metric that represents the percentage of net profit generated from a company's revenues. It is calculated by dividing the net profit by the total revenues and then multiplying the result by 100 to express it as a percentage. This metric is derived from the comprehensive income statements and can be analysed by segments when companies segregate their report through activity segments. This net profit margin indicates how efficiently a company converts its revenues into actual profit after accounting for all expenses.

$$\text{Net profit margin} = \frac{\text{net profit}}{\text{total revenues}}$$

The drivers of the net profit margin are the same as those for the net profit. However, this metric places more emphasis on total revenues to evaluate their impact on value generation for shareholders.

Proxies were only used to estimate the net profit margin when the total revenue could not be computed, which occurred in limited instances. Details on how the net profit and total revenues are collected or estimated can be found in the Appendix.

CO_2 emissions potential

A carbon dioxide equivalent (or CO_2 equivalent) is a metric that allows for the comparison of emissions stemming from different greenhouse gases or fossil fuels based on their global warming potential (GWP). This metric is calculated by converting the quantities of fossil fuels into an equivalent amount of carbon dioxide that would have the same global warming impact [24]. This concept of CO_2 equivalent is used in this study solely to provide a foundation for potential use by other parties.

The drivers of this potential are:

Type of commodity
Volumes

This emissions potential does not represent a carbon emissions assessment mandated by the CSRD, which requires companies to report on actual emissions. Instead, it is a high-level assessment of potential emissions that could be stemming from the volumes of fossil fuels handled by the different companies, countries and segments analysed, assuming they are consumed. For further details on this approach, please refer to the Appendix.

[24] (Eurostat, 2024)

3 Fossil fuel net profits analysis

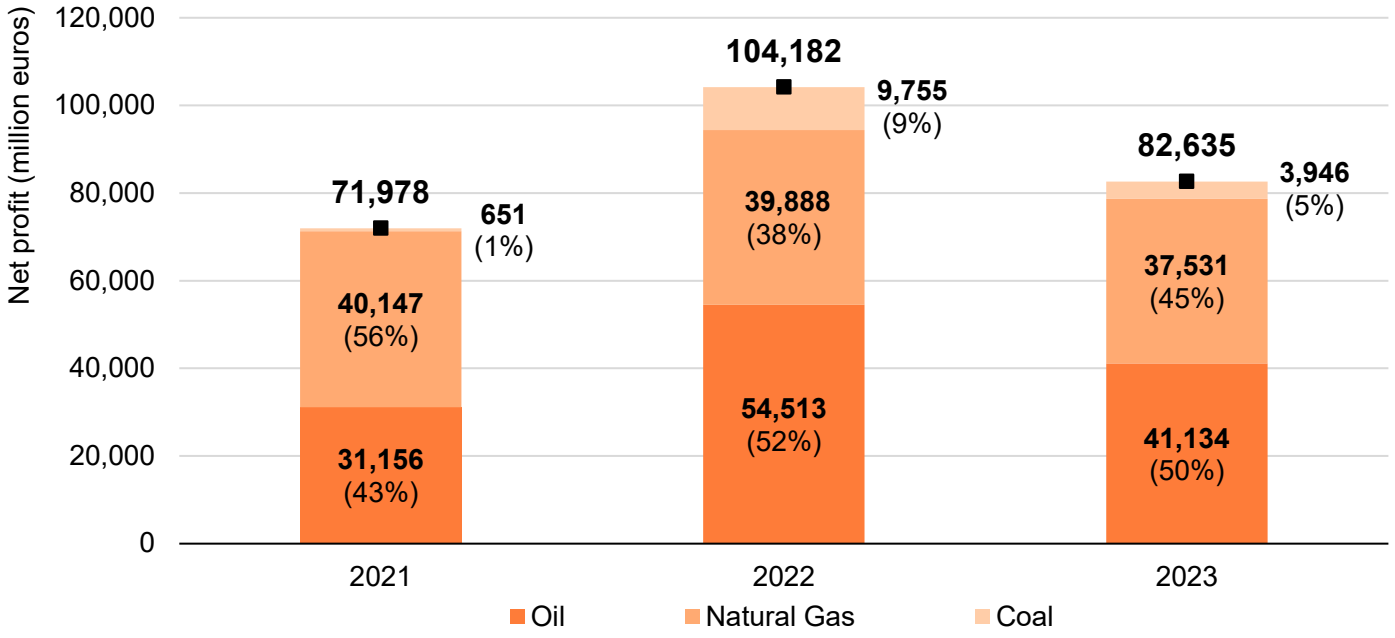
3 | Fossil fuel net profits analysis

This section begins with a snapshot of the net profits generated per fossil fuel within the scope of the study, focusing on the years 2021, 2022, and 2023 [25]. A comparative analysis of the yearly net profits is later put forward, highlighting the impact of trends, fluctuations and geopolitics on the oil, natural gas and coal markets in Europe. Additionally, the section assesses the potential CO_2 emissions associated with each fossil fuel, emphasising the possible environmental costs tied to these activities.

This section further breaks down net profits and net profit margins across the various activity segments, providing insights into which segments are the largest and most lucrative. Major countries in the EU with stakes in these industries are analysed to showcase regional specificities and reactions to global phenomena. Finally, maps of the EU are presented for each fossil fuel and activity segment, highlighting the main companies used in the sampling of this study [26].

It is important to note that the upstream analysis does not capture import flows, implying certain cross-border transactions and intragroup transfers that can affect reported margins may fall outside our scope. Movements of production between affiliated entities in different jurisdictions, including transfers from outside the EU into an EU Member State, may be subject to internal pricing policies and influenced by market conditions, contractual terms, quality differentials, logistics, and hedging arrangements that are not fully observable in public disclosures. Given these data limitations, some flows may not be consistently attributed to the upstream phase in our dataset. This consideration is particularly relevant for vertically integrated groups operating across multiple jurisdictions and may result in portions of economic value not being fully captured in our upstream estimates [27].

Figure 3 – Extrapolated yearly net profits in the EU-2728 [28].



[25] The years in scope for the data gathering process (2021 to 2023) correspond to calendar years.

[26] The illustrations highlight main companies included in the sampling used for this study, and not necessarily the major player per country per market share.

[27] (CEPR, 2015)

[28] This study is based off 31 unique oil companies analysed, 53 natural gas companies and 30 coal companies. They represent an estimated volume-based part of the market (according to our calculation) corresponding in 2022 to 54% for oil companies, 79% for natural gas and 42% for coal.

As it stands, there is limited transparency regarding the fossil fuel import balances for the companies analysed. However, this does not mean that the profits captured in this study are not correct. Instead, it simply highlights the taxation differences and complex imbalances among countries' jurisdictions. The revenues and net profits considered are based on factually reported data from financial reports. For more information about the methodology, please consult the Methodology section.

Context

After the Russian invasion of Ukraine in 2022, a series of bans, exemptions, sanctions, supply disruptions, and other geopolitical events led to a significant increase in energy prices and market instability. To provide a better understanding of the developments during these years, a timeline is presented in Figure 4, p14. Over these years, the price of natural gas skyrocketed in 2022 before eventually returning to pre-conflict levels. A similar trend was observed for oil prices, although market prices decreased, they did not fully revert to pre-conflict levels.

In terms of imports, natural gas which was mainly imported from Russia through the Nord Stream 1 (flows halted Q4 2022), Druzhba (with exempted countries still importing, though at halved flow since Q4 2021), and the Yamal Europe pipeline (halted since Q2 2022). However, Russian LNG has increased since end of 2021, as have imports from the USA, the United Kingdom (in 2022 and 2023), and Azerbaijan, which have more than doubled since Q1 2021 [29]. As a result, EU natural gas storage levels rose throughout 2022, not only in preparation for winter but also to ensure adequate supplies ahead of the ban on Russian natural gas starting in 2023. [30]

Not only did these events heavily impact the energy markets, but other socio-economic and geopolitical events had an impact too. Factors to consider are : drought in France and Brazil which lowered nuclear output and redirected large volumes of LNG destined to Asia and Europe; post-pandemic boom drove the industrial activity up; Gazprom's natural gas cuts prior to the Ukraine invasion leading to natural gas prices rise on the markets; lack of supply of natural gas requiring energy from alternative sources (hence the use of more coal); etc.

Higer level of imports, higher prices of crude oil and refined products, and higher demand for fuels in the transport-sector contributed to an increase in crude oil usage (in 2022 compared to 2021, motor gasoline consumption increased by 6.3% and kerosene consumption by 32.5%) [31]. Hence, leading to record revenues and similar high net profits being generated by companies partially or fully involved along the fossil fuels value chain of oil [32].

Natural gas net profits showed variations across different activity segments but exhibited an overall slight decline from 2021 to 2023. The reason is that the gas generation remained unchanged, and its price remained higher than coal, preventing a switch back from coal to gas [34]. In the following pages, a comprehensive analysis of the main findings is presented, emphasising the context's influence on observed variations.

[29] (Bruegel, 2024)
[30] (Bruegel, 2024)
[31] (Eurostat, 2024)
[32] (The Guardian, 2024)
[33] (The New York Times, 2024)
[34] (Ember Climate, 2023)

Figure 4 – Extrapolated net profits in EU per year

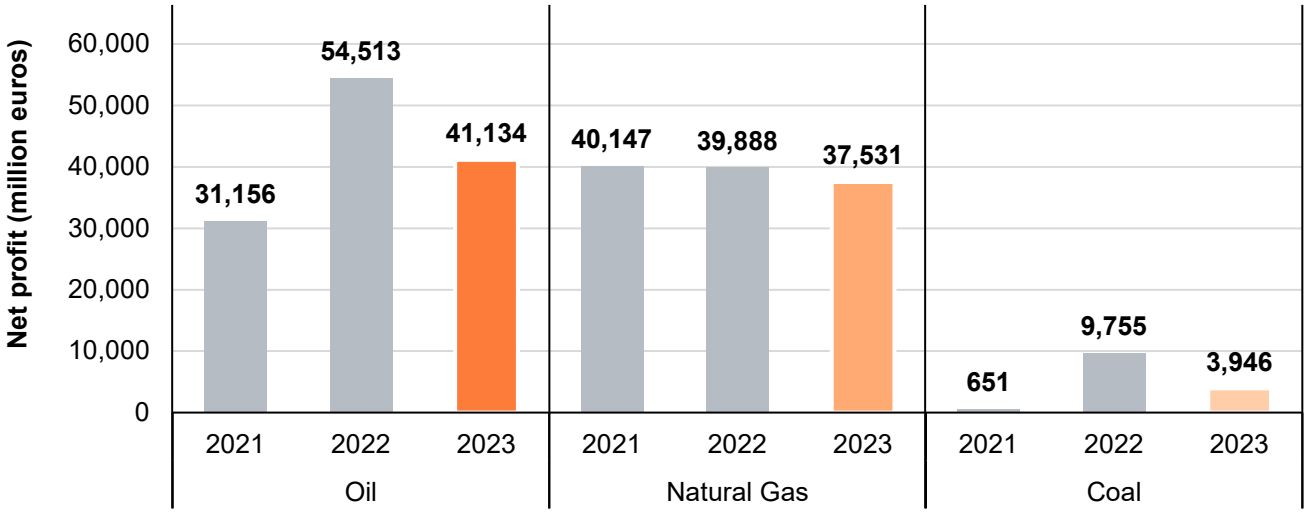
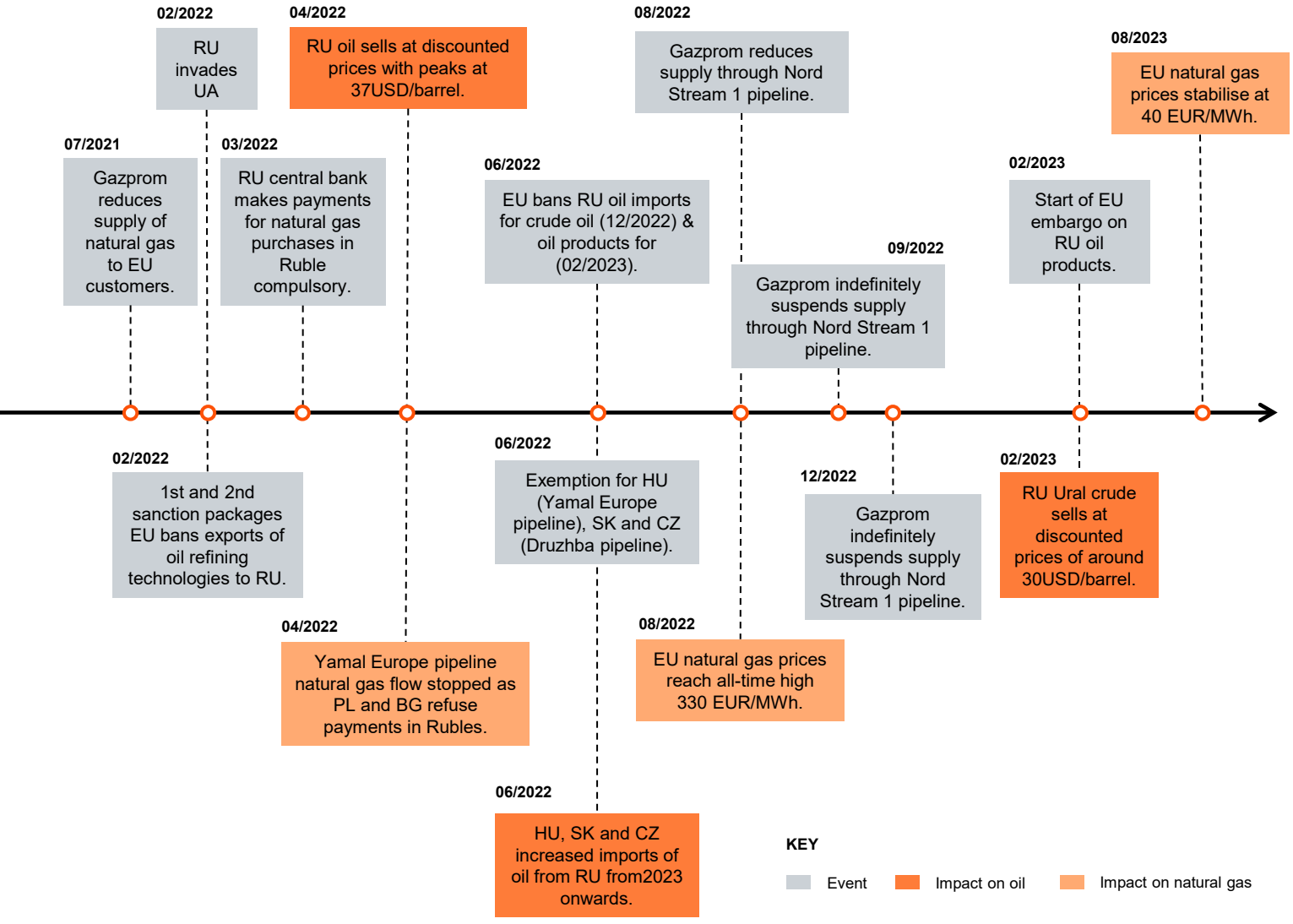


Figure 5 – Timeline of the EU - Russia (RU) sanctions, bans and impacts from July 2021 to August 2023 [35].



[35] (Bruegel, 2024)

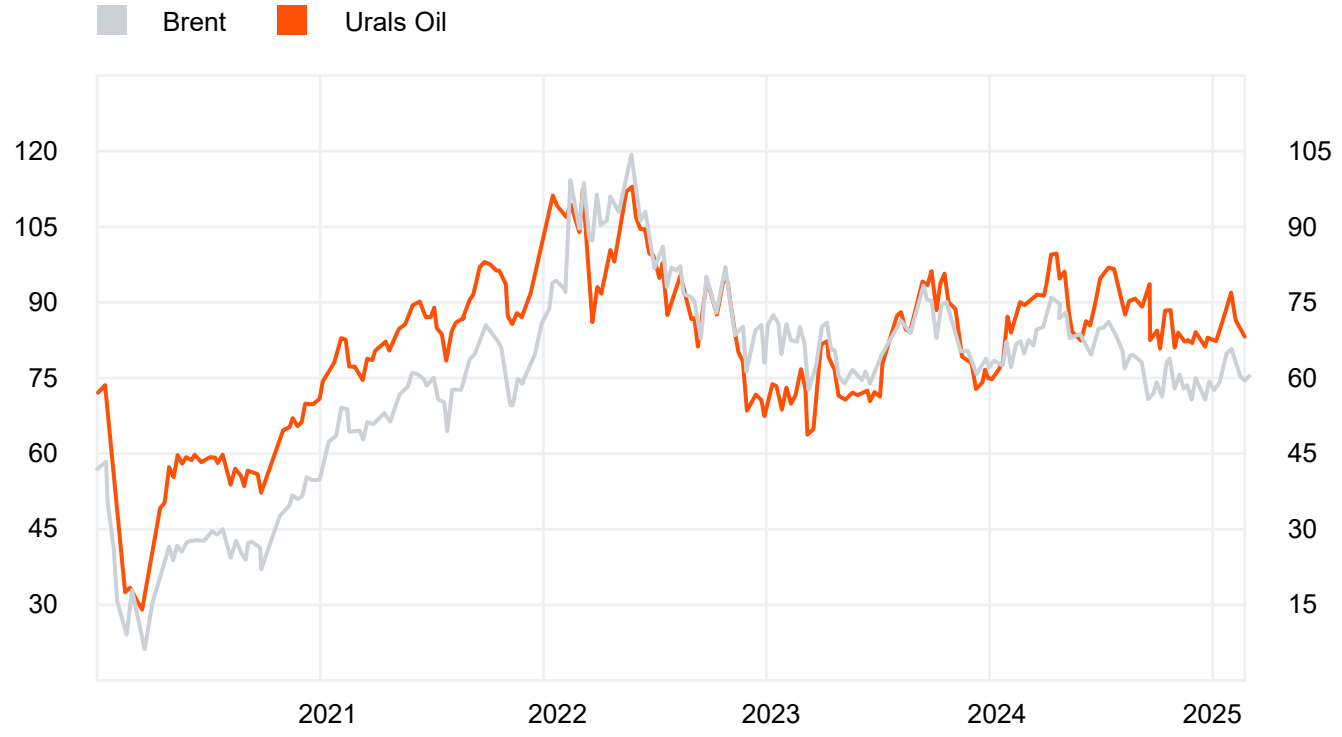
Oil

The net profits in the oil industry soared by 75% between 2021 and 2022, amounting to 54.5 billion euros. However, a decrease of close to 25% followed in 2023.

Since the beginning of 2021, crude oil and refined oil prices have generally been higher than those observed since 2014 [36]. This price effect, driven by various geopolitical, socio-economic, and market changes explained in the Context section, contributed to the increased profits.

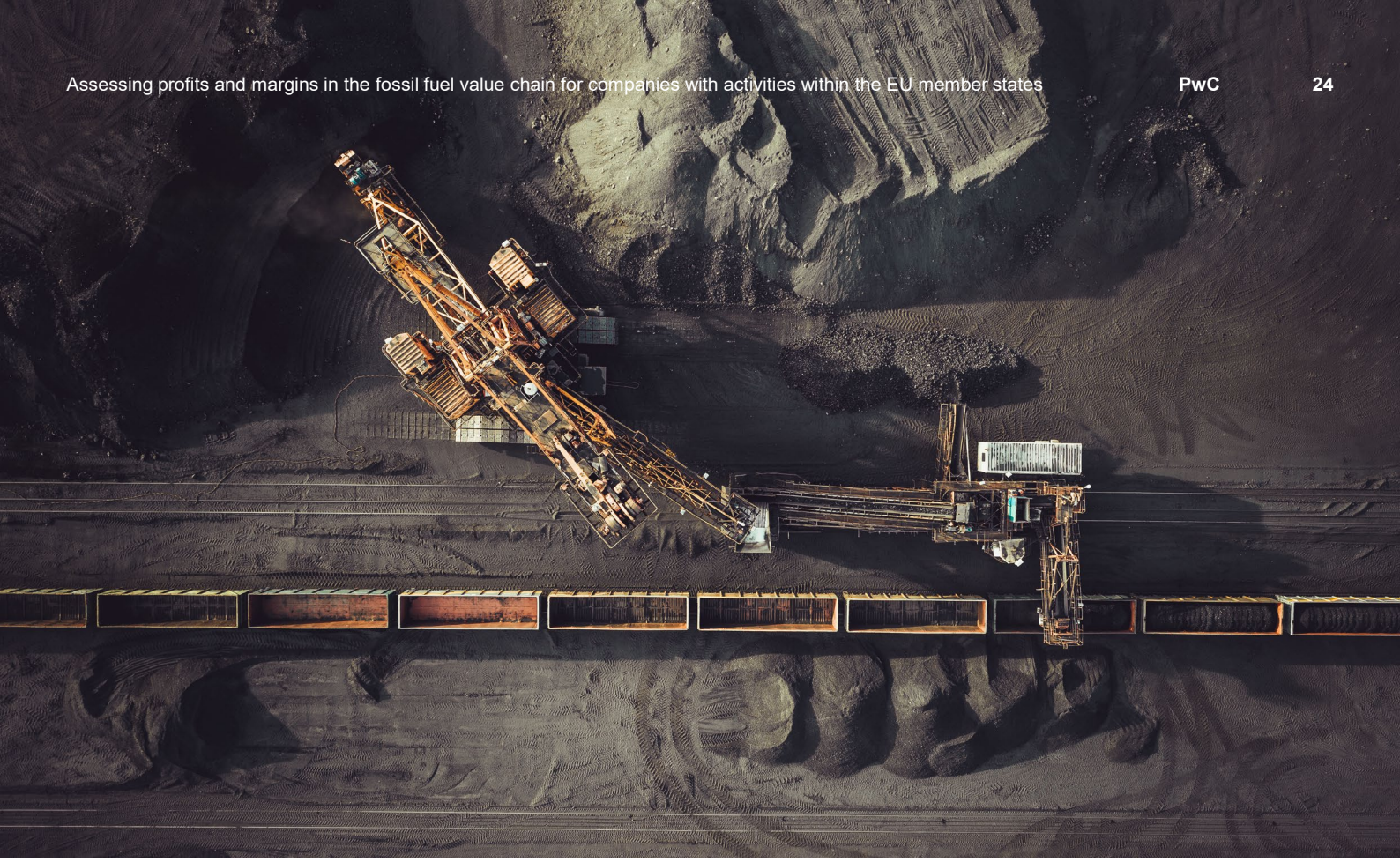
The increase in net profits observed in 2022 for oil can be explained by increased revenues due to an oil price increase caused by the lower amount of available oil on the market. The inelastic nature of oil results in its demand remaining relatively stable, despite prices being volatile and largely dependent on supply. A look at the Brent and the Urals crude oil prices and spread highlights the existing spread and volatility over the last years on the commodity markets [37].

Figure 6 – Brent and Urals crude commodity markets evolution between 2020 and 2025



source: tradingeconomics.com

[37] (Statista, 2024)



The observations of the market are as follows. While the Brent crude 2021 yearly average price was below its 10-year average [38] (70.9 USD/bbl), the year was marked by a sharp increase of both indices, which grew by a factor 2 (Brent) and 2.5 (Urals), increasing the costs of oil and therefore refined products on both ends. The yearly average of the Brent crude in 2022 (100.9 USD/bbl) crossed the 100 USD/bbl threshold for the first time since 2014.

The spread between the Urals and the Brent crude reached a 30 USD margin, which made it possible to increase revenues and profits for companies located in the three countries benefitting from exemptions in the EU (mentioned in the Context section), as well as entities of companies dealing with them outside of the EU through other pipelines, selling it back to the EU afterwards. In 2023, the yearly average (82.5 USD/bbl) decreased, and the second half of the year was marked by a much less significant spread between both indices. Prices remained higher than the 10-year average in 2023.

Note:

The transport sector accounts for about 31% of the final energy consumed [39]. Global initiatives aimed at reducing the use of fossil fuels have the potential to significantly decrease fossil fuels consumption. Therefore, electricity-powered transportation modes, hydrogen fuels, renewables, and Sustainable Aviation Fuels are likely to take larger market shares in the future.

[38] The Brent crude 10 years average (2011-2020) is 78.72 USD/bbl (Statista, 2024)

[39] (Eurostat, 2024)

Increased profit margin in 2022 and its subsequent decrease in the oil sector can be explained by several combined factors.

Firstly, a post-pandemic recovery stimulated the demand for refined oil products, as all activity sectors strived to reach their pre-pandemic productivity levels.

This put refineries in a position of being stretched to meet the increasing demand.

Additionally, a 20-30% Urals-Brent spread on the market incentivised refineries to stock up on crude oil from Russia in anticipation of the ban on Russian crude oil in late 2022 (imports of crude oil were very low in 2021 but surged by 7.4% in 2022 [40]).

The market, anticipating the forthcoming ban on Russian imports, saw refined products prices skyrocket, driving refinery margins up at similar cost levels and substantially increasing net profits. For example, the production of refined petroleum products increased by a total of 8% in 2021 and 2022 [41]. The lower net profits observed in 2023 could be due to the market slowly returning to pre-crisis levels, a secured energy supply not driving prices up, and lowered refinery margins after 2022.

[40] (Eurostat, 2024)
[41] (Eurostat, 2024)

Natural Gas

The net profits in the natural gas industry have decreased by around 5% between 2021 and 2022, going from 36.9 to 34.9 billion euros. In 2023, a decrease of almost 6% in net profits was noticed compared to prior year, reaching 32.9 billion euros. Overall, the estimated net profits have lowered by approximately 4 billion euros from 2021 to 2023.

These lowering net profits observed can be explained by the following factors:

Firstly, there were **lower volumes of natural gas consumed** within the EU in 2022 and 2023.

In recent years, there has been a market shift in energy consumption patterns, particularly concerning natural gas. In 2022, natural gas consumption decreased by over 20% [42], continuing its decline into 2023, driven primarily by high prices. This prompted various sectors to seek alternative energy sources. The industrial sector increasingly turned to LPG as a substitute, while the electricity sector shifted towards coal and renewable energy. Additionally, there was a concerted effort to conserve gas in residential heating. The European Union was at the forefront of this transition, achieving a 20% reduction in natural gas consumption between 2021 and 2023 by surpassing its initial targets [43]. The disparity in pricing between natural gas and other energy commodities motivated industrial consumers in sectors such as metals, ceramics, glass, and asphalt to consider alternatives like LPG [44], despite the challenges of transitioning to new infrastructure and equipment. This trend reflects a broader evolution in energy strategies, as industries adapt to economic pressures and environmental considerations.

Secondly, the **lower volume of natural gas supplied** from Russia due to decreased import through pipelines also contributed to the reduction ingas use [45] (see Context section).

The total gas (natural gas and LNG) supplied to the EU decreased slightly by the end of 2022, and more significantly in 2023 [46]. Indigenous production fell by 8.6% in 2022, while imports of natural gas partially made up for the difference, especially compensated by higher levels of LNG imported mainly from the United States, the UK, Southeast Asia and South America [47]. Higher LNG volumes imported (observed through increased levels of regasification) within the EU since 2022 made up for most of the volumes not imported through pipelines in 2022. Because of these product types and country of origin changes, the profits have shifted from traditional pipeline-based to traders operating on the LNG market. The fact that this does not exactly resonate with the figures comes from the aggregation of all types of gases in the study, LNG included.

[42] (Eurostat, 2022)
[43] (INSTITUTE FOR ENERGY ECONOMICS AND FINANCIAL ANALYSIS, 2024)
[44] (Argus, 2022)
[45] (BBC, 2022)
[46] (Eurostat, 2024)
[47] (Bruegel, 2024)

Thirdly, higher natural gas prices led to **transferred profits**.

Natural gas prices doubled between 2021 and 2022 [48], due to lower supply from Russia to Europe, uncertainty about the economic and political situation, fears of natural gas shortages and lower hydro- and nuclear electricity output [49]. Instead of generating higher net profits for companies located in the EU, a large part of the profits went to imports of natural gas and LNG [50]. This is further explained in the breakdown of profits into the activity segments, where we observe that most of the profits are generated on the downstream segment due to traders and distribution companies extracting higher margins from it [51].

Coal

The EU Green Deal deemed essential the phase out of coal to achieve climate targets and notably a 90% reduction of greenhouse gases emission by 2050 [52].

The net profits in the coal industry soared from 0.6 to just under 10 billion euros between 2021 and 2022, followed by an almost 60% decrease in 2023. Overall, the estimated net profits have increased by approximately 3.3 billion euros from 2021 to 2023. Several factors explain these trends.

An **increase in revenues was observed, due to higher coal prices** driven by higher demand. Coal prices increased by around 150% between 2021 and 2022 [53].

Besides, there was an **increased demand for coal** [54] to secure energy supply in the EU for 2022 led to the need to generate energy from various sources such as coal, renewables and other alternatives. After securing alternative sources of energy from other countries (i.e. natural gas from Norway, LNG from the USA), the relative attractiveness of energy from coal became less appealing, resulting in lower volumes and net profits in 2023 (as reflected in coal prices on the commodity market and electricity prices for coal-generated electricity).

On top of that**, higher imports of thermal coal** (e.g. lignite) for use in energy generation increased the volume of coal processed and used to generate energy from countries outside Europe (e.g., Colombia, South Africa, Australia [55]), increasing the cost of transport. Therefore, larger coal-related revenues and ultimately, net profits, were observed. As such, coal supply increased by 8.3% in 2022, of which lignite production grew by 7.1% and imports by 18.4% [56].

[48] (Eurostat, 2024)
[49] (Center for Economic Policy Research, 2023)
[50] (Eurostat, 2024)
[51] (European Securities and Markets Authority, 2023)
[52] (European Court of Auditors, 2022)
[53] (Statista, 2023)
[54] (Ember Climate, 2023)
[55] (World Bank, 2023)
[56] (Eurocoal, 2023)

4 Fossil fuel activity segments analysis

4 | Fossil fuel activity segments analysis

In this section, we delve deeper into the net profits and net profit margins associated with the activities of the companies under analysis for each fossil fuel and their respective value chain activity segments. By examining the financial performance of these companies, we aim to provide a comprehensive understanding of where profits are generated and concentrated within the value chain. This detailed analysis covers the upstream, midstream, and downstream activities for oil, natural gas, and coal, highlighting the variations in profitability across different activity segments. Through this in-depth exploration, we seek to uncover the key drivers of profitability and offer insights into the financial dynamics of the fossil fuel industry.

Oil

The Figure 7 displayed below highlights the estimated net profits that have been generated on the EU-27 territories between 2021 and 2023, for each activity segment of the oil industry analysed. Further, an analysis of each activity segment details the drivers of the net profits' evolution over the years.

Figure 7 – Net segmental profits in the EU oil value chain

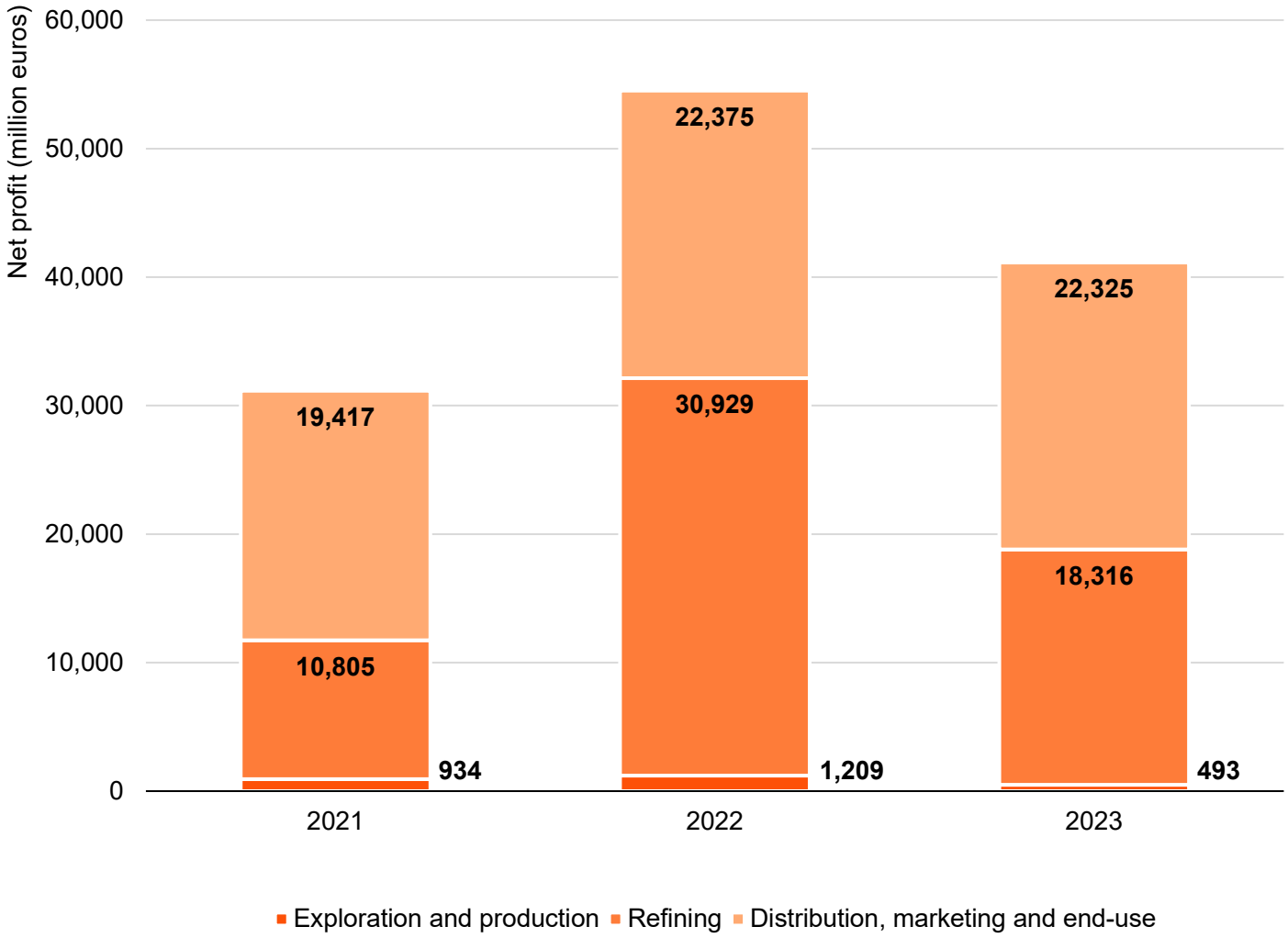
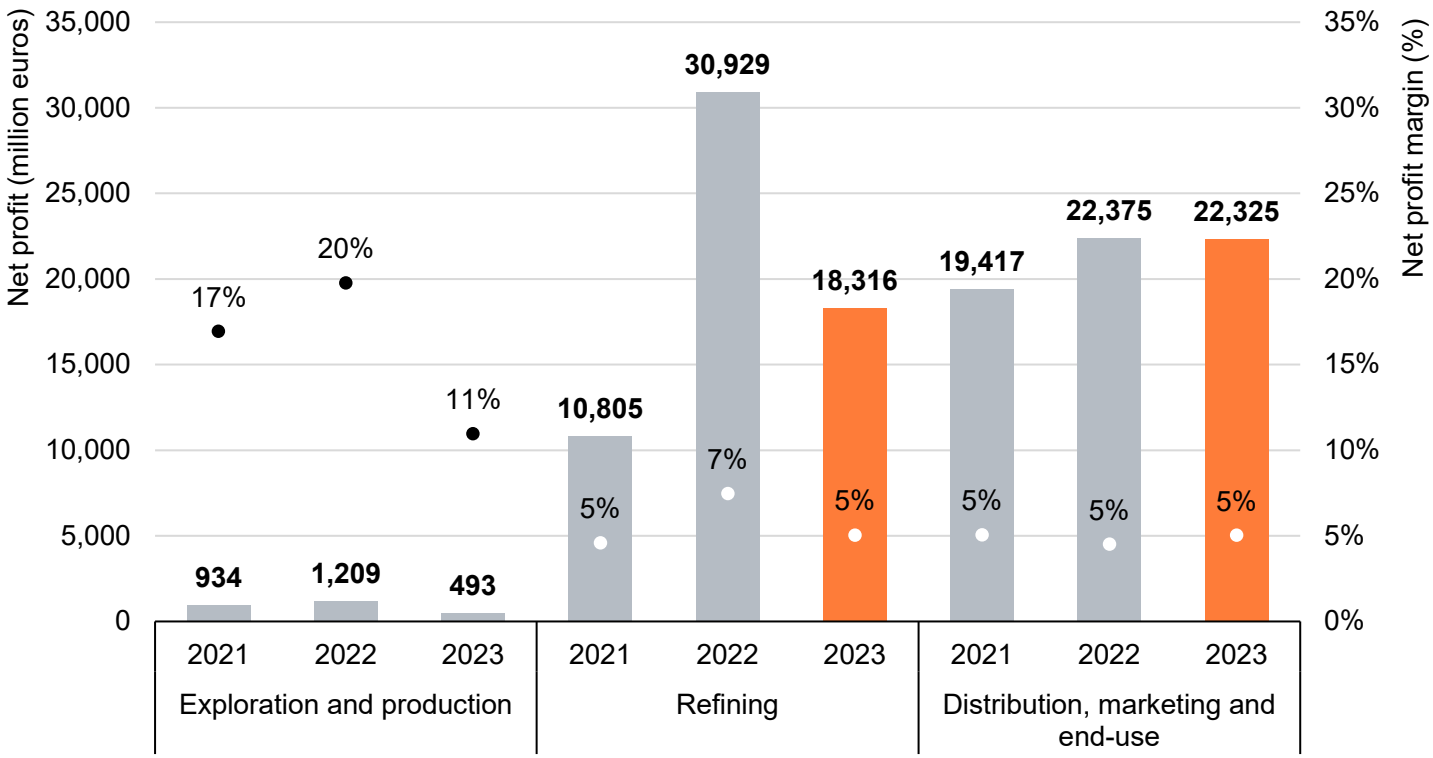


Figure 8 – Net segmental profits and profit margins in the EU oil value chain



Upstream - Exploration, production, transportation and storage

Net profits stemming from crude oil extraction increased from 0.9 billion euros in 2021 to 1.2 billion euros in 2022, representing an increase of around 30%. This was followed by a decrease of around 60% in 2023, falling far below the 2021 levels. While the price of crude oil in 2023 was still higher than its 2021 level, this decrease could be explained by several factors:

- **Higher volumes of imported crude oil** due to (1) European companies having stocked up on cheaper Russian oil in 2022 [57], (2) continued **imports of cheaper oil from outside the EU rather than producing** it locally at higher costs [58], and (3) relying on companies processing cheaper Russian oil from countries exempted from the ban (see Context section).
- **Lack of trust in the high prices of 2023** and the belief that they would not last, requiring companies to spend more in exploration and looking out for new fields, hence increasing costs [59].

As volumes of crude oil imported to refineries decreased over the course of 2023 [60] and volumes of oil extracted have decreased (from 16.23 Mtoe in 2022 to 15.45 Mtoe in 2023), total volumes consumed are effectively lower compared to previous years.

Moreover, a net profit margin shift was noticed in 2023 among the companies analysed, with a decrease from around 20% in 2022 to only 11% in 2023.The cheaper imports from outside the EU and the cooling down of the market compared to the overheated market in 2022, lowered the net margins.

[57] (Euractiv, 2024)
[58] (Clean Energy Wire, 2024)
[59] (Reuters, 2024)
[60] (Eurostat, 2023)

Midstream - Refining

The refining segment saw profits multiply by three between 2021 and 2022, reaching 30.9 billion euros and a profit margin of around 7%, compared to around 5% in 2021 and 2023. **The net profit margins increase** during this period can be attributed to several factors:

- Higher crack spread (i.e., the difference between the price of crude oil and of the refined product) [61],
- An overheated market,
- High fuel prices in 2022, and
- Low imports of fuels to the EU from Russia [62].

In this analysis it is important to differentiate the crack spread (i.e. market-based, also called "refining margin") from the net margin of the refining activity analysed in this report (i.e. financial-report factoring in all operational costs, investments costs, transfer pricing, profit shifting). Though the crack spread increased from around 5 USD/bbl to 12-25 USD/bbl in 2022 and moderated in 2023, it is also important to understand that some refineries benefitted more from it than others. The countries exempted from the ban (mentioned in the Context section) were able to import, stock up, and refine cheaper crude, consequently increasing their own margins from these refining activities[63] [64].

In 2020 the sector reached the lowest level of petroleum products produced since 1990 (beginning of the Eurostat dataset). This low level was due to COVID-19 related restrictions in movements, which reduced the demand for fuels used in transportation, such as gasoline and diesel.

Moreover, the high margins on refined oil products with 30.9 billion euros of profits in 2022 are due to higher margins stemming from the refineries in the countries under exemption of Russian oil import ban (i.e., volumes imported at a 20-30% discounted price).

On top of that, the closure of some refineries (2021: 93; 2022: 89; 2023: 86) lowered the capacity available for refining during the year 2022 (not in 2023 due to investments being realised and increasing the capacity of refineries again) [65]. These lower capacities, the increased demand for refined products combined with the lower crude oil prices (explained above) for 2022 directly influenced the net margins to increase.

[61] The most common type of crack spread is the simple 1:1 crack spread, which represents the refinery profit margin between the refined products (gasoline or diesel) and crude oil. The crack spread — the theoretical refining margin — is executed by selling the refined products futures (i.e. gasoline or diesel) and buying crude oil futures, thereby locking in the differential between the refined products and crude oil. (CME Group, 2017)

[62] (Fitch Ratings, 2023)

[63] (Fitch Ratings, 2023)

[64] Though this is a market-based fact, the analysis of the companies performed in this report are subject to the level of transparency and segmentation buckets shared by the companies themselves. Hence, highlighting the difference between a market observation and a financial report based one. Moreover, the invasion of Ukraine by Russia and the consequent sanctions and bans created deformities in the market, in which some refining companies benefitted more than others, as can be observed from the figures of this report and other similar reports.

[65] (Concawe, 2024)

For the year 2023, we observe a decrease of net profit margins to around 5%, similar to what was observed in 2021. Several factors could explain this phenomenon:

- Prices of refined petroleum products decreased by 11.5% from 2022 to 2023 [66],largely due to cheaper Russian crude oil being taken away in 2023 [67], increasing feedstock cost for refineries. Volumes increased due to the recovery of the global economy, resulting in **lower profit margins** in 2023, even though profits were still higher than in 2021.
- A **change in the import source and refineries output of refined products** could explain the change in profits. While 2021 and 2023 show that the most consumed refined products are diesel/gasoil (2021: 41.2%; 2023: 40.2%) and gasoline (2021: 8.6%; 2023: 18.7%), refined products prices steeply increased in 2022 [68]. The booming economic activity in the EU, following a post-pandemic recovery, coupled with a 40% of diesel imports in the EU coming from Russia [69], domestic refineries needed to increase their production outputs and find alternative import routes for these products. The subsequent higher prices for refined products increased margins due to a low crude oil price still in force in 2022. In 2023, with alternative imports secured, the situation stabilised.

[66] Average petroleum product price computed by PwC for 2021 (0.62 EUR/L), 2022 (0.96 EUR/L) and 2023 (0.85 EUR/L)
[67] (Deutsche Welle, 2024)
[68] (Trading Economics, 2025)
[69] (Bruegel, 2023)

Downstream - Distribution, marketing and end-use

Total profits rose from 19.4 to 22.4 billion euros between 2021 and 2022, while 2023 remained stable compared to 2022. This increase of around 15% was accompanied by a stable net profit margin, staying around 5% during the three years analysed.

The year 2020 was heavily affected by the COVID-19 pandemic, which slowed down the use of transport fuels and refined petroleum products. However, 2021 showed a gradual recovery with 408 Mtoe consumed within the EU-27, close to pre-COVID-19 levels of 412 Mtoe in 2018 [70]. The volumes consumed in 2022 decreased only by 1% compared to 2021 levels, reaching 405 Mtoe in 2022.

While the volume consumed did not change significantly between 2021 and 2022, the average price of oil products increased by around 55% during the same period, and imports increased by around 6%. All other things being equal, this would normally increase profit and profit margins of oil retailers and wholesalers.

This was however accompanied by an increase of around 43% price of the Brent crude on the commodity markets, lowering the potential spread effects. When factoring in the sample diversity, the verticality of activities from some key companies (thus able to control their profits' location within the value chain), the inelasticity [71] of end-consumers to daily petroleum product prices, as well as the increased volume of imports, the profits' increase can be explained by the higher oil products prices.

As the last players in the value chain, end-consumers have seen prices increase in 2022 compared to 2021 levels. While definitive numbers about 2023 volumes are not exact yet at the time of writing (due to processing by national statistics offices), it seems that volumes imported are lower than 2022 levels for the first two quarters of 2023, both in value and volume. Additionally, we observe that prices have decreased and seem to be heading back to pre-COVID-19 crisis levels.

[70] (Eurostat, 2024)

[71] Elasticity is the degree to which the number of products sold changes when the product's price changes (Cambridge Dictionnary, s.d.). In a situation of large elasticity, a small increase of the price will drive the demand down more than proportionally, and the other way around for a price decrease. In a situation of inelasticity, a variation of the price will have a less proportional effect on the demand, due to many potential reasons (lack of substitutes, necessary resource, etc.).

Natural gas

The Figure 9 displayed below highlights the estimated net profits that have been generated on the EU-27 territories between 2021 and 2023, for each activity segment of the natural gas industry analysed. Further, an analysis of each activity segment details the drivers of the net profits evolution over the years.

Figure 9 – Net segmental profits in the EU natural gas value chain

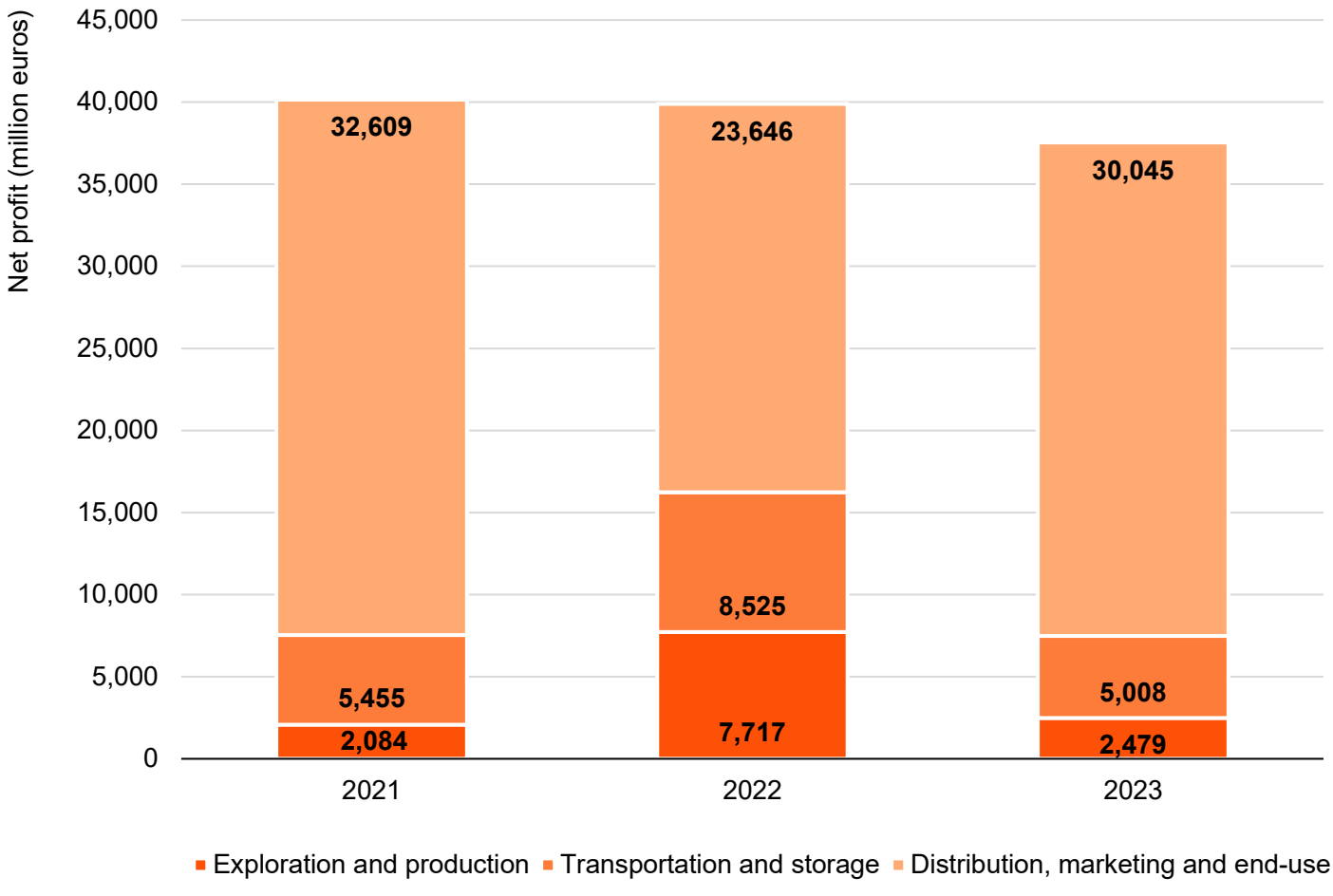
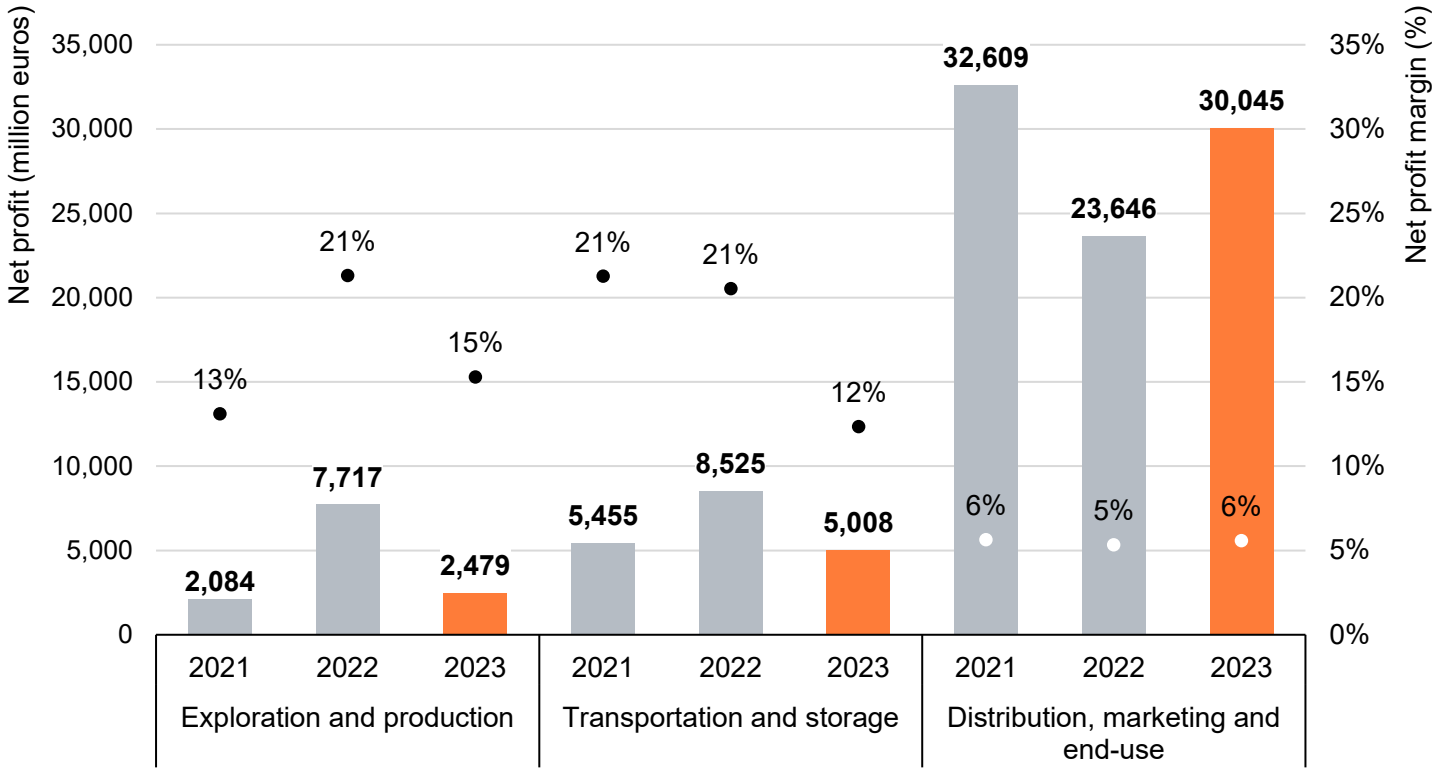


Figure 10 – Net segmental profits and profit margins in the EU natural gas value chain



Upstream - Exploration and production

Net profits from natural gas production increased from 2.1 billion euros to 7.7 billion euros between 2021 and 2022. This was followed by a decrease of almost 68% in 2023, falling far below 2022 levels, but still approximately 19% above 2021 levels. The net profit margins have followed a similar trend, with a sharp increase from 13% to 21% between 2021 and 2022, followed by a drop to 15% one year later.

In 2022, natural gas prices surged by over 146% compared to 2021, rising from 0.028 EUR/kWh to 0.069 EUR/kWh. In 2023, they remained elevated, with an average yearly price of 0.062 EUR/kWh [72]. The increase observed in 2022 and 2023 led to higher profit margins, while domestic volumes decreased.

The volumes of natural gas produced have steadily decreased since 2021, which is in line with the downward trend for production of natural gas since 2010. While the EU produced 5,094 PJ (Peta Joules) of natural gas in 2010, only 1,914 PJ were produced in 2020, and 1,362 PJ in 2023. The EU has a high dependency on natural gas imports, estimated at 90% in 2023 [73]. Imports increased from 13,942 PJ in 2020 to 15,613 PJ in 2022 and decreased to 13,922 PJ in 2023.

[72] (Eurostat, 2024)
[73] (Eurostat, 2024)

In other words, the scarcity of natural gas resources and high prices made 2022 a record-high year for net profits of natural gas producers within Europe. While prices and imports increased, the internal European production of natural gas decreased [74]. This structural decrease was further pushed by the EU through its EU Fit for 55 [75] strategy of shifting from fossil gas to renewable and low-carbon gases, as well as the REPowerEU objectives [76] of saving energy, diversifying energy supplies and producing clean energy. These events are mainly linked with the shortage of natural gas supply from Russia from 2022 onwards and the necessity for the EU to find alternative energy sources (i.e., natural gas suppliers, but also LNG and other energy providers such as coal, which will be explained further in this study).

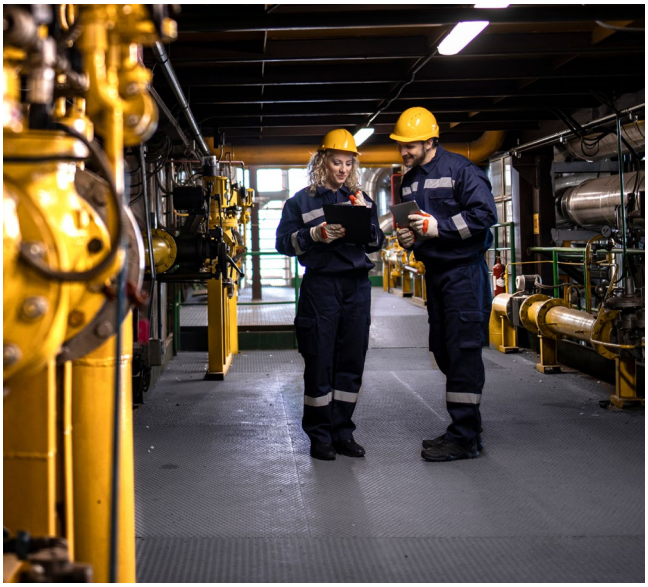
Net profits and net profit margins decreased in 2023 to levels slightly higher than 2021. This trend outlines the lower availability of natural gas coming from differentiated sources of supply, other energy types taking more importance in the mix (e.g., renewables accounting for 12.3% in 2021 and 15.2% in 2023 [77]) and increased levels of LNG imports to compensate for lower imports of natural gas in 2023 [78].

Midstream – Transportation and storage

The transport and storage segment is relatively stable, being heavily regulated. As such, governments often control the rates charged for transporting gas (i.e., via pipelines). However, the use of LNG allows for a different mode of transportation over routes that are not reachable by pipelines (e.g., across oceans, over longer distances). Consequently, the segment mostly varies based on the demand of natural gas within Europe.

Though a specific geographical analysis of the pipeline routing and profits sources is not part of this study, some TSOs could have increased their profits due to (1) the rerouting of gas flows, and (2) increased tariffs. According to ACER, “EU cross-border transport costs have risen by circa 40% since 2021 on average, double the rate of inflation” [79]. These higher tariffs could have contributed to blocking non-Russian gas imports into Europe, hence presenting a geographical heterogeneity of available volumes, and access to affordable natural gas.

[74] (British Petroleum, 2023)
[75] (Council of the European union, 2024)
[76] (European Commission, 2022)
[77] (British Petroleum, 2023) (Energy Institute, 2024)
[78] (Bruegel, 2024)
[79] (ACER, 2024)



The net profits generated by the segment increased by around 56.3% between 2021 and 2022 to 8.5 billion euros. In 2023, the net profits decreased again to 5.0 billion euros (- 41.3%). The 2022 increase could be due to a shrinkage of demand, lowering the volumes of gas transmitted by the TSOs (though at higher costs as previously observed). Moreover, the reduction of volumes imported from Russia caused the supply flexibility to decrease. This lack of flexibility impacted the storage spreads [80]. Because of this tight market, the storage business captured a significant part of the revenue, which persisted in a lesser manner in 2023 though the market has loosened.

This increase could be due to the supply shortage of natural gas, and the lower volumes produced within the EU (hence, not transported). During 2022 and 2023, LNG, which is an initially costlier transport means than pipelines (i.e., it requires more processing activities for its change of state, as well as more costly tanker transport and terminal costs), proved useful in meeting the increasing natural gas demand across the continent. Though it is inherently costlier, the limited slot availability, the price war due to Asia's growing demand for LNG, and increased demand for natural gas formed a spread close to 5 USD/bbl. Though favouring LNG transport and allowed for the sector to increase profits, pipeline gas was still used as a first choice [81].

The net profit margin remained around 21% in 2021 and 2022. However, it decreased to around 12% in 2023. This decreasing margin does evolve in the same direction as net profits. The lower profits generated in the transport segment could be linked to the increased regasification capacity for LNG (share of LNG imported ranged from 20% in 2021 to 41% in 2023 [82]), the securing of alternative sources of natural gas, reducing prices, cooling down the market and reducing profits [83].

[80] (Timera Energy, 2024)
[81] (S&P Global, 2024)
[82] (European Commission, s.d.)
[83] (European Union, 2024)

Downstream - Distribution, marketing and end-use

Net profits in the retailing and wholesaling of natural gas have decreased by a bit more than 12% between 2021 and 2023. The lowest net profits were obtained in 2022 with 25,3 billion euros and the highest in 2021 with 32.6 billion euros. Net profit margins have remained stable over the same three years period, averaging 6%. Though a specific country-by-country analysis has not been performed in this study, some countries could have benefitted from access to different market with commodities at lower prices, driving company profits up, while others would not have benefitted from such scenarios.

Lower profits in 2022 could be partially due to the EU demanding a voluntary reduction of natural gas consumption to its Member States, from August 2022 to March 2023, in order to secure energy supply [84]. This is translated into lower volumes consumed in 2022, with a decrease of 13%, closely aligned with the decrease in net profits. While the methodology applied did rely on publicly available data, the first two quarters of 2023 have seen demand falling by 7.4% in 2023 [85]. Net profits estimated for 2023 might thus actually be slightly lower than what is displayed.

[84] (European Council , 2024)
[85] (Eurostat, 2024)

Coal

The Figure 11 displayed below highlights the estimated net profits that have been generated on the EU-27 territories between 2021 and 2023, for each activity segment of the coal industry analysed. Further, an analysis of each activity segment details the drivers of the net profits evolution over the years.

Figure 11 – Net segmental profits in the EU coal value chain

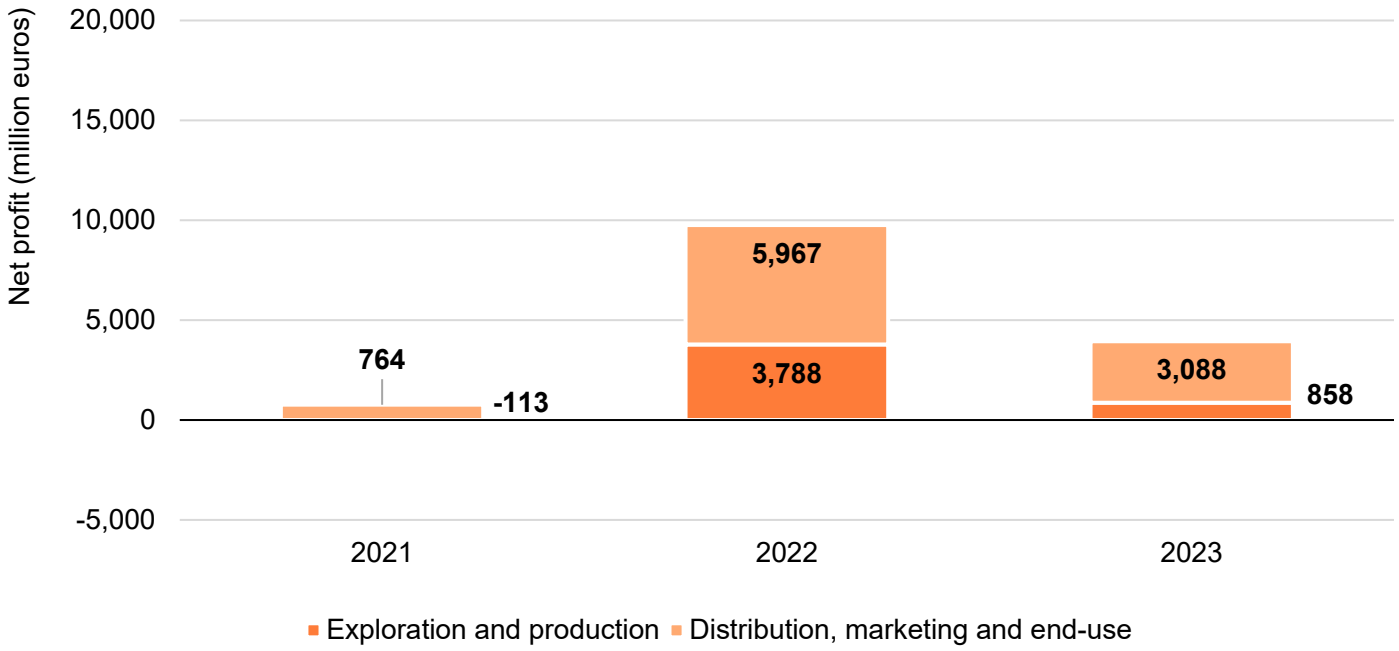
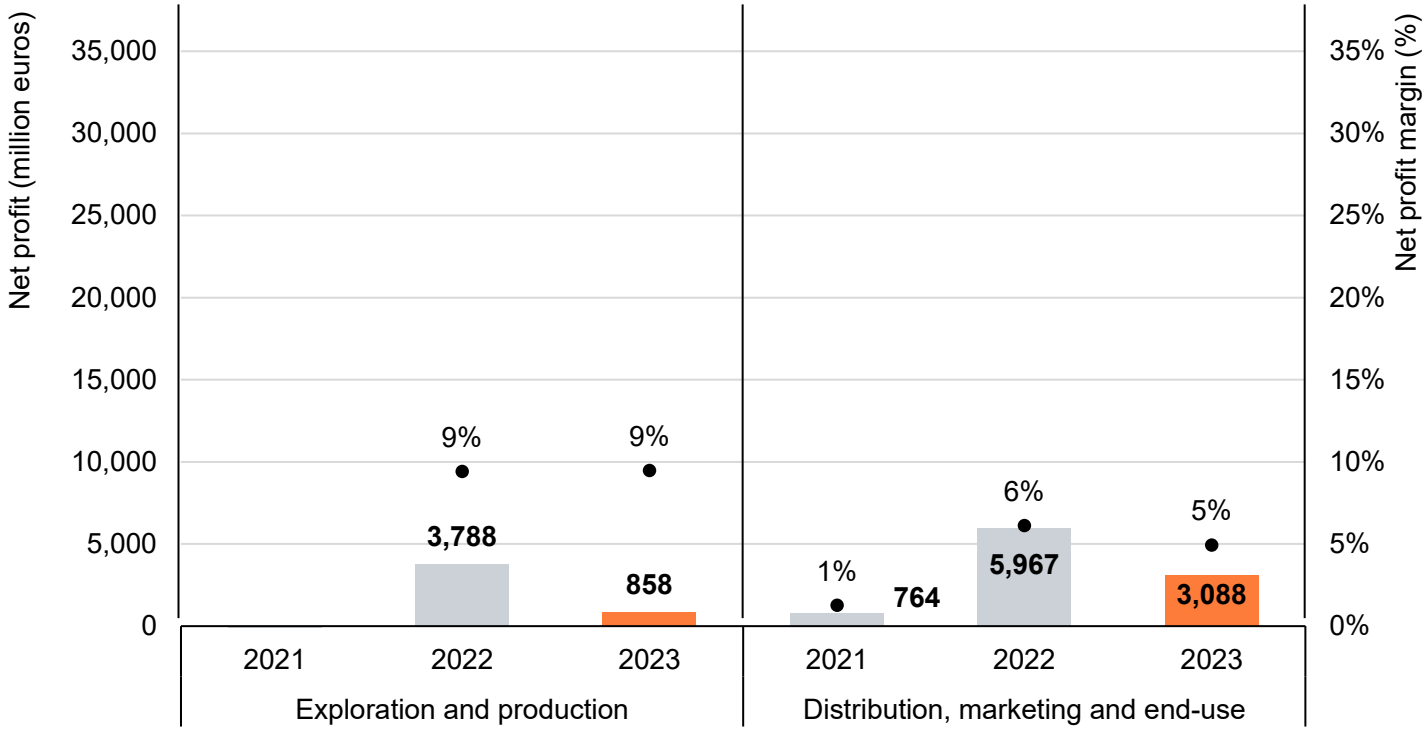


Figure 12 – Net segmental profits and profit margins in the EU coal value chain



Upstream - Exploration, production, transportation and storage

The net income generated by the exploration and production of coal substantially increased in 2022, compared to 2021 and 2023 levels. The net loss generated in 2021 was close to 0.3 billion euros, while it increased to a net profit of 3.7 billion euros in 2022. However, the profits decreased again in 2023 to 0.8 billion euros, still slightly above zero. Net profits margins evolved in the same direction, rising from around -1% in 2021 to 9% in 2022 and 2023. Net profit margins levels are comparable for oil and natural gas, while they are negative in 2021 for coal and lower than the other fossil fuels in 2022 and 2023.

The net profit generated in the production of coal are lower than for oil and natural gas. The peak observed in 2022 can be explained by several factors:

Firstly, sanctions on Russian energy exports lead to uncertainty regarding energy supply (Russian coal was sanctioned as from August 2022, while Russia was Europe's largest exporter of coal to the EU with around 52% of coal consumed imported from Russia in 2021 [86]), with countries turning to coal as a backup source of heat and power generation.

Secondly, the sanctions caused the price of natural gas to increase, making coal a more economical option for power generation.

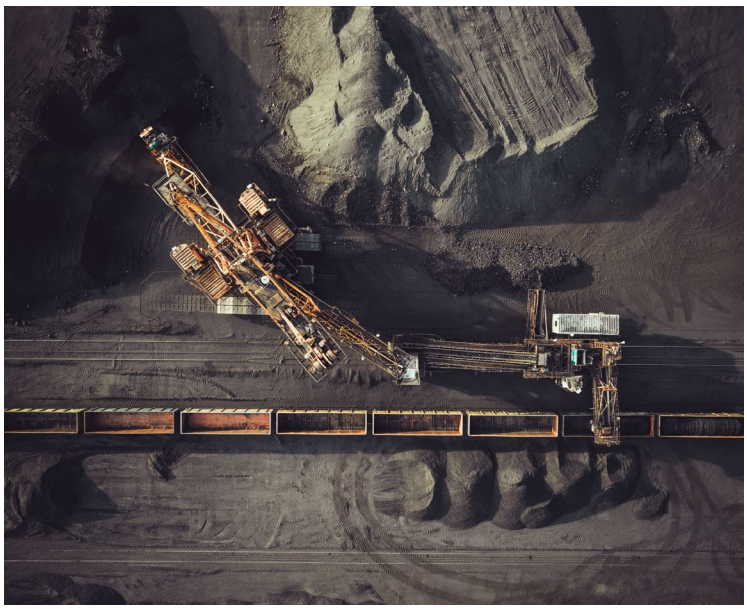
Lastly, the desire of reducing energy dependency on Russian gas led to the temporary revival of coal plants.

As an alternative to natural gas used for heat and power generation, coal prices were pushed from 120 EUR/T to 279 EUR/T between 2021 and 2022 [87]. To secure coal supply, imports of coal had to come from farther away (e.g., South Africa, Australia, South Africa and Colombia, which became the largest partners of the EU for coal import after Russia [88]). Not only did it have the consequence of increasing coal prices on the market, but il also led to an increase in mining activities and the reopening of coal-fired power plants by companies to maximise profits.

[86] (Eurostat, 2024)
[87] (Market Observatory for Energy of the European Commission, 2023)
[88] (Eurostat, 2024)

The impact of the lower supply of natural gas is also visible in 2022, with a different energy mix in the EU. While renewables (2021: 17.2%; 2022: 39.4%) and coal shares (2021: 12.4%; 2022: 15.8%) did increase, the natural gas (2021: 23.2%; 2022: 19.6%) share decreased [89] [90]

While the events occurring in 2022 sparked a need for solid fossil fuels and generation of energy from alternative sources, this need decreased in 2023 with alternative sources of supply secured (e.g. LNG). While energy generation from coal in the EU was smaller in 2022 than in 2015, this trend is expected to continue, with coal power generation falling by 26% in 2023 [91]. Countries planning to phase out coal extraction and coal-fired power plants, along with an increased share of wind and solar energy, better level of hydro-generation than in past years (further explained in the Context section), and the expected increase of nuclear will shape the future of energy generation in Europe [92].



Downstream - Distribution, marketing and end-use

Initially, most of the profits from coal were generated through electricity production. However, in 2022, the exceptional demand for energy made coal extraction highly profitable. Because many companies in this industry are vertically integrated, the same companies often generate profits from both coal extraction and its use in electricity or heat generation, though in different segments of their operations.

The price of coal on the Northwest European ports reached 292 USD/T, from 123 EUR/USD/T in 2021. This price increase is the consequence of several factors already mentioned: an increased demand in Europe, an increased production, higher levels of imports at higher costs to compensate for reduced domestic production and the embargo of Russian coal (increase by 18.3% from 2021 levels [93] , from countries defined above). These historically high prices benefitted to substantial revenues and profits for major players.

[89] (Fuels Europe, 2024)
[90] (Eurostat, 2023)
[91] (Ember Energy, 2024)
[92] (Ember Energy, 2023)
[93] (Eurocoal, 2023)

5 Additional observations

5 | Additional observations

As previously explained, a proxy of the net revenue can be obtained in the form of a combination of volumes exchanged and unit price of the given commodity. While this proxy has its limitations — particularly if used for upstream and midstream activities where exchange prices differ from market prices — it still offers a reasonable indication of the price and quantity effects impacting the profits generated along the value chains. These net profit fluctuations can be explained by the following two factors:

- The **volumes exchanged** is a key element driving total revenue and profitability, as it reflects the demand and supply dynamics in each fossil fuel segment.

  The available data shows that oil volumes exchanged increased between from 6.2 to 6.6 Mtoe of total traded volumes over 2021 to 2023. This suggests increased demand for oil products across the years in scope. Natural gas volumes showed some fluctuations, it represented 5.4 Mtoe of total volume in 2021, decreased to 4.9 Mtoe of the overall fossil fuels demand in 2022, and increased to 5.1 Mtoe in 2023. These variations are likely due to supply disruptions and demand shifts. Coal volume exchanged increased in 2022, rising from 2.2 Mtoe to 1.4 Mtoe of exchanged volumes, possibly due to a short-term demand surge as an alternative energy source. However, this increase was followed by a significant decline in 2023, indicating a return to lower demand levels.

- The **price of fossil fuels** is the second factor affecting the total revenue.

  Mostly determined by the commodity markets and long-term purchasing agreements between companies, its increase in value directly drives revenue up (at constant volume exchanged). Consequently, impacting the net profit upwards. Oil prices rose sharply from 84 EUR per barrel equivalent in 2021 to 106 EUR in 2022, before settling at 89 EUR in 2023. The 2022 price hike boosted oil revenue and profit, despite stable volumes traded. Natural gas prices followed a similar trend, increasing from 0.03 EUR per kilowatt-hour in 2021 to 0.07 EUR in 2022, then slightly decreasing to 0.06 EUR in 2023. The substantial price increase observed in 2022 helped maintaining profitability in the industry, though volumes exchanged were lower than the previous year. Coal prices surged from 120 EUR a ton in 2021 to 279 EUR the next year. They decreased back to 106 EUR in 2023. The price spike drove up coal revenue and profits temporarily, compensating for its modest trading volume. These price variations across all segments highlight that 2022 was a peak year for fossil fuel profitability, as the significant price increases outweighed the relatively stable or fluctuating volumes, particularly in oil and coal.

Figure 13 – Extrapolated yearly volume exchanged in the EU-27

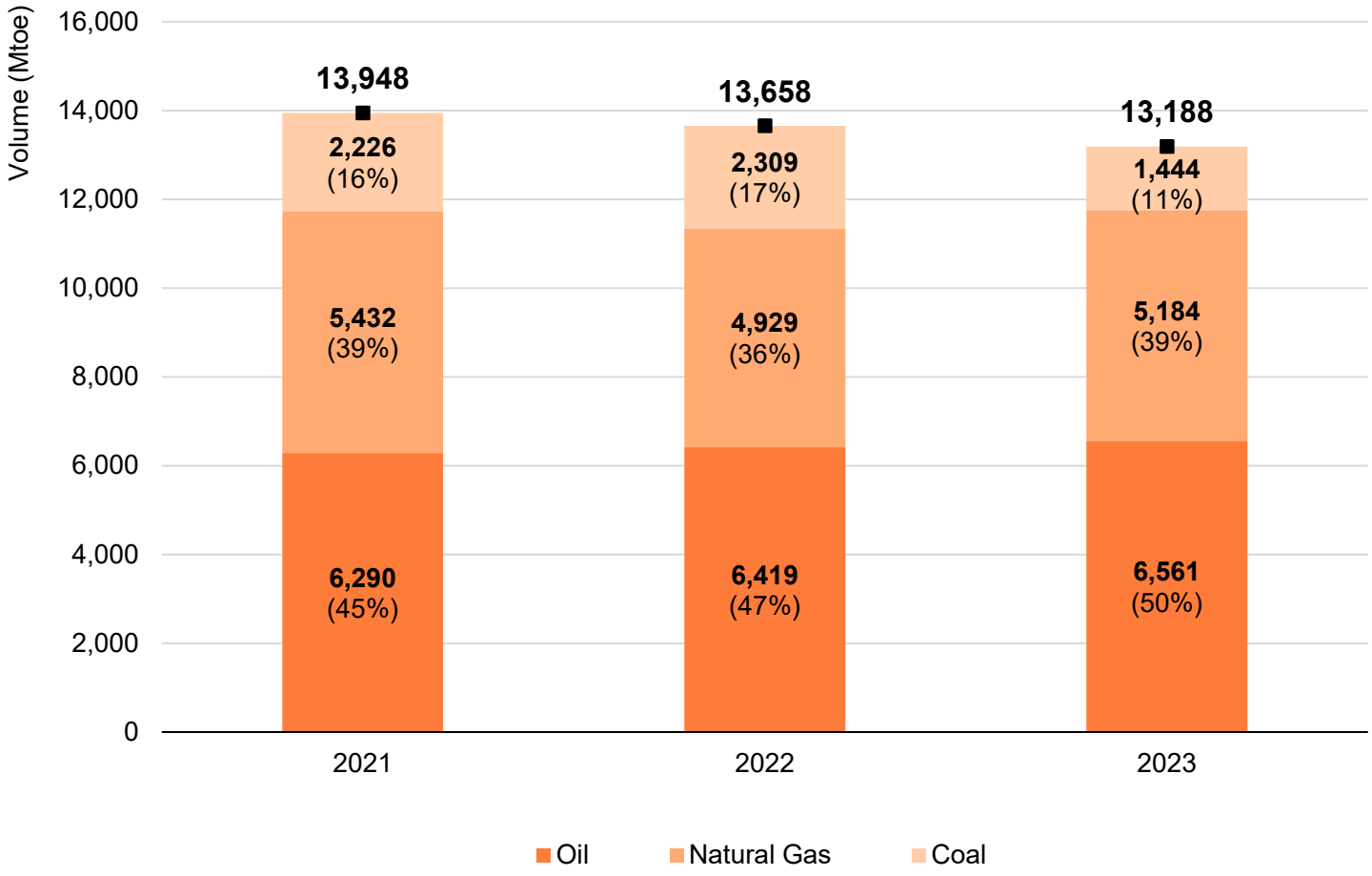
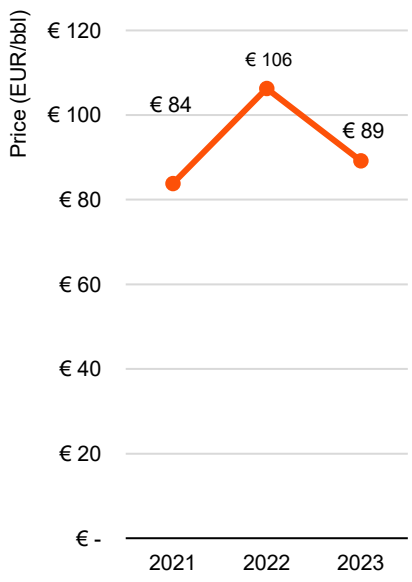
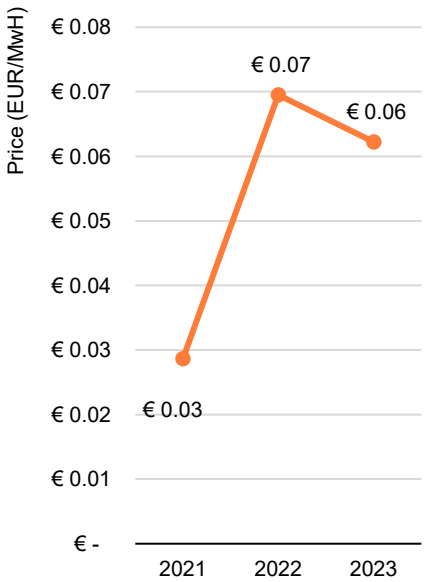


Figure 14 – Yearly average commodity market price in the EU-27

Brent crude yearly average commodity market price



Natural Gas yearly average commodity market price



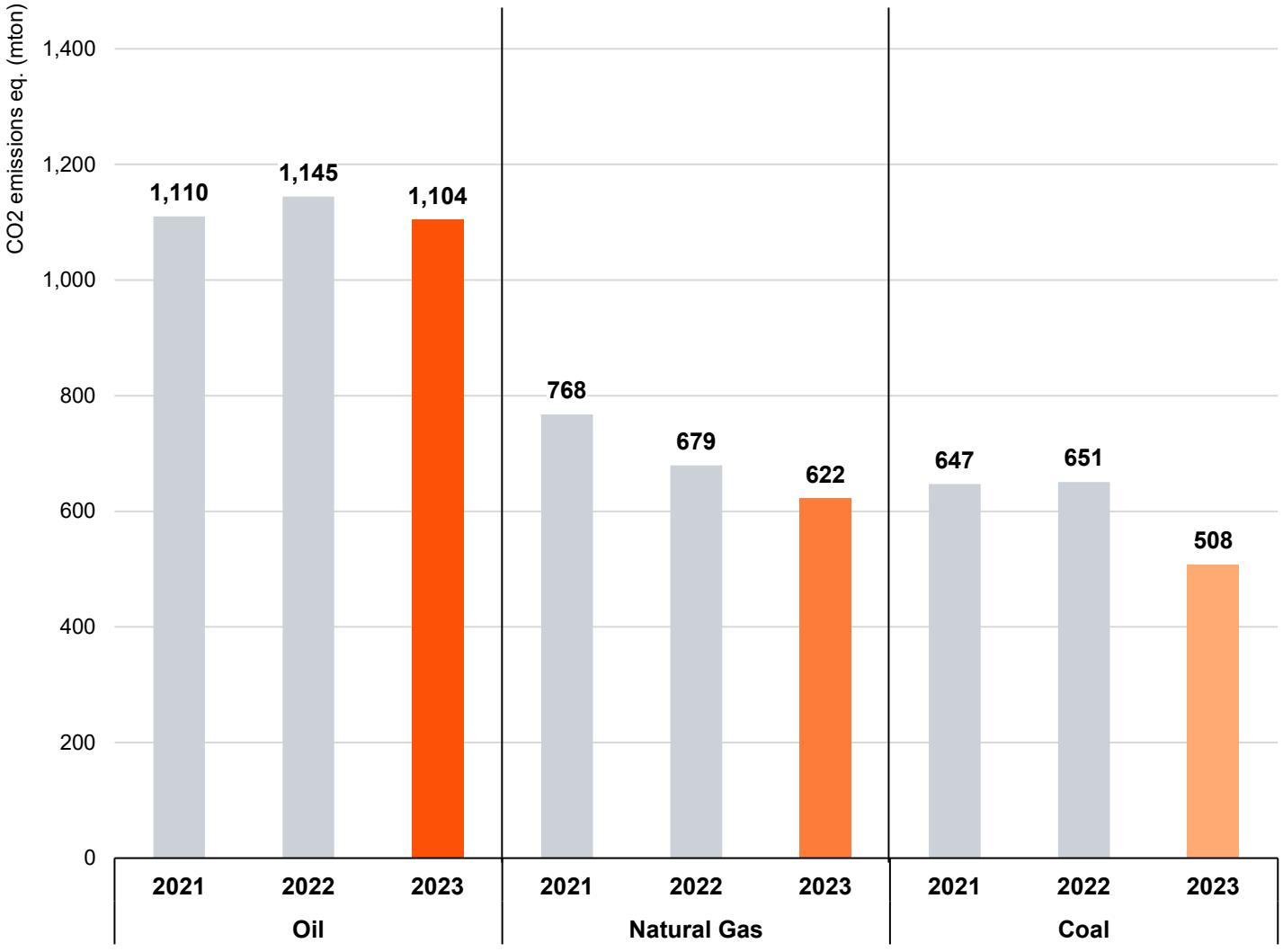
Coal yearly average commodity market price

CO2 emissions potential

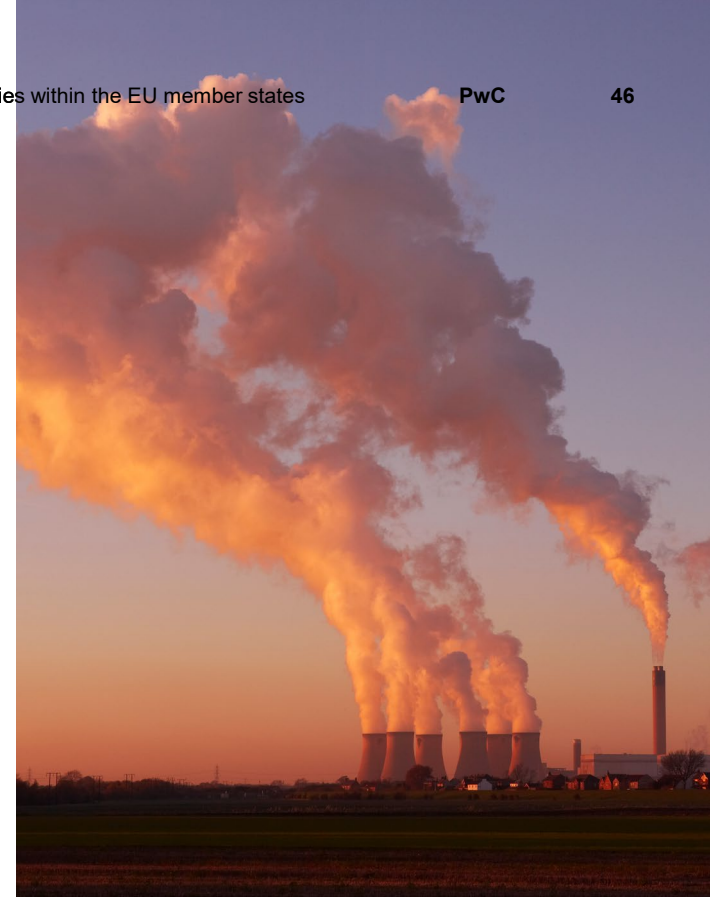
This section aims at representing the carbon dioxide equivalent that would be generated in the fossil fuel value chain, if all the fossil fuel were burned. The carbon dioxide emissions equivalent represents the *quantities of CO_2 that would be emitted in the atmosphere if the oil, natural gas and coal volumes handled in the EU Member States' value chains were entirely consumed*. As such, it remains an assessment of the potential quantities of carbon dioxide emitted in the atmosphere by the EU over the years analysed. It is important to understand those estimations only represent a *potential*, due to fossil fuels quantities ultimately being either stored, consumed as input in a transformation process, lost in transport, transformed into chemicals, etc. (i.e., not burned only).

The emissions potential is determined by the quantities of the fossil fuel handled throughout every activity segment of the value chain and an emission factor for its combustion. [94] As shown on Figure 15 below, natural gas has the lowest emission factor, and coal the highest (i.e. different types of coals have different emission factors) as defined in the section. Changes throughout the years always highlight here a change in the volume handled throughout the value chain, the conversion factors being fixed.

Figure 15 – CO2 emissions potential by fossil fuel complete value chain in the EU



[94] (CarbonMajors, 2014)



Overview

In 2023, the emissions potential of oil and oil products accounted for around 50% of total emissions that could stem from fossil fuels use, while natural gas accounted for a bit less than 28% and coal for around 23% (c.f. Methodology section for more details). Over the last three years, the total CO2 emissions potential that could be emitted from the volumes handled decreased from a potential volume of 2.5 to 2.2 billion tons, or a decrease of 11.5% between 2021 and 2023. In the fossil fuel value chain, most of the potential emissions occur within the distribution, marketing, and end-use activity segment. For oil, a significant amount of CO2 emissions potential is also handled during the refining process, while transportation is a major contributor to CO2 emissions potential for natural gas.

Oil

Oil is the main source of CO_2 emissions potential over the three years analysed and has slightly increased during this period. The total emissions potential of oil and oil products throughout the value chain increased by 3% between 2021 and 2022, before returning to 2021 level one year later., This reflects the higher volume of oil handled in 2022. It is important to note that this increase in volume for 2022 is due to increased demand [95] (while production decreased in the EU over the same period, imports increased). As an illustration, the relative part of crude oil and refined products consumption in the EU decreased from 30.7% to 30.3% between 2021 and 2022, while the above chart highlights an increase of emissions potential of 3% over the period.

[86] (Eurostat, 2024)

Natural gas

Natural gas has the second highest CO2 emissions potential, with 0.6 billion tons of carbon dioxide in 2023. The total volumes observed decreased heavily over the last three years, with a 20% decrease during this period (most of which occurred in 2022, or 11.5%). This decrease can be explained by the lower supplies of natural gas (i.e. explained by geopolitical events and market turmoil), and the higher share of renewables energies, coal and other sources of energy available for consumption in the European mix [96].

Coal

A decrease in carbon dioxide emissions potential between 2021 and 2023 is observed, with 2023 totalling around 80% of the emissions potential of 2021. However, the emissions potential level slightly increased in 2022. The decrease observed for 2023 could be explained by the lower levels of extractions and generation of electricity needed from coal, due to the other energy sources taking larger parts in the energy mix, as explained previously.

The lower volumes of CO_2 emissions potential observed for 2023 could be explained by:

- The progressive phase out of current mines and thermal powerplants in Europe [97],
- The use of other sources of energy in energy generation [98],
- The lower supply of brown coal (-24%) and hard coal (-20%) in the EU between 2022 and 2023 [99].

[96] (Eurostat, 2024)
[97] (Beyond Fossil Fuels, 2024)
[98] (Fuels Europe, 2024)
[99] (European Commission, s.d.)

6 Conclusions

6 Conclusions

This study provides a comprehensive assessment of the net profits generated along the value chains of oil, natural gas, and coal within the EU for the years 2021, 2022, and 2023. The analysis covers the upstream, midstream, and downstream activities of these fossil fuels, aiming at identifying where profits are generated.

Oil Value Chain

Net profits in the oil industry soared by 75% between 2021 and 2022, reaching an estimated 54.5 billion euros, which takes its source in higher crack spreads, low import volumes from Russia, and an overheated market. This differs across countries, as some having exemptions for importing Russian oil were able to stock on low price oil, increasing margins further.

The net profits generated by the oil industry decreased by around 25% in 2023, bringing them down to 41.1 billion euros. The explanation is found in a lower market price for refined oil products and a change in the import supply partners to secure the procurement of oil and refined products.

Overall, the estimated net profits increased by approximately 10 billion euros from 2021 to 2023. The profits are mostly concentrated in the refining (44% in 2023) and distribution, marketing and end-use activity segments (54% in 2023). The relatively low presence of net profits generated in the production segment (2% in 2023) is due to the low volumes extracted in the EU, the higher cost of extraction, and the high dependency on cheaper imports.

Natural Gas Value Chain

Net profits decreased by around 5% between 2021 and 2022, from 37.6 billion euros to 35.8 billion euros. In 2023, a further decrease of more than 2% was observed, bringing the net profits down to around 35 billion euros. Overall, the estimated net profits have lowered by approximately 2.6 billion euros from 2021 to 2023. This apparent stability is the resulting conjuncture of different variations in the activity segments.

The distribution, marketing and end-use segment is the most profitable in absolute terms (60% of total net profits in 2022, or 23 billion euros). Net profits strongly decreased in 2022 which could find its cause in a decrease of the demand within the EU. The transport and storage segment saw its profits soar in 2022, reaching 8.5 billion euros from 5.5 in 2021. The reason could lie in the increase of TSO's tariffs (and the rerouting of gas flows, which could have contributed to blocking non-Russian gas imports to Europe), the supply shortage of natural gas heating up the market, and higher storage spreads over the period. This would have cooled down, hence decreasing net profits, with new supply routes and an increased reliance on LNG imports in 2023.

The exploration and production segment contributes to a lesser extent in the generation of net profits for the EU fossil fuel industry. While it reached 7.7 billion euros in 2022 (more than 3 times 2021's profits), it went down to 2.5 billion euros in 2023. This increase finds its source in high market prices for natural gas in 2022, caused by a scarcity of the supply caused by Russia's lower flows supplied, and a decreased in the internal production.

Coal Value Chain

The coal industry has shown high variability in net profits over the last three years. Net profits in the coal industry strongly increased between 2021 and 2022, from 0.6 to 9.8 billion euros, decreasing back to a middle ground of 4 billion euros in 2023. The high net profits generated in 2022 were probably caused by the uncertainty on the energy supply caused by the sanctions on Russian coal exports increasing the demand for coal, the transition of coal becoming a relatively interesting power generation source due to high natural gas prices, and the desire to reduce energy dependency on Russian energy. Consequently, the increase of coal price allowed for higher net profits to be generated.

The coal value chain analysis indicates that the distribution, marketing and end-use segment yield the highest profits, with a peak of 6 billion euros reached in 2022, from 0.8 billion euros in 2021. This peak was largely due to higher market prices, and vertically integrated companies to capitalise on it to generate more profits during 2022.

The exploration and production segment, however, faces lower profitability, under the national coal phaseout plans for most of the EU 27, and the EU securing alternative imports of coal from countries in 2023.

Main observations

Over the years in scope, both oil and natural gas generated the most profits. The activity segments generating the largest part of the total profits from 2021 to 2023 are the distribution, marketing and end-use both for oil (around 64 billion euros, or 47% of the 3Y total), natural gas (around 86 billion euros, 73% of the 3Y total), and coal (around 10 billion euros, or 68% of the 3Y total). The highest net profit margins observed are on the refining segment for oil (peaking at 7% in 2022), the transportation and storage for natural gas (at 21% before 2023) and the exploration and production for coal (at 9% in 2022).

After oil increase in net profit from 2021 to 2022, a slight decrease is observed in 2023. However, it still contributed largely to net profit generation across the industries. Natural gas, while stable or slowly decreasing profits, accounted for a significant portion of net profits generated, with coal accounting for the remaining. Across all fossil fuels, the distribution, marketing, and end-use segment almost always shows the highest absolute net profits, particularly for oil and natural gas (the only exception for oil is the refining segment in 2022, accounting for net profits surpassing all other segments). This segment's high absolute profitability puts the spotlight on the relatively small size of the downstream activities in capturing value within the EU, across all fossil fuels analysed. This is mostly due to a lack of production activities in the EU, and a strong dependency on imports. Volume trends align with these profitability patterns, with oil dominating fossil fuel supply volume in the EU, followed by natural gas and coal.

This study reveals that fossil fuel profitability within the EU is driven by oil and natural gas, particularly within the distribution and refining segments. Coal's role remains limited and is likely to continue declining under EU decarbonization policies.

Bibliography

ACER. (2024, 10 22). Key developments in the European gas wholesale markets: 2024 Market Monitoring Report. Retrieved from ACER: https://acer.europa.eu/sites/default/files/documents/Publications/ACER_2024_MMR_Gas_Key_Developments_Q3.pdf

ALCOX. (2019). Different Types of Coal Storage Methods. Retrieved from ALCOX: https://www.alcox-steel.com/blog/different-types-coal-storage-methods/

American Petroleum Institute. (2015). Oil and Natural Gas Supply Chains. Retrieved from Energy Infrastructure: https://www.energyinfrastructure.org/-/media/energyinfrastructure/images/about-us-ei/supply-chain-and-production/oil-supply-chain-vs-2.pdf

Argus. (2022, 10 4). Industry eyes LPG switch but suppliers hesitant. Retrieved from Argus: https://www.argusmedia.com/en/news-and-insights/latest-market-news/2377145-industry-eyes-lpg-switch-but-suppliers-hesitant

BBC. (2022, July 26). EU allows get-out clause in Russian gas cut deal. Retrieved from bbc.com: https://www.bbc.com/news/business-62305094

Beyond Fossil Fuels. (2024, June 10). Europe's Coal Exit: Overview of national coal phase out commitments. Retrieved from Beyond Fossil Fuels: https://beyondfossilfuels.org/europes-coal-exit/

Britannica. (2025, 02 02). Commodity trade. Retrieved from Britannica: https://www.britannica.com/money/commodity-trade

British Petroleum. (2021, July). Approximate Conversion Report. Retrieved from Statistical Review of World Energy: https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-approximate-conversion-factors.pdf

British Petroleum. (2023). Statistical Review of World Energy 2022. Retrieved from British Petroleum: https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf

Bruegel. (2023, 02 09). Europe’s half a million barrels per day diesel supply question. Retrieved from Bruegel: https://www.bruegel.org/blog-post/europes-half-million-barrels-day-diesel-supply-question-1

Bruegel. (2024, May 29). European natural gas demand tracker. Retrieved from Bruegel: https://www.bruegel.org/dataset/european-natural-gas-demand-tracker

Bruegel. (2024, September 10). European natural gas imports. Retrieved from Bruegel: https://www.bruegel.org/dataset/european-natural-gas-imports

Bruegel. (2024, 02 22). The European Union-Russia energy divorce: state of play. Retrieved from Bruegel: https://www.bruegel.org/analysis/european-union-russia-energy-divorce-state-play

Cambridge Dictionnary. (n.d.). Price elasticity of demand. Retrieved from dictionary.cambridge.org: https://dictionary.cambridge.org/dictionary/english/price-elasticity-of-demand

CarbonMajors. (2014). Methodology. Retrieved from CarbonMajors: https://carbonmajors.org/Methodology

Center for Economic Policy Research. (2023, July 20). Reasons behind the 2022 energy price increases and prospects for next year. Retrieved from Center for Economic Policy Research: https://cepr.org/voxeu/columns/reasons-behind-2022-energy-price-increases-and-prospects-next-year#:~:text=Natural%20gas%20as%20the%20main,uncertainty%20and%20fears%20of%20shortages

CEPR. (2015, 01 5). Knocking on tax haven’s door: Multinational firms and transfer pricing. Retrieved from CEPR: https://cepr.org/voxeu/columns/knocking-tax-havens-door-multinational-firms-and-transfer-pricing

Clean Energy Wire. (2024, 04 03). Germany, EU remain heavily dependent on imported fossil fuels. Retrieved from Clean Energy Wire: https://www.cleanenergywire.org/factsheets/germanys-dependence-imported-fossil-fuels

CME Group. (2017, May 09). Introduction to crack spreads. Retrieved from CME Group: https://www.cmegroup.com/education/articles-and-reports/introduction-to-crack-spreads.html

Bibliography

Concawe. (2024). Refinery and Biorefinery Sites in Europe. Retrieved from Concawe: https://www.concawe.eu/refineries-map/

Council of the European union. (2024, April 12). Fit for 55. Retrieved from Consilium.europa.eu: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55/

Deutsche Welle. (2024, 01 08). War in Ukraine: Russian oil still flowing into the EU. Retrieved from Deutsche Welle: https://www.dw.com/en/war-in-ukraine-russian-oil-still-flowing-into-the-eu/a-69826039#:~:text=However%2C%20despite%20this%2C%20the%20EU's,member%20states%20shutting%20off%20imports.

EIA. (2022, July 22). Public U.S. oil producers saw higher revenues and higher operational costs during Q1 2022. Retrieved from U.S. Energy Information Administration: https://www.eia.gov/todayinenergy/detail.php?id=53140

EKT Interactive. (2024). Natural Gas Value Chain. Retrieved from EKT Interactive: https://ektinteractive.com/natural-gas/natural-gas-value-chain/

Ember Climate. (2023, January 31). European Electricity Review 2023. Retrieved from Ember: https://ember-climate.org/insights/research/european-electricity-review-2023/

Ember Energy. (2023, 01 31). European Electricity Review 2023. Retrieved from Ember Energy: https://ember-energy.org/latest-insights/european-electricity-review-2023/electricity-source-trends/#coal

Ember Energy. (2024, 02 07). European Electricity Review 2024. Retrieved from Ember Energy: European Electricity Review 2024

Energy Institute. (2024). Statistical Review of World Energy 2024. Retrieved from Energy Institute: https://www.energyinst.org/statistical-review

Energy, R. C.-U. (2018). National Energy Technology Laboratory. Retrieved from https://netl.doe.gov/sites/default/files/2019-08/06_Coal%20Beneficiation_20190108.pdf

Euractiv. (2024, 12 17). Russia continues to ship oil directly to the EU despite sanctions, investigation finds. Retrieved from Euractiv: https://www.euractiv.com/section/politics/news/russia-continues-to-ship-oil-directly-to-the-eu-despite-sanctions-investigation-finds/

Eurocoal. (2023, April). EURACOAL Market Report 2023 no.1. Retrieved from Eurocoal: https://public.euracoal.eu/download/Public-Archive/Library/Market-Reports/EURACOAL-Market-Report-2023-1_v03-kwe.pdf

Eurocoal. (2023, 04). EURACOAL Market Report 2023 no.1. Retrieved from Eurocoal: https://public.euracoal.eu/download/Public-Archive/Library/Market-Reports/EURACOAL-Market-Report-2023-1_v03-kwe.pdf

European Central Bank. (2023, February). Oil price developments and Russian oil flows since the EU embargo and G7 price cap. Retrieved from ECB Europa: https://www.ecb.europa.eu/press/economic-bulletin/focus/2023/html/ecb.ebbox202302_02~59c965249a.en.html

European Central Bank. (n.d.). Currency Converter. Retrieved from ECB Data portal: https://data.ecb.europa.eu/currency-converter

European Commission. (2022, May 28). REPowerEU at a glance . Retrieved from Commission.europa.eu: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en

European Commission. (2024, June 27). New EU Transport Report: Current trends and issues. Retrieved from Transport Europa: https://transport.ec.europa.eu/news-events/news/new-eu-transport-report-current-trends-and-issues-2024-06-27_en

European Commission. (2024, September 2024). Weekly Oil Bulletin. Retrieved from Energy Europa: https://energy.ec.europa.eu/data-and-analysis/weekly-oil-bulletin_en#price-developments

Bibliography

European Commission. (n.d.). EU coal regions in transition. Retrieved from EC Energy: https://energy.ec.europa.eu/topics/carbon-management-and-fossil-fuels/eu-coal-regions-transition_en#:~:text=Key%20facts%20on%20coal%20in%20the%20EU,-13%25&text=Since%202012%2C%20total%20coal%20power,million%20tonnes%2C%20according%20to%20Eurostat.

European Commission. (n.d.). Liquefied natural gas. Retrieved from EC Energy: https://energy.ec.europa.eu/topics/carbon-management-and-fossil-fuels/liquefied-natural-gas_en

European Council . (2024, January 27). Council of the European union. Retrieved from Gas demand reduction in the EU: https://www.consilium.europa.eu/en/infographics/gas-demand-reduction-in-the-eu/

European Council. (2024). How is EU electricity produced and sold? Retrieved from European Council: https://www.consilium.europa.eu/en/infographics/how-is-eu-electricity-produced-and-sold/

European Council. (2025, 01 31). Where does the EU's gas come from? Retrieved from Council of the European union: https://www.consilium.europa.eu/en/infographics/where-does-the-eu-s-gas-come-from/#:~:text=Norway%20and%20the%20United%20States,countries%2C%20the%20UK%20and%20Qatar.&text=Treemap%20showing%20market%20shares%20and,to%20the%20EU%20in%202023.

European Council of the European Union. (2024). European Council of the European Union. Retrieved from Where does the EU's gas come from?: https://www.consilium.europa.eu/en/infographics/eu-gas-supply/#0

European Council of The European Union. (2024, April 4). How is EU electricity produced and sold? Retrieved from European Council of The European Union: https://www.consilium.europa.eu/en/infographics/how-is-eu-electricity-produced-and-sold/

European Court of Auditors. (2022). EU support to coal regions. Retrieved from OP Europa: https://op.europa.eu/webpub/eca/special-reports/support-coal-regions-22-2022/en/#:~:text=The%20EU's%20increasingly%20ambitious%20climate%20agenda&text=The%20Green%20Deal%20identified%20the,greenhouse%20gas%20emissions%20by%202050.

European Securities and Markets Authority. (2023, 10 24). The August 2022 surge in the price of natural gas futures. Retrieved from ESMA: https://www.esma.europa.eu/sites/default/files/2023-10/ESMA50-524821-2963_TRV_Article_the_August_2022_surge_in_the_price_of_natural_gas_futures.pdf

European Union. (2009, 07 13). Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas . Retrieved from European Union: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0073

European Union. (2024, 06 13). Directive (EU) 2024/1788 of the European Parliament and of the Council of 13 June 2024 on common rules for the internal markets for renewable gas, natural gas and hydrogen. Retrieved from European Union.

European Union. (2024). Quarterly Report On European gas markets. Retrieved from Energy EC: https://energy.ec.europa.eu/document/download/c26261bd-aa50-462b-912a-9c4d2a712ae4_en?filename=New%20Quarterly%20Report%20on%20European%20Gas%20Market%20Q1%202024.pdf

Eurostat. (2022, 12 20). EU gas consumption down by 20.1%. Retrieved from Eurostat: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20221220-3

Eurostat. (2023, September 25). EU imports of energy products continued to drop in Q2 2023. Retrieved from Eurostat: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20230925-1

Eurostat. (2023). Shedding light on energy in the EU – 2023 edition. Retrieved from Eurostat: https://ec.europa.eu/eurostat/web/interactive-publications/energy-2023#:~:text=In%202021%20in%20the%20EU,nuclear%20power%20plants%20(25%25).

Eurostat. (2024, 07). Coal production and consumption statistics. Retrieved from Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Coal_production_and_consumption_statistics

Eurostat. (2024, 05 24). Complete energy balances. Retrieved from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/NRG_BAL_C__custom_12971715/default/table?lang=en

Bibliography

Eurostat. (2024). Electricity prices for non-household consumers - bi-annual data (from 2007 onwards). Retrieved from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/nrg_pc_205__custom_12935159/default/table?lang=en

Eurostat. (2024). Energy production and imports. Retrieved from Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_production_and_imports#Natural_gas

Eurostat. (2024). Energy statistics - an overview. Retrieved from Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview#Final_energy_consumption

Eurostat. (2024, May). Energy statistics - an overview. Retrieved from Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview&oldid=627198#Gross_available_energy

Eurostat. (2024, Janvier 15). EU industry concentration in 2021. Retrieved from Ec.europa.eu: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240115-2

Eurostat. (2024). Gas prices for non-household consumers - bi-annual data (from 2007 onwards). Retrieved from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/nrg_pc_203/default/table?lang=en

Eurostat. (2024, August 22). Glossary:Carbon dioxide equivalent. Retrieved from EC.Europa.eu: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Carbon_dioxide_equivalent

Eurostat. (2024, September 24). Gross domestic product at market prices. Retrieved from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/tec00001__custom_13006289/default/table?lang=en

Eurostat. (2024, May 28). Natural gas demand drops by 7.4% to 12.72 TJ in 2023. Retrieved from Eurostat: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240528-1#:~:text=The%20EU's%20demand%20for,cumulated%20data%20began%20in%202008.

Eurostat. (2024, May 28). Natural gas demand drops by 7.4% to 12.72 TJ in 2023. Retrieved from EC Europa: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240528-1#:~:text=The%20EU's%20demand%20for,12.72%20million%20terajoules%20in%202023.

Eurostat. (2024). Oil and petroleum products - a statistical overview. Retrieved from Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Oil_and_petroleum_products_-_a_statistical_overview#Production_of_crude_oil

Eurostat. (2024, April 15). Oil import dependency at its highest in 2022. Retrieved from ec.Europa.eu: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240415-1#:~:text=The%20EU's%20import%20dependency,high%20of%2097.7%25%20in%202022.

Eurostat. (2024, 04 15). Oil import dependency at its highest in 2022. Retrieved from Eurostat: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240415-1

Eurostat. (2024, September 05). Population change - Demographic balance and crude rates at national level. Retrieved from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/DEMO_GIND__custom_13006332/default/table?lang=en&page=time:2024

Eurostat. (2024, July 17). Supply, transformation and consumption of gas. Retrieved from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gas__custom_12979550/default/table?lang=en

Eurostat. (2024). Supply, transformation and consumption of solid fossil fuels. Retrieved from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_sff__custom_12917613/default/table?lang=en

Eurostat. (2024, July 17). Supply, transformation and consumption of solid fossil fuels. Retrieved from EC Europa: https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_sff__custom_13018225/default/table?lang=en

Fitch Ratings. (2023, 06 16). European Refiners' Profitability to Moderate After Record 2022. Retrieved from Fitch Ratings: https://www.fitchratings.com/research/corporate-finance/european-refiners-profitability-to-moderate-after-record-2022-16-05-2023

Bibliography

Forbes Advisor. (n.d.). Convert Kuwaiti Dinar To Euro. Retrieved from Forbes Advisor: https://www.forbes.com/advisor/money-transfer/currency-converter/kwd-eur/#:~:text=1%20KWD%20%3D%202.95024%20EUR%20Sep%2018%2C%202024%2022%3A02%20UTC&text=The%20currency%20converter%20below%20is,currency%20rates%20are%20updated%20frequently.

Fuels Europe. (2024). 2024 statistical report. Retrieved from FuelEurope: https://www.fuelseurope.eu/uploads/files/modules/documents/file/1688473038_669YHw9MApRAZOvNo7atC42hk09oIXcvzESi6pIP.pdf

IG. (n.d.). What are oil futures and how do you trade them? Retrieved from IG: https://www.ig.com/en/commodities/oil/how-to-trade-oil-futures#:~:text=Oil%20futures%20are%20financial%20contracts,or%20before%2C%20the%20contract's%20expiry.

INSTITUTE FOR ENERGY ECONOMICS AND FINANCIAL ANALYSIS. (2024, 05 14). Two years of REPowerEU: Gas reduction on track but latest target raises risks. Retrieved from IEEFA: https://ieefa.org/resources/two-years-repowereu-gas-reduction-track-latest-target-raises-risks#:~:text=The%20EU%20exceeded%20its%20first,20%25%20between%202021%20and%202023

Intergovernmental Panel on Climate Change. (2020, 01 10). Annex II - Metrics & Methodology. Retrieved from Ipcc.ch.

International Energy Agency. (2024). Executive summary. Retrieved from International Energy Agency: https://www.iea.org/reports/coal-2023/executive-summary

Market Observatory for Energy of the European Commission. (2023). Quarterly report on european electricity markets with focus on annual overview for 2023. Retrieved from Energy.ec.europa.eu: https://energy.ec.europa.eu/document/download/d48ec6b0-987f-4702-af0a-76bfb4fbce0c_en?filename=New%20Quarterly%20Report%20on%20European%20Electricity%20markets%20Q4%202023.pdf

Nederlandse Aardolie Maatschappij. (2024, April 30). Jaarverslag 2023. Retrieved from Nederlandse Aardolie Maatschappij: https://www.nam.nl/news/2024/nam-financial-statements-2023/_jcr_content/root/main/section_top/call_to_action/links/item0.stream/1714644299005/029e01185cc91a21e916b91d290a9d4239811345/2023-nam-bv-annual-report-kvk.pdf

Reuters. (2024, February 24). Oil majors rejigger portfolios with $30-per-barrel price in mind. Retrieved from Reuters.com: https://www.reuters.com/business/energy/oil-majors-rejigger-portfolios-with-30-per-barrel-price-mind-2024-02-14/#:~:text=Investors%20have%20not%20returned%20to,the%20rush%20to%20cut%20costs.

S&P Global. (2024, 07 15). Flurry of new European LNG projects risk underutilization amid muted demand. Retrieved from S&P Global: https://www.spglobal.com/commodity-insights/en/news-research/latest-news/lng/071524-flurry-of-new-european-lng-projects-risk-underutilization-amid-muted-demand

Statista. (2023). Price of thermal coal from 2013 to 2022. Retrieved from Statista: https://www.statista.com/statistics/214236/thermal-coal-prices-since-2003/

Statista. (2024, September). Average annual Brent crude oil price from 1976 to 2024. Retrieved from Statista: https://www.statista.com/statistics/262860/uk-brent-crude-oil-price-changes-since-1976/

Statista. (2024, 06). Northwest Europe coal marker price from 2003 to 2023. Retrieved from Statista: https://www.statista.com/statistics/383500/northwest-europe-coal-marker-price/

The Guardian. (2024, February 19). World's largest oil companies have made $281bn profit since invasion of Ukraine. Retrieved from Theguardian.com: https://www.theguardian.com/business/2024/feb/19/worlds-largest-oil-companies-have-made-281bn-profit-since-invasion-of-ukraine

The Guardian. (2025, 01 09). European imports of liquefied natural gas from Russia at 'record levels'. Retrieved from The Guardian: https://www.theguardian.com/environment/2025/jan/09/european-imports-of-liquefied-natural-gas-from-russia-at-record-levels#:~:text=Last%20year%2C%20it%20overtook%20Qatar,on%20ships%2C%20according%20to%20F%C3%A4hnrich.

Bibliography

The New York Times. (2024, February 02). Oil Giants Pump Their Way to Bumper Profits. Retrieved from nytimes.com: https://www.nytimes.com/2024/02/02/business/oil-gas-companies-profits.html

Timera Energy. (2024, 05 20). Gas storage returns remain high vs pre-crisis. Retrieved from Timera Energy: https://timera-energy.com/blog/gas-storage-returns-remain-high-vs-pre-crisis/

Trading Economics. (2024, September 16). Crude Oil. Retrieved from Trading Economics: https://tradingeconomics.com/commodity/crude-oil

Trading Economics. (2025, 01 01). Gaoline and Heating Oil Market Prices. Retrieved from Trading Economics: https://tradingeconomics.com/commodity/gasoline

U.S. Energy Information Administration. (2022, January 04). Crude oil prices increased in 2021 as global crude oil demand outpaced supply. Retrieved from EIA: https://www.eia.gov/todayinenergy/detail.php?id=50738#:~:text=Crude%20oil%20prices%20increased%20in%202021%20as%20global%20crude%20oil%20demand%20outpaced%20supply,-Source%3A%20Graph%20by&text=Crude%20oil%20prices%20increased%20in%202021%20as%20increasing

Wood Mackenzie. (2024, April 26). Wood Mackenzie. Retrieved from Oil refining in the energy transition: key questions answered: https://www.woodmac.com/news/opinion/oil-refining-in-the-energy-transition-key-questions-answered/#:~:text=Benchmark%20refining%20margins%20climbed%20to,recovery%2C%20and%20recent%20refinery%20closures.

World Bank. (2023, 03 21). Declining coal prices reflect a reshaping of global energy trade. Retrieved from World Bank: https://blogs.worldbank.org/en/opendata/declining-coal-prices-reflect-reshaping-global-energy-trade

Yahoo! Finance. (2024, 07 31). The Oil Trading Boom Has Finally Fizzled Out. Retrieved from Yahoo! Finance: https://finance.yahoo.com/news/oil-trading-boom-finally-fizzled-230000237.html?guccounter=1

Appendix

Appendix

General approach

The methodology used was intended to be transversal and is therefore not dependent on the fossil fuel analysed. The approach is the same for oil, natural gas and coal, as much as the segmentation permits it. Any divergence observed mainly result from the different system measures used to classify, segment, or express the specific fossil fuel analysed.

The definition of market

In this study, the "market" refers to a given segment (e.g., refining) of a given commodity (e.g., oil) in a given country (e.g., Germany).

Metrics of interest and usage

Methodological choices regarding the data collection were taken throughout the prism of an analysis covering the EU countries in scope of this study. This section provides an explanation of the various parameters examined, their application, and the methods of computation.

The data collection aimed to achieve a coverage of at least 40% in each market for a selected group of companies (refer to the section on *Market share and extrapolation*). The parameters of interest were as follows:

1. **Volumes of commodity handled:** (e.g., volume of units of oil extracted, refined or sold)

- Retrieval method: **Approach 1**, which involved using financial reports and assumptions to disaggregate at the market level (see the section on *Country and segmental division*).
- Applications to (1) compute the volume of embedded CO_2, (2) determine market shares by comparing with national databases, (3) estimate revenues in very limited instances (see section on *Approach 2*).

2. **Net income, revenues and net income margin:**

- Retrieval method:
  - **Approach 1,** involving financial reports and assumptions for market-level disaggregation (see the section on *Country and segmental division*), or
  - **Approach 2**, applied in very limited instances when Approach 1 was not technically feasible, involves multiplying volumes (from segmented financial reports) by the yearly average market prices of the commodity.

Financial figures such as net incomes and revenues are subsequently extrapolated using the retrieved volumes and computed market shares to compensate for the unretrieved market portions (refer to the section on *Market Share and extrapolation*).

Approach 1 – Financial perspective

Data collection – Financials and cross-country activities

The primary objective of this approach was to pinpoint the sources of profit generation along the fossil fuel value chain for companies operating within the European Union. The initial step involved determining which financial data would most accurately reflect financial returns and profitability. To this end, the following data points were selected:

Volumes: these refer to the quantities directly associated with the segment being analysed, considering the specific country and time period in scope, and distinguishing between fossil fuel types and product categories.

Sales revenues (excluding intersegment sales [100]): these revenues are directly tied to the segment under analysis, segmented by country and time period, and further categorized by fossil fuel type and product.

Net profit/loss margin: this serves as an indicator of a company's profitability. Whenever data granularity permitted it, segment-specific net profit/loss margins were obtained; otherwise, company-wide data were utilized.

Net profit/loss: this metric represents the residual financial amount after deducting all operational expenses, interest, taxes, and other costs from the total revenue. It represents the funds available for distribution to shareholders or allocation to reserves. This figure was predominantly calculated using the net profit margin identified or derived earlier.

The collection of these critical financial indicators was carried out through the examination of financial statements from the identified companies, their corporate websites or publications, data sheets, or intelligence sources such as Factiva and Forbes. These indicators provided a comprehensive evaluation of the financial performance and profitability of the companies over a three-year period, which encompassed significant geopolitical events and the global COVID-19 health crisis.

For certain vertically integrated companies under scrutiny, intersegment sales [101] were subtracted from total sales to accurately compute the revenues attributable to each segment. This adjustment helped prevent the double counting of revenues within the same company.

To calculate net profits/losses, the financial statements of the analysed companies were used. In instances where these were unavailable, alternative sources included published financial statements in national regulatory databases, such as Belgium's "*Banque centrale des entreprises*" were used. The income statement section was scrutinized to determine the total sales revenues, excluding intersegment sales. If sales were divided by commodity (e.g., oil, natural gas, coal), those figures were employed and weighted by segment. If sales were divided by segment, the corresponding segment was selected and weighted by commodity. In cases where no subdivision was present, weighting was applied based on both commodity and segment.

---

[100] Intersegment sales are sales occurring between different segments of activity of a group, usually present in the consolidated statements of a company.

[101] In consolidated statements of a company, sales occurring between different segments of activity of the group.

Data collection – Volumes

In the analysis of fossil fuel volumes across the value chain, data is typically expressed in millions of tons of oil equivalent (Mtoe). This unit reflects the quantity of energy handled at each stage of the value chain process for each company, segmented by country and year. Although data retrieval can occur in various units (such as billion cubic meters, litres, or kilowatt-hours), a conversion to Mtoe was performed using standard scientific conversion factors to ensure a consistent and comparable dataset.

Collection of oil volumes

The collection of oil volumes begins with data sourced directly from companies, which was then aggregated from its original measurement units and converted into Mtoe.

For oil refining, volumes were estimated by examining the volume of refined products sold in a country or by analysing the output of refineries within that country. This process involved identifying each country's refining capacity and utilisation rates, or alternatively, the volumes produced over the year. By applying a ratio based on the barrels refined in each country to the total volume sold, the final refined volumes were derived.

For final oil consumption, a proportional calculation was employed. When country-specific sales data was available, it was utilised directly. In cases where such data was unavailable, information on the number of gas stations owned or operated by each company in a country was collected. A percentage was then calculated relative to the total number of gas stations operated by the company. This percentage was applied to the total volume of barrels sold to estimate consumption.

Collection of natural gas volumes

Natural gas volume information was usually available for each segment but often combined at the country level. To calculate country-specific and segment-specific volumes, shares were determined for each country and then multiplied by the segment volumes handled. Given the variety of units in which data was expressed, a uniform conversion to common units like megawatt-hours (MWh), million barrels of oil equivalent (Mboe), and Mtoe was performed.

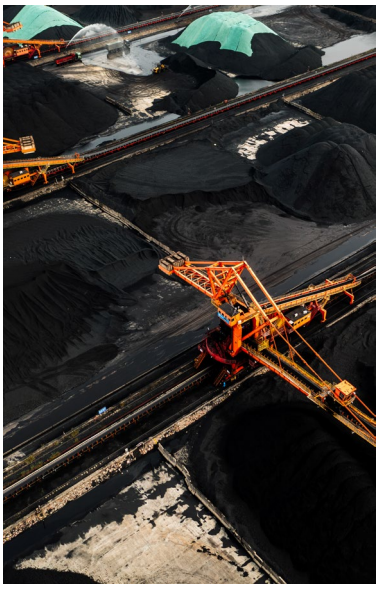
Collection of coal volumes

For coal, the data provided in company reports was used where available. In instances where the data was not in Mtoe, conversions were made utilizing the aforementioned conversion assumptions to standardise the measurements across all data points.

This approach ensured that all volume data were comparable and aligned with the unit of Mtoe, facilitating a coherent analysis of energy quantities across different segments and countries in the fossil fuel sector.

Country and segmental division

Consolidated financial statements and company annual reports aggregate data on company or group-level. Typically, data is grouped either by country (especially for large groups or companies operating in multiple countries), by commodity, by segment, or by several of them at the same time. As the diverse sources of information analysed did not often explicitly mention sales revenue splits, net incomes and net margins for each country, commodity, or segmental division, educated assumptions were used. The results obtained aimed at faithfully representing the reality based on available information, with estimates closely approximating the actual financial performance and profitability of the analysed companies. The professional judgment and reasoning in this part of the process created clear results, providing valuable input for future discussions on the topic.



Country

The representation of a company's activity in a country was computed based on geographical sales of its products, or other proxies if not disclosed, for each activity, based on its annual report(s) and financial statement(s). This weight was further used to estimate the proportion of the activity in volumes, sales revenues and net profits in that region. This process was used similar for oil, natural gas and coal.

Activity segment

The breakdown of companies' activity segments, if reported, was utilised to align with the segments defined in this study. This alignment served as the basis for weighting volumes and financial data by segment. Most of the companies examined were highly vertically integrated and served as key players within the entire industry. Consequently, their operations spanned multiple segments, nearly all of which were considered in this analysis. This multi-segment operation justified the segmentation of their data.

Moreover, many companies did not report on specific segments relevant to this study, such as oil transport, natural gas processing, coal transport, or processing. Due to the limited publicly available data on these activities, certain segments in this analysis were merged as follows:

- The transport and storage segment for oil was integrated into the exploration and production segment (activities are combined and not reported separately in annual reports),
- In a similar way, the transport and storage segment for coal was integrated into the exploration and production segment (activities are combined and not reported separately in annual reports),
- The refining and processing segment for natural gas was integrated with the exploration and production, aligning both to the common practice observed in the analysed annual reports where fewer than 10% of companies made a distinction between the two activity segments,
- The refining and processing segment for coal was integrated with the exploration and production, aligning both to the common practice observed in the analysed annual reports where fewer than 10% of companies made a distinction between the two activity segments,
- Finally, the distribution and marketing segment was combined with the end-use and consumption segment due to the lack of differentiation in company reports, for all commodities under analysis.

Example 1 **Fully disaggregated data**

This example features MND's activity on the oil market. MND's transparency enabled us to retrieve total revenue data rather simply for the exploration and production of oil on the Czech territory. As such, from the annual reports (incl. financial reports) of MND, the operating segments directly display:

- Total volumes of oil extracted were clearly indicated in the report, for Czechia and the years observed, and were retrieved as such.
- Total revenue for the exploration and production in Czechia, was retrieved rather easily as the following were already clear in the report:
  - Separation between the oil and gas segments,
  - Separation between external revenue and intersegmental revenues,
  - Separation of the different activity segments of the company.

Example 2 **Fully aggregated data**

This example features Shell's activity, for the distribution, marketing and end-use of oil on the Belgian territory. The following operations had to be executed, for the related data collected:

- Total revenue for the segment in Belgium:
  - Separate the EU and World sales of refined products oil, in percentages (with regards to activities of the group in other countries).
  - Identify the percentage of fuel stations on the Belgian territory operated by Shell compared to the rest of Europe.
  - Identify the total revenues stemming from third-party sales compared to inter-segmental ones.
  - Select values from the Marketing segment, excluding upstream, integrated gas, chemicals and products, renewables and energy solutions, and Corporate.
  - Convert the USD values to EUR.
  - Multiply the different value obtained above to obtain an estimated total revenue for the sales of refined oil products on the end-consumption market in Belgium, for the year considered.
- Net income: due to the aggregated level of the data, the overall net income margin was used to derive net profits for the company.
- Total volumes sold in Belgium:
  - Identify the percentage of fuel stations on the Belgian territory operated by Shell compared to the rest of Europe.
  - Transform average daily sales to yearly data, in the right unit format.
  - Convert tons of oil equivalent to barrel of oil equivalent.
  - Compute the estimated yearly sales of refined oil products from Shell in Belgium.

Most situations encountered required making at least one assumption to obtain usable financial or volume information. This was particularly true for large companies operating in small countries, as they tend to aggregate most of their data on a supra-national level rather than for individual countries. A similar pattern was observed for companies with activities across various segments (i.e., vertically integrated, and/or diversified) such as renewable energy, gas, oil, nuclear, chemicals, mobility, trading, etc. Conversely, the larger the country and its historical operator, the easier it was to retrieve accurate data. This was the case for companies like TotalEnergies in France and Eni in Italy.

Limitation of the country and segmental division

The country and segmental divisions used in the study do not allow for a detailed breakdown of financial information on a per-country or per-segment basis because disaggregation was done through volumes. Consequently, the values derived from these proxies may not precisely reflect the actual financials of the companies analysed.

The refinery margin discussed in the study represents the net income margin that a company earns on its refining activities. This margin is distinct from the traditional crack spread or refinery margin, which compares the difference between the input costs (such as crude oil) and the market price of refined product (like diesel).

Net income margins were calculated using two approaches: (1) the overall net income margin of a company, or (2) a segment net income margin, which considers the weight of each company segment and the company's final net income. The second approach is a proxy for the segment's true net margin, but it accounts for various factors such as investments, taxes, and other financial considerations.

While proxies influenced the computation of country and segmental data, affecting the study's disaggregated figures, the aggregated data still provide a consistently calculated estimation of the revenues and net profits generated by the observed companies within their respective value chains.

Coverage

When the preferred Approach 1 was not feasible due to insufficient information and transparency, an alternative method, Approach 2, was employed. The results from both approaches were compared, allowing for cross-validation of the findings and ensuring alignment between operational and financial perspectives. Although discrepancies naturally occurred in some areas, analysing the spread between the different data collected enabled a deeper and more detailed examination of the economic contexts. Overall, both the volume-based and financial statement approaches showed strong alignment but varied across segments and resources. The proportions in which the two approaches were utilised are described in the below table.

Share of the data retrieved with Approach 1 and Approach 2

Share of revenue data retrieved per approach	Oil		Natural Gas		Coal	
	Approach 1	Approach 2	Approach 1	Approach 2	Approach 1	Approach 2
Upstream	99.0%	1.0%	100.0%	-	100.0%	-
Midstream	NA	NA	33.8%	66.2%	NA	NA
Downstream	95.3%	4.7%	91.7%	8.3%	100.0%	-

Imports were analysed using a country-specific balance approach for each commodity, relying on data from Eurostat. This method involved calculating the trade balance for each commodity by assessing imports against other trade flows, such as exports and domestic production, at the country level. The country-specific balance approach is useful for identifying the importance of imports relative to domestic production, storage, and exports, and for understanding the roles different countries play as suppliers. This approach also aids in evaluating a country's dependency on external sources for commodities and offers an additional perspective for analysing the behaviour of volume, price, or throughput processing.

Currencies

Financial data from each company were collected and, where not directly available in euros, converted to ensure harmonisation of information in a single currency. A yearly average exchange rate of the foreign currency to euro (e.g. USD/EUR) was used for each given year.

Sources

The financial data were collected from companies' annual reports, financial statements, companies' websites, stock exchange filings, central balance sheet offices and industry reports. Public databases such as Eurostat, along with recognized financial information platforms and market research firms (i.e. Forbes, Factiva, Financial Times, Reuters) also served as valuable inputs here.

Approach 2 – Volume and market-based

The objective of the analysis remains consistent with that of Approach 1, but the methodology diverges. In situations where reliable and sufficient information was scarce, commodity market prices were utilised to estimate potential market revenues. These estimates did serve as approximations and do not precisely represent the actual segmental sales revenues and net profits of companies being analysed.

Data collection – Volumes

In conducting our analysis, we focused on retrieving volumes directly associated with the specific segment under examination within the given market. When the available data permitted, these volumes were identified and extracted to ensure a precise reflection of segmental activity. Following retrieval, these figures were subsequently converted into millions of tons of oil equivalent (Mtoe). This conversion facilitated the standardisation of outputs, allowing for a harmonised and coherent presentation of data across various segments. The use of Mtoe as a unified metric enabled us to effectively compare segmental information, ensuring consistency and accuracy in our overall analysis.

Data collection – Market data

Oil

In the early stages of the value chain, the average spot price of Brent crude (in USD per barrel) for each relevant year – namely 2021, 2022, and 2023 – was collected. These data points were utilised to quantify the revenues generated by companies involved in the production of oil, particularly when they trade crude oil and sell it on the markets. Although companies do not exclusively purchase Brent crude from the spot market [102], as they also source crude oil from other commodity markets such as WTI [103] or Dubai/Oman [104], depending on their reach and geographical presence, they employ futures [105] contracts to hedge their risks.

For refined petroleum products whether in trading post-refining or in retailing and wholesaling, the same calculation method was applied to these segments. Oil bulletin data [106] concerning volumes exchanged per refined products, as well as the prices of such products per country over the period from 2021 to 2023 were weighted [107] to compute a yearly average price for refined petroleum products. Consequently, no separate prices for different oil products (e.g. diesel, naphtha, kerosene, etc.) were utilised.

The following formula illustrates the computation adopted to obtain a single yearly price (excluding VAT):

$$\text{Yearly weighted average price} = \sum_{i=1}^{27} \text{Price}_i * \frac{\text{Volume of refined product exchanged}_i}{\text{Total volume of products exchanged}}$$

Natural gas

A comparable methodology to that employed for oil was utilised for the collection of natural gas data on a country-by-country basis. Prices, expressed in EUR/kWh, were sourced from the Eurostat database [108] , which provides gas prices for EU countries, distinguishing between household and non-household consumers. Given the variations in prices across different customer categories, such as industrial and household consumers, a yearly weighted average was calculated for each country.

$$\text{rly weighted average price} = \sum_{i=1}^{27} \text{Price}_i * \frac{\text{Volume of natural gas consumed by households/non households}_i}{\text{Total volume of natural gas exchanged}}$$

These averaged prices were subsequently employed to estimate the volume-based revenues of companies across all segments. Although natural gas exists in different forms, such as wetter and drier gas, the volume-based approach adopted a proxy that aggregated these differences. This aggregation was essential to facilitate the interpretability and comparability of the results.

---

[102] Light, sweet crude from the North Sea, global price benchmark.

[103] Light, sweet crude from the U.S., benchmark for U.S. oil prices.

[104] Medium sour crude from the Middle East, benchmark for Middle Eastern exports to Asia.

[105] Contracts in which a buyer and a seller agree to trade a specified number of barrels of oil at a fixed price set for a future date. Crude oil futures give the buyer the obligation to buy the underlying market, and the seller the obligation to sell at, or before, the contract's expiry. (IG, s.d.)

[106] (European Commission, 2024)

[107] Weighted products include Euro-Super 95; Gas oil; Heating oil; Fuel oil; Fuel Oil Sulphur > 1%; LPG.

[108] (Eurostat, 2024)

It should be noted, however, that the application of this methodology to natural gas did not constitute the majority of cases analysed in the study. Below is an overview of the various values used exclusively for Approach 2.

Price of gross and refined products for oil and natural gas

Price	Oil (EUR/Bbl)			Natural Gas (EUR/kWh)		
	2021	2022	2023	2021	2022	2023
Crude/Gross product	70.855	100.931	82.494	0.023	0.070	0.062
Refined product	98.905	153.164	135.437	0.165	0.235	0.250

Computation – Revenues

The formula used to compute an estimated revenue was the following:

$$\text{Estimated segmental revenue} = \text{Yearly average price} * \text{Volumes traded in the segment}$$

The type of price used will depend on the fossil fuel and the stage of the transformed product. This is explained and categorised above.

Computation – Net income and net income margin

The approach to calculating net profit or loss margin, as well as net profit figures, mirrored the methodology outlined in Approach 1. These parameters were determined by applying the net profit margin, either at the segment level or for the company as a whole. Subsequently, this margin was multiplied by the calculated revenue to derive an estimated net income.

Limitations and consequences

The proxy utilised for estimating total revenue, through a combination of exchanged volumes and unit prices, inherently possessed certain limitations:

1. Exclusion of additional revenue sources: the proxy did not capture other sources of revenue that companies often generate, such as income from services, trading activities, or government subsidies. These additional income streams could influence the overall financial performance of the entities involved.
2. Price variation and operational considerations: the proxy did not account for price variations from long-term contracts, fluctuation in the spot market, or other pricing discrepancies. Furthermore, it overlooked the impact of operational efficiencies, cost structures, and potential revenue from non-fossil fuel activities, all of which could affect total revenue.
3. Variations in upstream and downstream activities: when applied to upstream and midstream activities, where exchange prices differ from market prices, the proxy may lead to discrepancies compared to empirical data.

Despite these limitations, the proxy offered a reasonable indication of the price and quantity effects impacting net profits along the value chains, provided it was employed with due caution.

In summary, while this proxy provided a general estimate, it might not have fully reflected the comprehensive financial performance of the principal fossil fuel entities within the scope of this study.

Example **Approach 2**

The objective of this analysis was to estimate the revenues generated by GRT Gas from its transport activities in Germany for the year 2021. Due to the absence of specific transport-related disclosures, Approach 2 was employed for this estimation.

In 2021, GRT Gas transported a total of 322 TWh. Given the price of 0.029 EUR/kWh per kWh, it was assumed that company generated revenues amounting to approximately 9.23 billion euros for that year. This assumption was necessary as the transported volume was the sole useful piece of data available regarding the company’s operations. Consequently, the revenue calculation was constrained by the limited information at hand.

Furthermore, with the group's net income margin recorded at 18.15% for 2021, the estimated net profits were calculated to be approximately 1.67 billion euros. This approach, while based on limited data, provided a estimate of the financial outcomes associated with GRT Gas's transport activities for the specified period.

Market share and extrapolation

Definition of market share

In this study, the market shares used were defined in terms of volumes handled by a company (e.g. extracted, transported, sold or distributed) for a specific fossil fuel within each segment of a particular country. This approach facilitated an estimation of the company's market share relative to the country's' total aggregated quantities,, independently of pricing considerations, as determined by Approach 1. Methodologically, this involved identifying two distinct types of data points: the volumes handled by a company and the volumes handled by a country.

By comparing these data points, the study aimed to present a clear picture of each company's market presence within the context of the country's fossil fuel activities. The analysis provided insights into the relative significance of each company in the fossil fuel value chain, offering a comprehensive understanding of market dynamics.

Market share

The process of estimating market shares involved gathering volume data for each activity segment by company and comparing it to national data for the same segment and year. Given the discrepancies between data sources – company annual reports versus Eurostat – a correction factor was applied to ensure that the calculated market shares did not sum to less or more than 100% of the market.

To maintain consistency in comparisons, Eurostat was used as the sole source for market volume data across the three fossil fuels analysed. However, due to the unavailability of aggregated data for the year 2023 at the time of writing – affecting most segments, such as production – market shares for 2023 could not be computed using the same methodology [109]. Instead, the values derived from the analysed sources were retained and compared against the average national data for 2021 and 2022.

The company volumes ($V_{Company}$) were retrieved from the annual and financial reports, with the highest granularity possible (i.e., commodity, segment, country, year). In the instances of lack of available data, see the methodology applied in the section *Country and segmental division*.

The national volumes ($V_{National}$) handled are those published by Eurostat on the different segments of activity for each of these fossil fuels (net production, net refining, net sales, net storage, net transport).

$$\text{Market share (\%)} = \frac{V_{\text{Company (segment,commodity,country)}}}{V_{\text{National (segment,commodity,country)}}}$$

[109] The scope of the study spanning three years, from 2021 to 2023, there are instances where key players in a fossil fuel or segment of activity, did not finished disclosing operational and/or financial results yet.

Extrapolation

To approximate the revenues and net incomes for the portion of the market not directly accessible through company annual and financial reports, an extrapolated market share was determined. This calculation was performed for each segment, year, and commodity, employing a specific formula [110]:

$$\text{Extrapolated market share (\%)} = \sum_{i=1}^{n} \frac{\text{Market share}_{\text{Company (segment,commodity,country)}}}{\text{Market share}_{i}}$$

To scale the result obtained, the revenue for the company retrieved was then divided by this extrapolated market share.

Threshold and company selection

A selection of a subset of the market was conducted by retrieving data from companies that, individually or collectively, represented at least 40% of the country's market for the most recent available year. For instance, it might have required data from three companies to cover at least 40% of Austria's oil exploration and production segment in 2021.

This threshold has been defined based on several criteria:

1. The distribution of the main players in the energy industry indicated that these markets were heavily concentrated [111],

2. In most activity segments, key market players were vertically integrated [112], thereby reducing the number of companies needed to account for the majority of a country's segment activity,

3. The quality and availability of data for smaller players, who are not obliged to publish their operational and financial data, made it challenging to capture this portion of the market. Conversely, the high reliability and consistency of information available for large key players justified the selection of a smaller number of large players.

Therefore, the sample threshold of minimum 40% ensured that the companies selected were sufficiently representative for inferring country and EU-wide results. The extrapolation of results for 2023 was approached differently from 2022 and 2021. Given that the source of information for country-level volumes handled, Eurostat, had not yet published data for these segments, a proxy was used. This proxy averaged the market share of identified companies over 2021 and 2022 to estimate the 2023 market share.

[110] Where n is the number of companies retrieved to reach the 40% threshold explained further below in the next section. Where i is one company that has been taken for this segment, country and commodity analysis.

[111] (Eurostat, 2024)

[112] A company that has activity in more than one segment of its industry value chain. From extraction to processing and/or refining, to distribution and supply of final consumption products. Example companies are TotalEnergies, Shell or ExxonMobil.

This analysis was conducted comprehensively, considering the most important activity segments for each fossil fuel, where transparent information was available, to obtain a realistic view of the key players and their significance in the market. Consequently, the primary countries and segments of key players were identified for the data collection process.

In some instances, the goal of achieving 40% market share was not met. For example, in Italy, Eni's refining segment did not report any revenue due to the company selling all its refining output to other segments. Some segments did not exist within the country, resulting in null values for the revenues generated. This was mostly observed in production activities, such as for natural gas in Cyprus, Estonia, Finland, Belgium, and Ireland.

In rare cases, the 40% threshold was not reached due to limited availability of company data. In such instances, caution must be exercised regarding the results provided. This was particularly true for some segments and countries, such as in the distribution, marketing and end-use of oil in Austria, Denmark and Estonia.

Limitations of the extrapolation

The threshold for data collection as established at 40% of the market share for the respective country, segment, year and commodity. The primary aim of this study was to extrapolate the findings to provide a representative overview of the market at EU level. However, the estimation work did not take into account the specific characteristics of companies that were not analysed. These characteristics could include variations in net profit margins, diverse financial structures, holding activities, profit transfers to other entities, and the effects of market concentration, among others. As a result, there is a potential for underestimation in the results obtained.

While this method of extrapolation offers an approximation of reality, it does not aspire to represent the market exhaustively for the given period. Consequently, the findings should be interpreted with caution.

Conversion factors

Scientific

For conversions of volume and energy related data, a British Petroleum [113] report was used. This might contrast with some conversion factors used, due to specific conditions in which company might operate (e.g. standard vs. normal conditions of temperature and pressure). However, the assumption was taken that these equivalences would translate to accurate numbers to proceed with.

Monetary

The report focusing on activities within the EU, the currency used for displaying financial information is the euro. For countries with currencies different than the euro, the European Central Bank's [114] conversion table were used. It allowed retrieval of the yearly average exchange rate of foreign currency against the euro.

For USD amounts, the yearly average currency exchange rate was retrieved from the European Central Bank's conversion table as well.

For the Kuwaiti dinar (e.g. for Q8), Forbes Advisor's [115] conversion table was used to compute the yearly average currency exchange rate.

CO2 emission equivalences

The definition of the CO_2 emission equivalences used is the following [116]:

A carbon dioxide equivalent or CO_2 equivalent (...) is a metric measure used to compare the emissions from various *greenhouse gases* based on their *global-warming potential (GWP)*, by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

As prescribed, the quantities of greenhouse gases are thus multiplied by their global-warming potential factor. To do so, the adjusted IPCC [117] conversion rates computed by *Carbon Majors* [118] were used.

The conversion of volumes handled by activity segment highlights the emissions potential that could be freed in the atmosphere, should this volume be fully burned. This equivalence does not pretend to represent the actual emissions stemming from these activities, which would need a complete analysis of the whole value chain with much more complete (not publicly available) information for all companies.

The equivalence of emissions emitted during each activity segment has been assumed based on the volumes identified to be handled during each stage of the value chain. These were converted, using the below conversion factors for each commodity.

Source converted to kg of CO_2	Conversion factor
1 bbl of oil to $kgCO_2$	371.40
1 kcf of natural gas to $kgCO_2$	53.40
1 ton of (lignite) coal to $kgCO_2$ [main coal type extracted in Europe]	1,203.20
1 ton of (anthracite) coal to $kgCO_2$ [~50% of coal type extracted in Poland]	2,621.50

The same methodology presented in the section General approach has been used to avoid counting twice quantities handled in different segments of activity for the same company.

[113] (British Petroleum, 2021)
[114] (European Central Bank, s.d.)
[115] (Forbes Advisor, s.d.)
[116] (Eurostat, 2024)
[117] (Intergovernmental Panel on Climate Change, 2020)
[118] (CarbonMajors, 2014)

Limitations of the methodology and consequences

1. The carbon dioxide emissions reported in this study were calculated as equivalences of the volumes handled, rather than as direct emissions from the activity segments within the study's scope. This means that the reported figures do not represent actual emissions of carbon dioxide but rather the potential emissions from the quantity of fossil fuel analysed at each step of the value chain. Consequently, these emission equivalences may not align country-wide emissions for specific fossil fuel types.

2. For each type of fossil fuel under review, assumptions, as detailed earlier in the study, were made regarding the products handled by the companies analysed. For instance, in the case of natural gas, biogas and shale gas were excluded from the analysis. However, there may have been instances where the data published by these companies did not distinguish activities based off the type of gas handled, potentially inflating the figures reported for natural gas. Such occurrences were limited, and it is believed that this would not significantly affect the consolidated volumes and financials figures.

3. Due to the assumptions made in this study, some data may not correspond precisely with the actual figures available internally to the companies analysed. The financials and volumes resulting from this data processing might display slight discrepancies compared to what companies would report in their consolidated statements. It is anticipated that the more granular the data, the more assumptions were required. Therefore, the segmental data for a company's net profit in a specific country might not fully reflect reality. However, aggregated data for this country's value chain would be more representative.

4. This study detailed value chains for different fossil fuel types, highlighting variations in activities. Companies do not always report their activities in the same way they are categorised here, leading to discrepancies due to differences in segmentation methods and the significance of each activity in their operations. Although industry activity segments are relatively standardised, companies often group their activities based on their own criteria. As a result, information from databases, company reports, or industry analyses may not always align with the value chain and segments defined in this study.

5. Companies' market shares served as the basis for extrapolating data to provide a consolidated view representing the entirety of a country's activity for a given year, company, segment, and fossil fuel type. These shares were compared to Eurostat volume data, meaning that any inaccuracies in reports or data reported to Eurostat, from which market shares were derived, could impact the results.

Limitations of the methodology and consequences

6. Although companies in the oil, natural gas, and coal industries often report by segment due to differences in activity types and levels of vertical integration, financial data were generally available. In cases where companies did not provide a breakdown of revenues by segment or commodity, estimated revenues were calculated by multiplying the quantities processed at each step of their operations by the average market price of that commodity for the year analysed. While companies may store, carry over, or internally process some volumes due to their vertically integrated operations, this estimation method was applied only in limited cases where transparency was restricted. To avoid double-counting, these estimated revenues were assigned to only one step of the value chain.

7. Where the information gathered from reports was transparent, it was possible to identify intersegment sales due to the high vertical integration in these industries. As such, the results may still underestimate the revenues generated due to profit optimisation mechanisms potentially employed. These sales were deducted from the computations to provide the most accurate view of the activities themselves.

8. The yearly average of currency exchange rates does not reflect the continuous relative changes of individual currencies against each other and the behaviours of companies selling when high and holding when low. However, it was assumed that, due to the frequency of exchanges and the necessity of the products in the economy, volumes would not deviate from the usual seasonal yearly cycles. Thus, the yearly average would closely approximate reality. This was observed when comparing the yearly average to realised prices from company reports.

9. For coal volumes, the data in reports were often very limited, leading to an approximation of volumes and market shares that could be inflated due to market opacity. For example, consumption levels were very low for several countries based on publicly available information. This is primarily because many small local players represent the majority of the business. As it was not possible to collect data for these small players who do not publish annual reports or financial statements, an inevitable bias is present for coal.

10. In certain countries, company-specific information (annual reports and financial accounts) was unavailable due to a lack of regulatory requirements. To derive the necessary financial data for this study, an estimation method was employed. In situations where a monopoly was known to exist, this was done by using consumption data from Eurostat as the basis for the country's data, to which the price per unit of volume was applied. Consequently, this method has its limitations and does not reflect the official figures a company might report, as the data are aggregated and represent an approximation.

[109] The scope of the study spanning three years, from 2021 to 2023, there are instances where key players in a fossil fuel or segment of activity, did not finished disclosing operational and/or financial results yet.

Quality controls

To ensure that the results obtained are as interpretable, usable and scalable as possible, the following quality controls have been performed:

1. **Data source verification**
   Ensuring that the sources used are reputable, reliable and relevant. This involved using data from trusted organisations such as Eurostat, national statistical offices, annual and financial reports, industry associations.

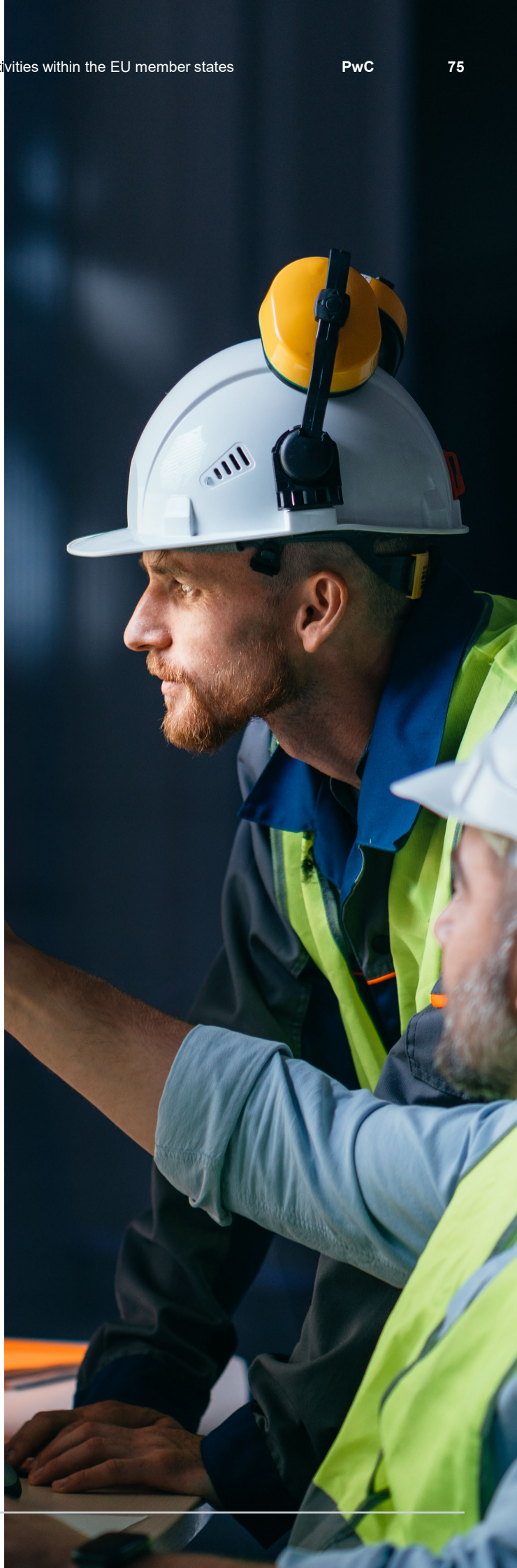
2. **Sampling methods**
   Employing appropriate sampling techniques to ensure that the sample was representative enough of the data population looked at. In this study, a sufficiently large sample size was used to reduce sampling error.

3. **Validation of the assumptions**
   Testing the assumptions underlying the analysis methods to ensure that they were valid. This involved checking for normality and benchmarking data (e.g., market price).

4. **Peer review**
   Martin Vladimirov from the Centre for the Study of Democracy reviewed parts of the study, especially to contextualise the analysis.

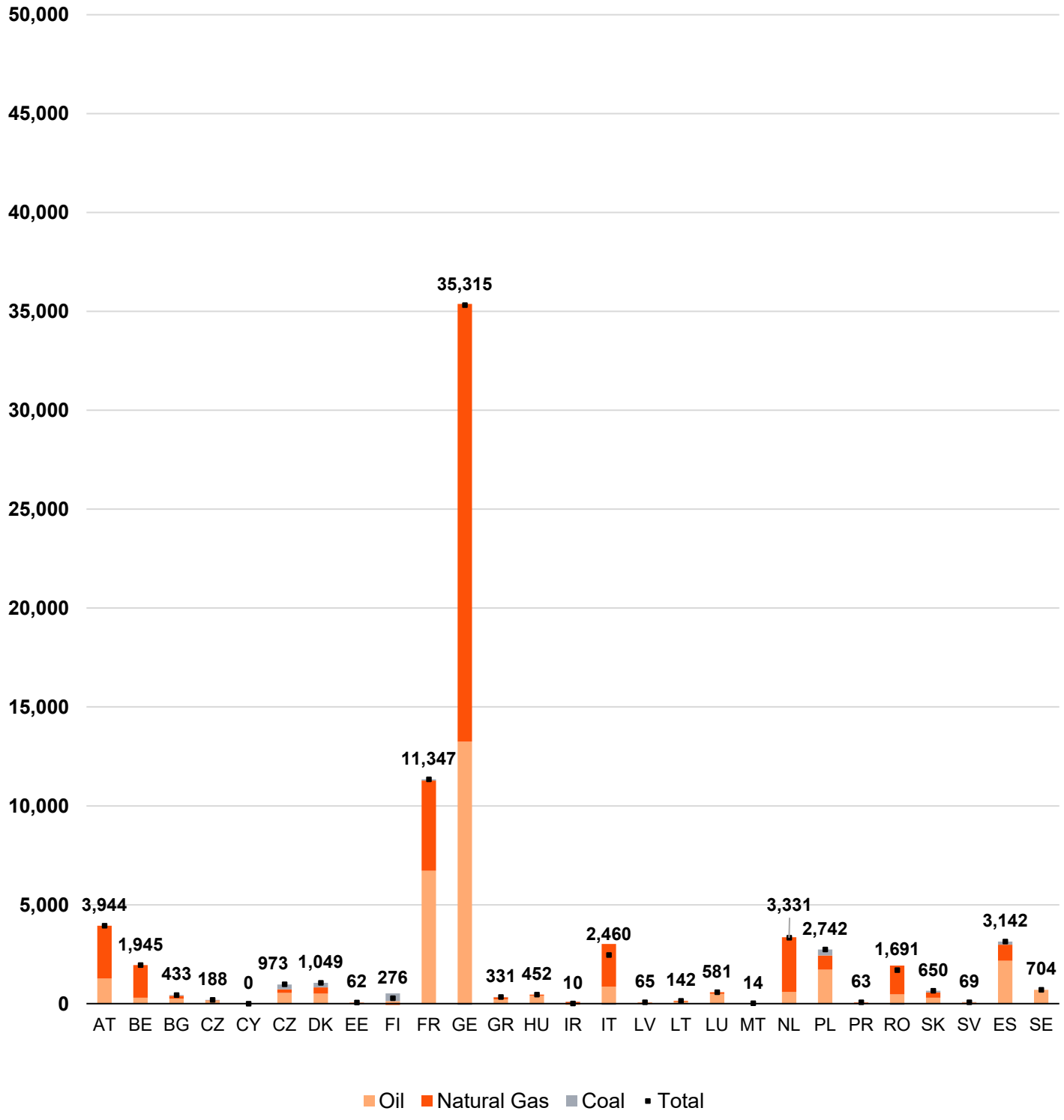
5. **Documentation and transparency**
   Providing clear documentation of the methodology, data sources, and any assumptions made in the study. This transparency allows others to replicate the study or understand the context of the findings.

6. **Ethical considerations**
   Ensuring that the study adheres to ethical guidelines, such as confidentiality of sensitive data and proper attribution of data sources.



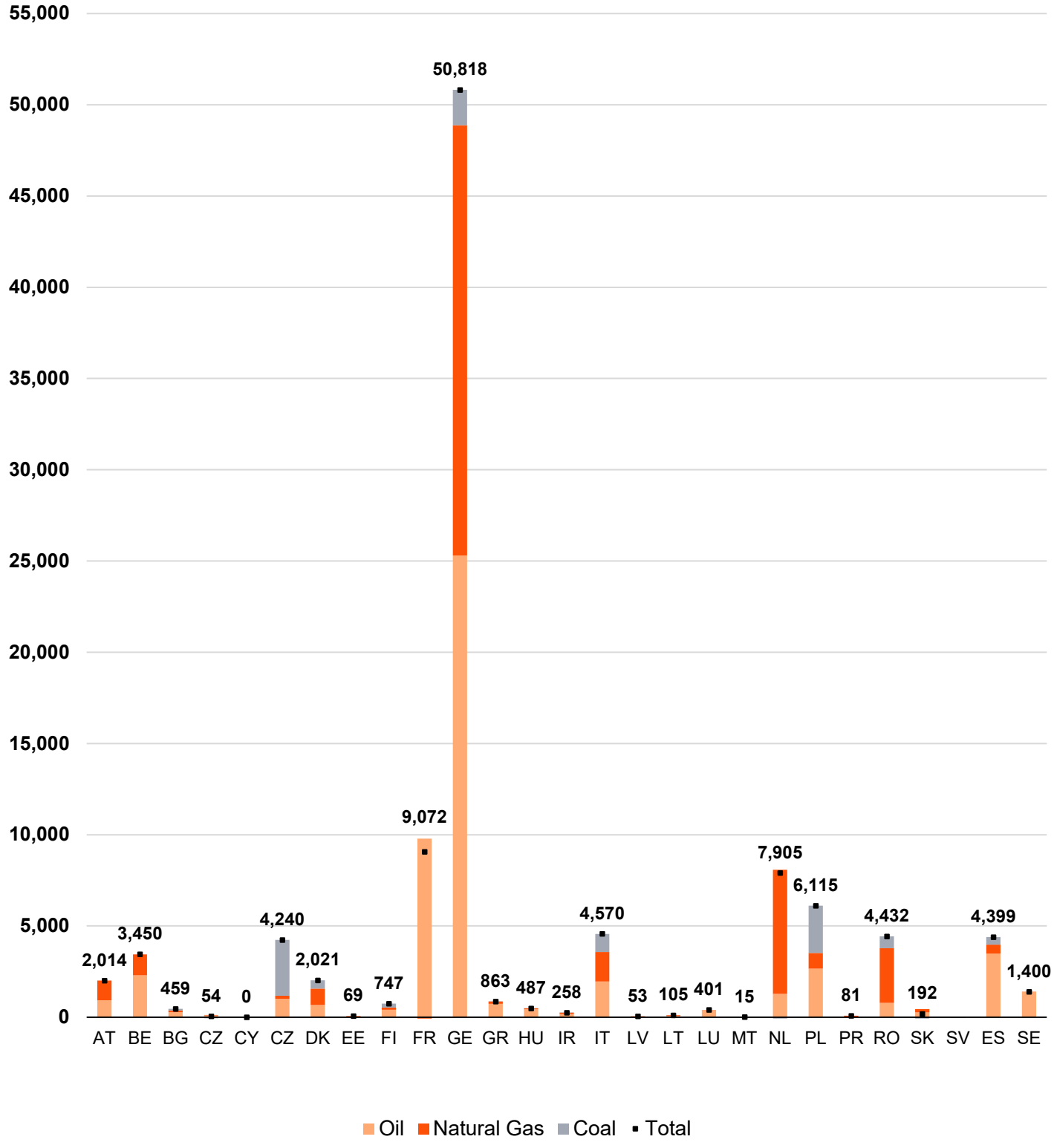
Country analysis

2021 Net profit per fossil fuel per country



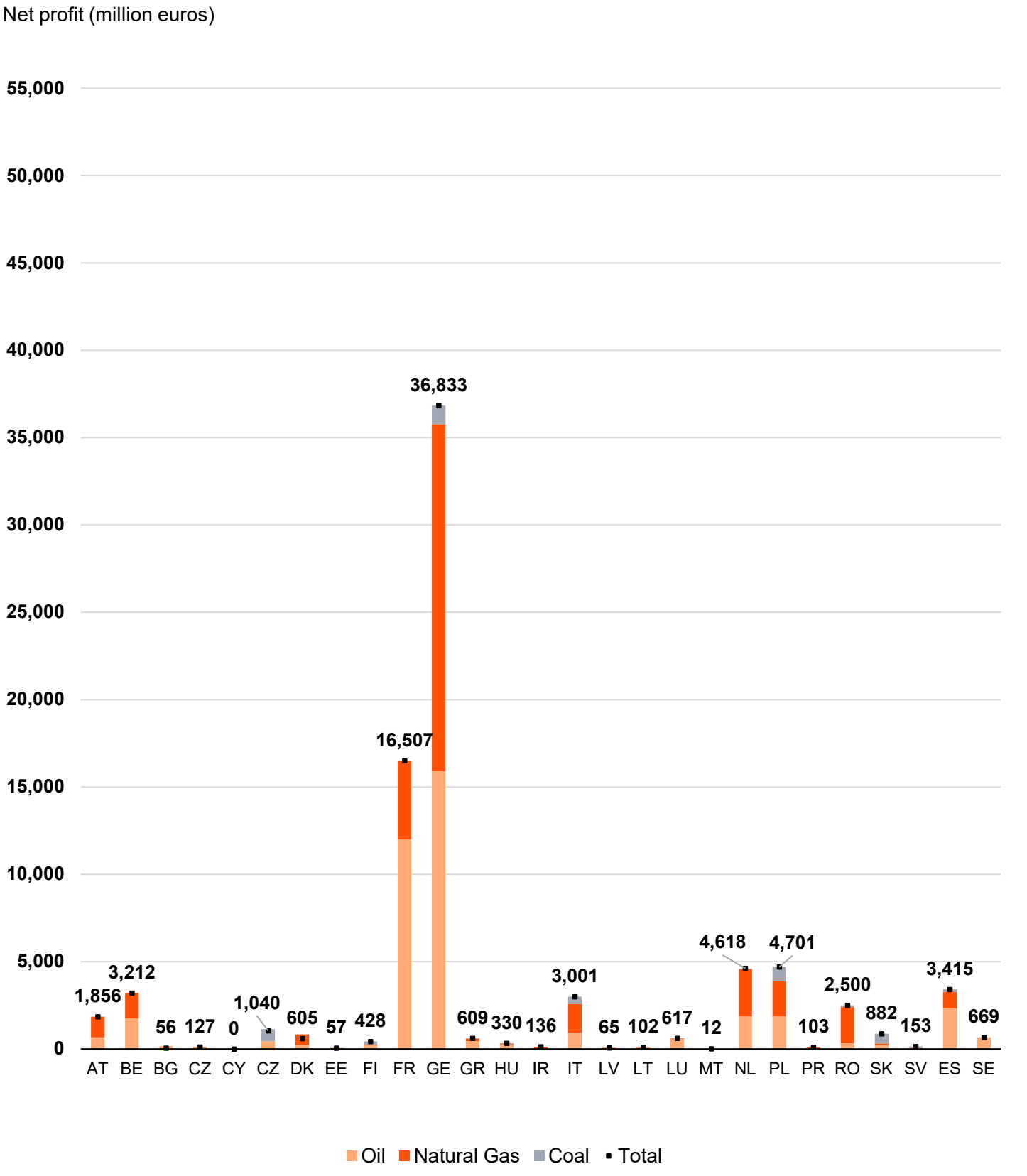
Country analysis

2022 Net profit per fossil fuel per country



Country analysis

2023 Net profit per fossil fuel per country



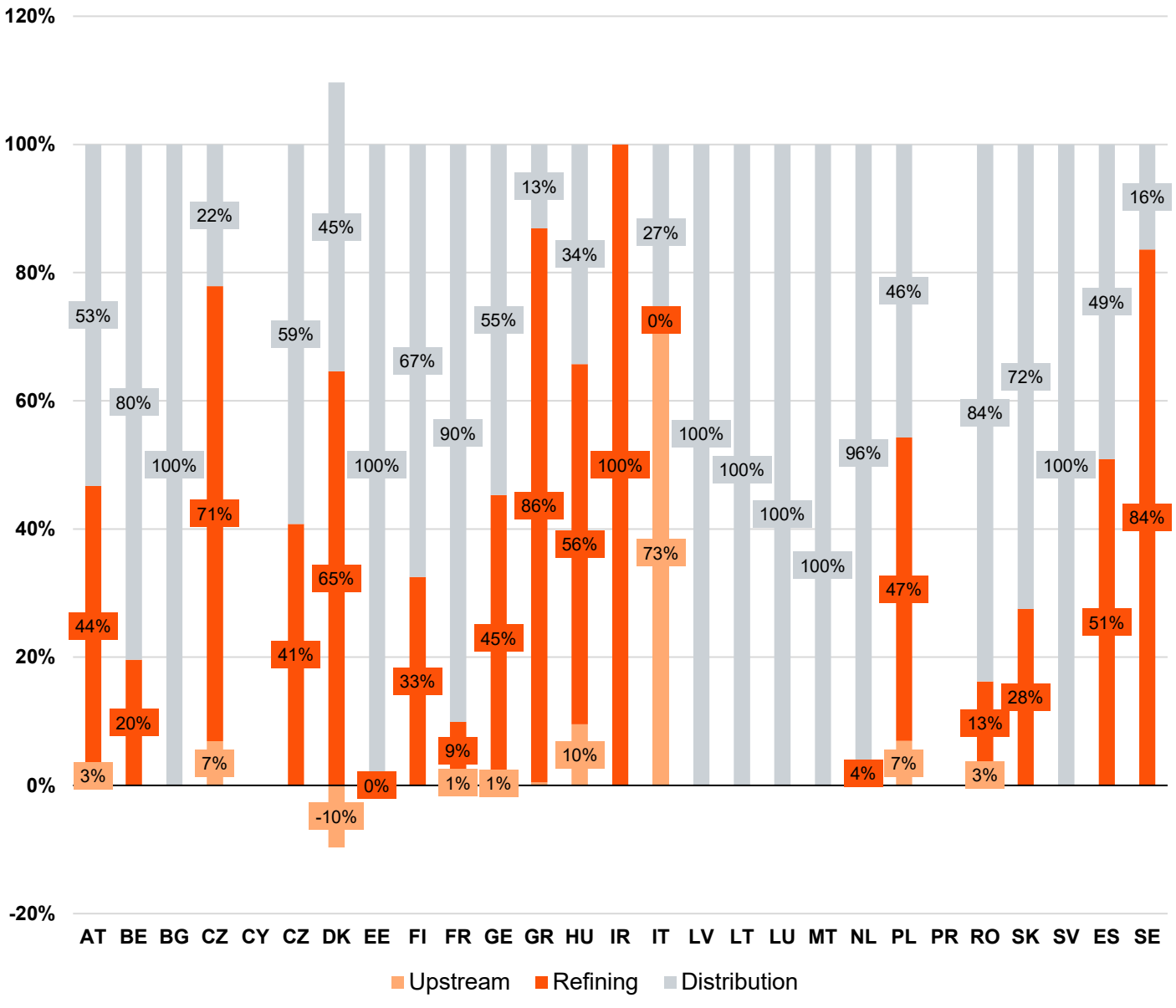
Segmental analysis by country

To This section aims at presenting an overview of each activity segment from the value chains of oil, natural gas and coal at EU country level. The ranking is based on the countries' average contribution to the total profits of the segment from 2021 to 2023. As a reminder, only activities localised in the EU are taken into consideration for this study. Consequently, global outperformances realised by companies might be stemming from different areas of the world, while performing differently in the EU, or the other way around.

In order to better illustrate this analysis, maps of Europe displaying an overview by country and by segment of the Major companies by country and segment are also provided at the end of the document. Those maps, one per each fossil fuel and activity segment, highlight the main companies used in the sampling of this study, for each country. The maps also include the presence of activity in the country's segment (or lack thereof). [119]

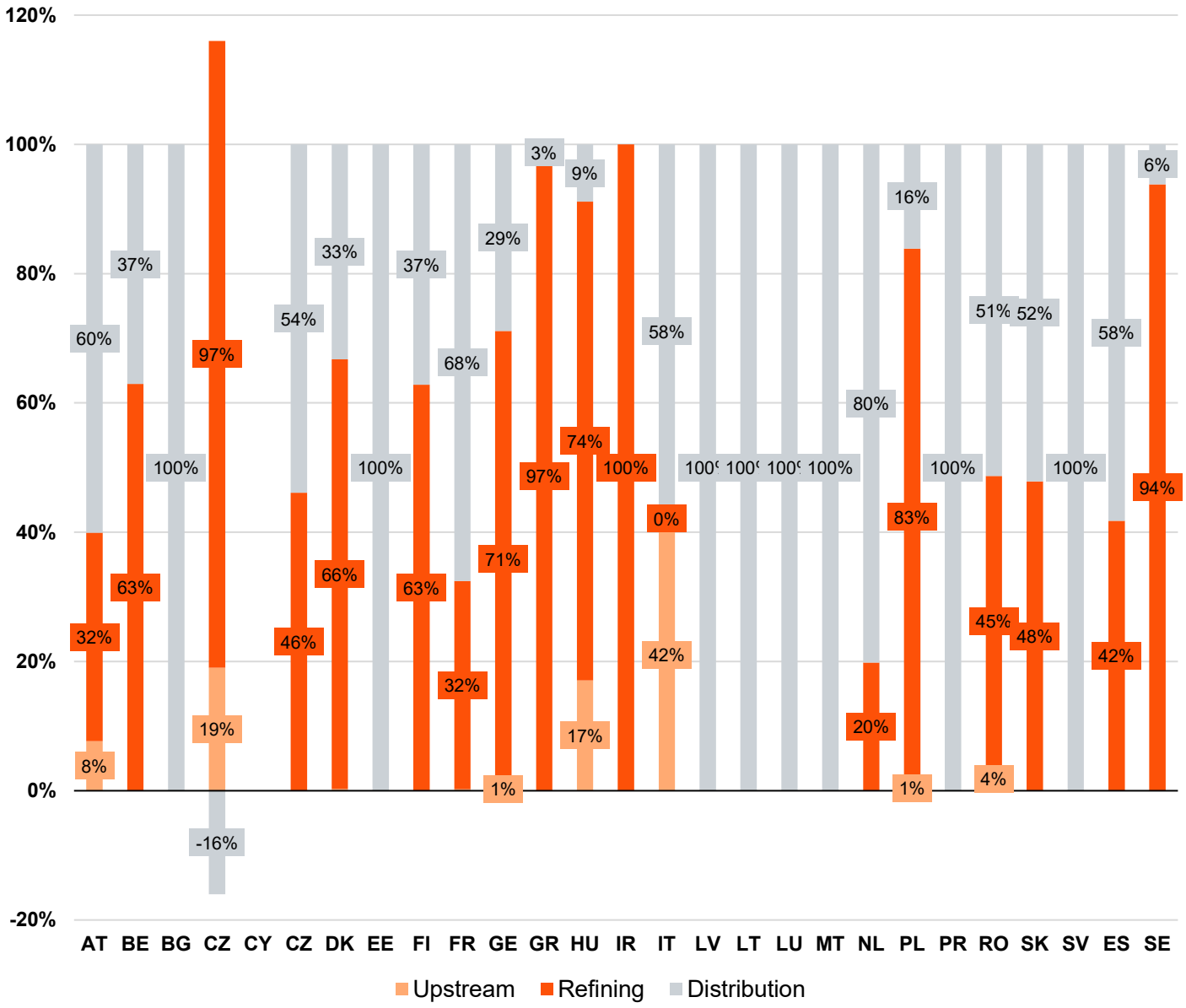
Oil

2021 net profit by segment per country



[119] The illustration highlights main companies included in the sampling used for this study, and not necessarily the major player per country per market share.

2022 net profit by segment per country

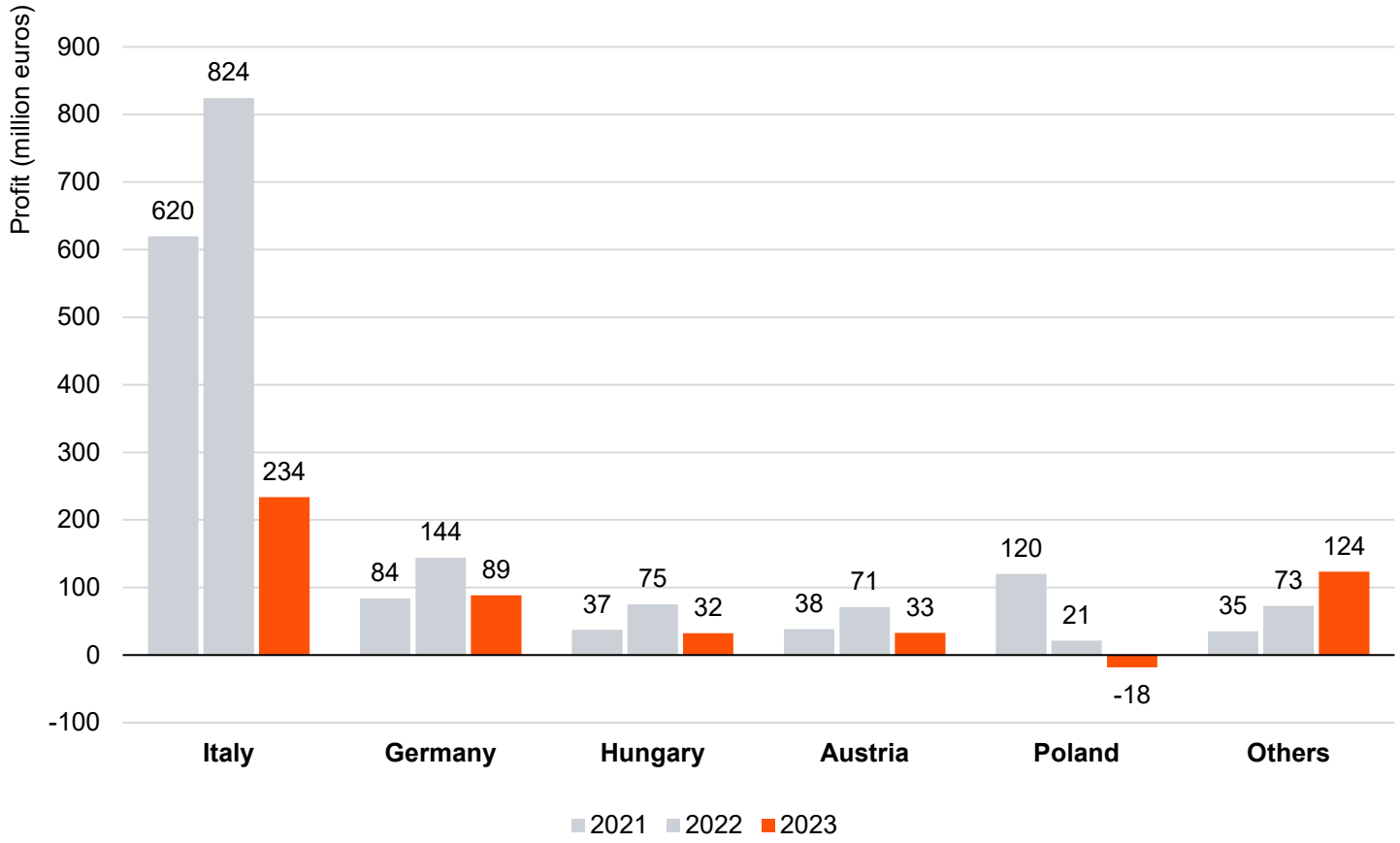


Exploration, production, transportation and storage

Countries such as Luxembourg (LU), Bulgaria (BG), and several others, including Lithuania (LT), Estonia (EE), Latvia (LV), Portugal (PT), Malta (MT), and Slovenia (SI), have 100% of their oil industry's profitability stemming solely from the distribution segment. They may primarily import refined oil products and focus on distribution and end-use sales rather than local extraction or refining processes. In the Netherlands, almost all profits are generated through distribution activities. France, Spain, Italy, Czechia, Austria, Romania, and Slovakia also derive most of their profits from oil distribution, with additional contributions from refining activities; in Italy's case, there is also a notable profit share from upstream operations. Croatia stands out as the only country where the distribution segment incurs a loss for domestic companies. Countries such as Germany, Poland, Sweden, Greece, Hungary, Ireland, and Croatia mainly generate profits through refining petroleum products. The overall pattern suggests that the distribution segment is the dominant source of profitability across the EU, emphasizing that the end-user and retail stages of the oil value chain generate the most financial returns.

The five countries in the EU generating the most net profits over the 2021-2023 period in the oil exploration and production activity segment are Italy, Germany, Hungary, Austria and Poland. Together, they generate in 2023 around 75% of the estimated net profits for this segment in the EU 27 and are responsible for more than 50% of the volume of crude oil extracted for the region in 2023.

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the oil exploration, production, transportation and storage segments



The net profits have increased in 2022 for most of the EU countries, except for Poland for which a steep decrease can be observed since 2021.

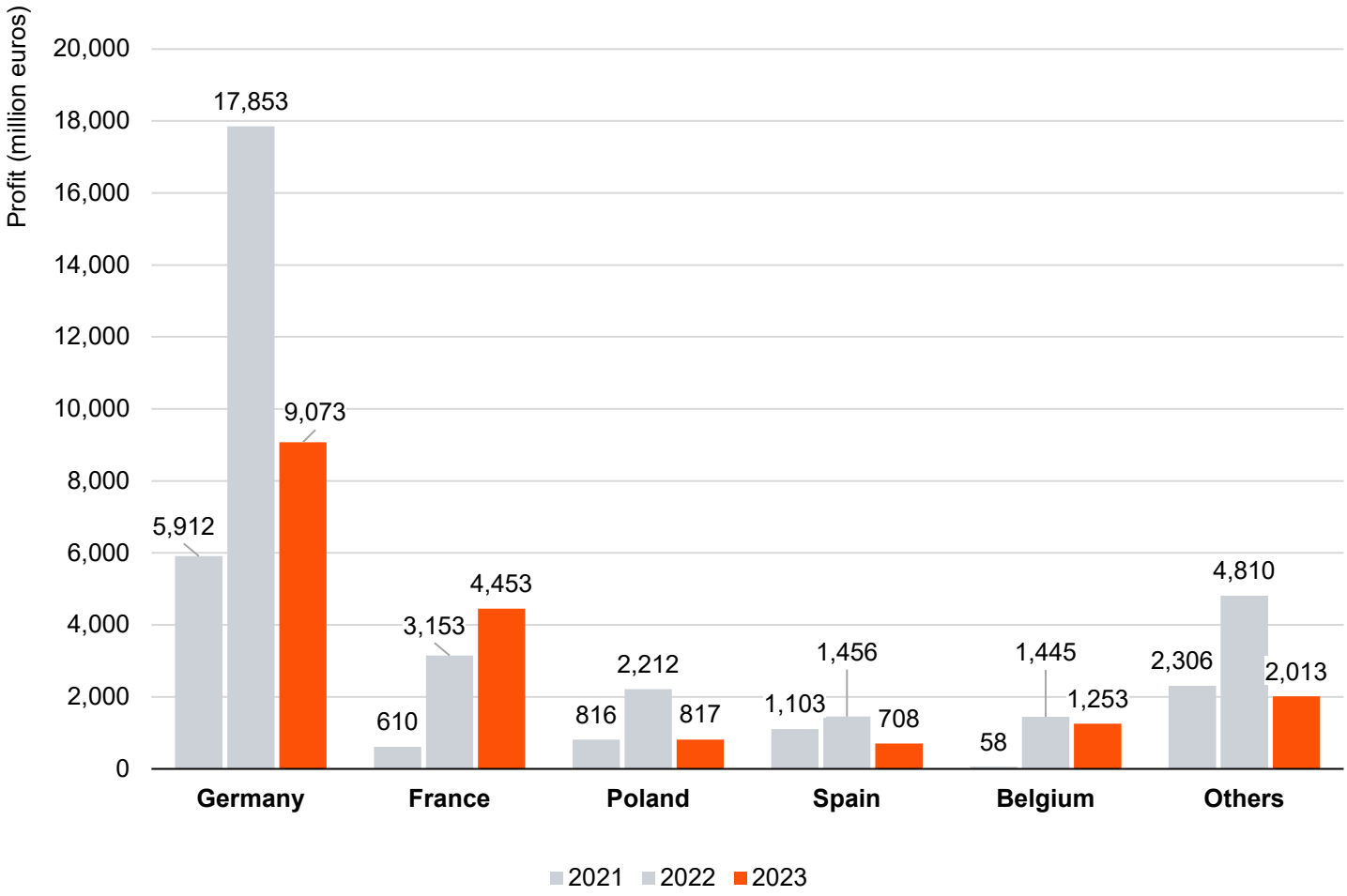
Italy, the largest net profit generator for each year in scope has seen a significant drop in net profits for 2023, below its 2021 and 2022 levels, heavily affected by falling oil prices. With a total volume extracted in 2023 which was 5% lower than 2022 levels, and oil prices above 2021 levels, the reduction in net margins for 2023 has come from the companies' increased cost base. Eni, the key player in Italy, saw its profit margin decrease significantly in 2023, going from around 28% in 2021 to only 12% in 2023 (mainly due to costs decreasing less than revenues, as well as relatively similar financial expenses and revenues), alongside a drop in revenues tied to oil production being below 2021 levels. The same goes for Poland, where net losses are observed due to Orlen suffering lower profits in 2023 than it had in 2022 (19%) and 2021 (28%) for this activity segment.

The other EU countries (i.e. those outside the top 5) saw their net profit increase from 2021 to 2023 from 35 to 124 billion euros. The main contributor to this growth is Denmark, which saw net profit margins increasing in 2022 and 2023 for TotalEnergies and BlueNord (i.e. linked to the good performance of other activities) while volumes stayed stable, compensating the price decrease observed between 2022 and 2023.

Refining

The greatest concentration of net profits in the EU for oil refining is observed in Germany and France, totalling 13.5 out of the around 18.3 billion euros of net margins estimated for the refining segment in 2023, or close to 75%. While net profits are down between 2022 and 2023 for almost all countries analysed, this is not true for France (see explanation below).

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the oil refining segment



High net margins in 2022 were mainly due to exceptionally high crack spreads [120] , amounting to four to five times the 5y average (e.g. diesel crack spread in 2021: 10 USD/bbl; diesel crack spread in 2022: 39 USD/bbl). High crack spreads were caused by low refined products stocks and lower European refineries capacity in 2022 (due to closings and issues in specific major refineries) [121] . The large difference between the crude oil and refined products prices increased this spread, boosting the net profits of refineries. Higher crack spreads in 2022 pushed refineries to higher utilisation rates, to benefit from these high prices trend (hence, the increase in refined products in the EU by 4.5% over this period). In opposition, a decrease of the crack spreads in 2023 was the main cause for lower net profits in the refining activity segment (due to higher level of inventories).

[120] A high crack spread refers to a large difference between the cost of crude oil and the selling price of refined petroleum products, such as gasoline or diesel. It indicates higher profitability for refineries, as they can sell refined products at significantly higher prices compared to the cost of crude oil.

[121] (European Central Bank, 2023)

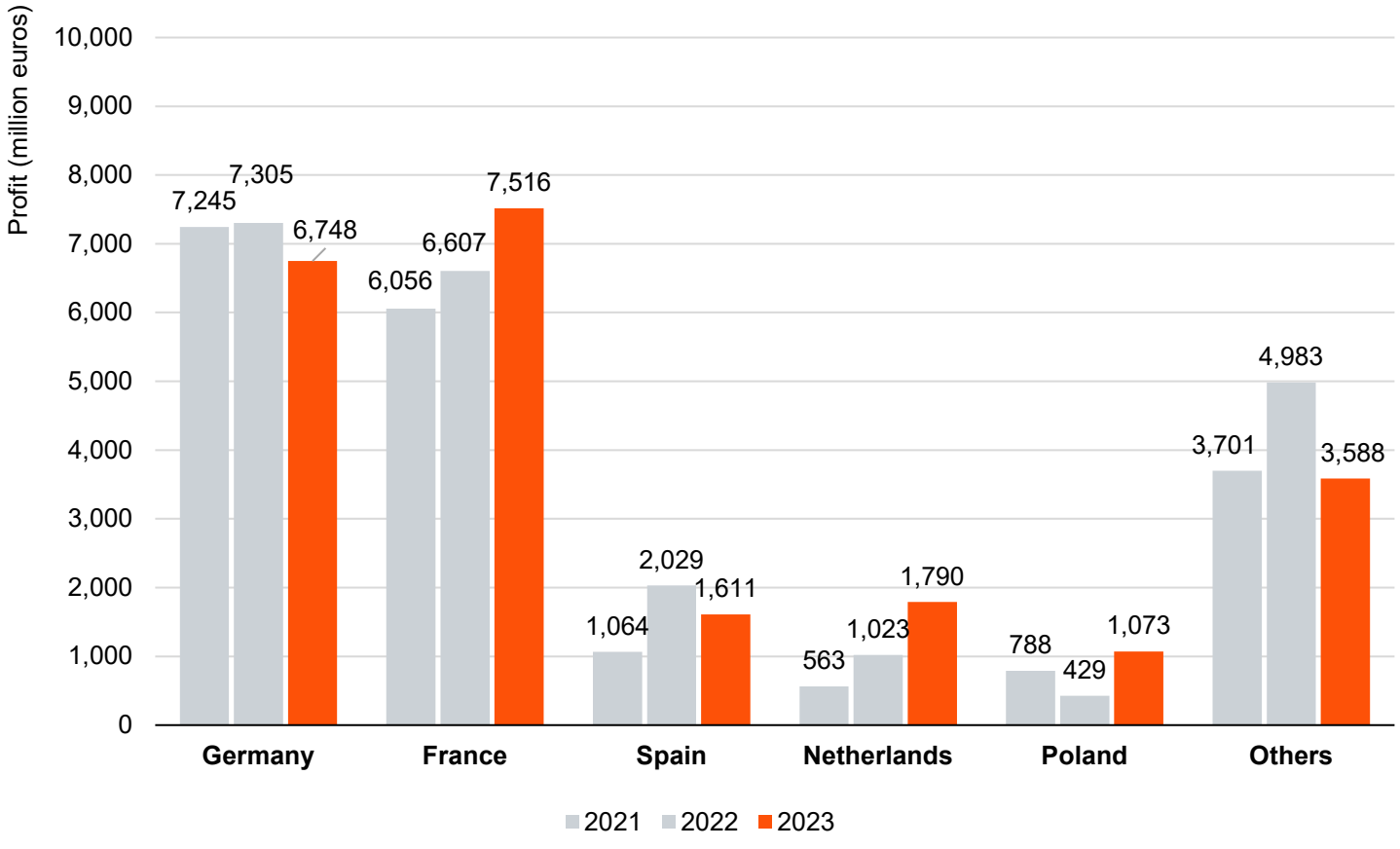
The increase in net profits generated in France is mainly based on higher volumes produced, TotalEnergies producing for example around 151 million barrels of oil in 2023 (despite lower refined products prices) while the production was only at 127 million barrels one year earlier. An increase in the net profit margins for the main actors between 2022 and 2023 (TotalEnergies going from around 7.5% to 9%; ExxonMobil going from almost 5% to almost 6%) was another reason for the increase observed.

In Germany, the steep decrease observed is not due to lower volumes (more volume was actually sold), but rather due to lowered prices and lower net margins of the sampled companies analysed (e.g. OMV, Shell, etc.), which could be due to lower performance of their other business segments as well.

Distribution, marketing and end-use

Similarly to the oil refining segment, Germany and France are the countries where most of the net profits are concentrated when looking at the period ranging from 2021 to 2023, with around 65% of the net profits generated in the EU in 2023 coming from these two countries. Germany and France are followed by Spain and the Netherlands for the retailing and wholesaling of oil products. These countries having the highest GDP of the EU, the highest level of oil products consumed reflects the intensity of those countries' economy [122] . Except for the Netherlands, the main countries highlighted in the figure below are also the most populated countries in the EU [123] . For these reasons, it does not come as a surprise that they are also countries where the most net profits are observed.

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the oil distribution, marketing and end-use segment



[122] (Eurostat, 2024)

[123] (Eurostat, 2024)

While for most countries increases have been observed between 2021 and 2022, it is not the case for Poland, where lower net profit margins from British Petroleum and MOL reduced the overall net profits generated.

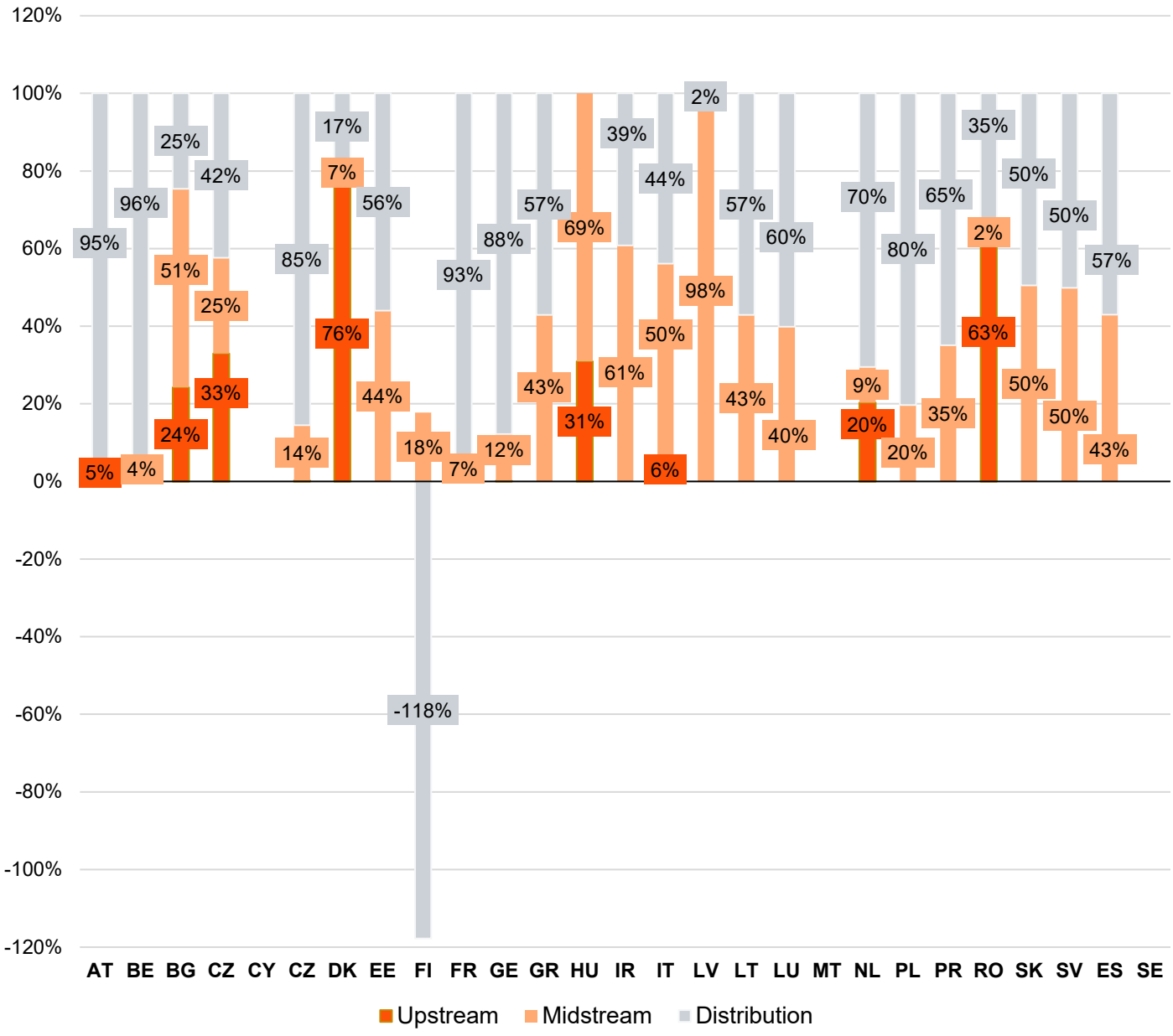
In 2023, while France, the Netherlands and Poland have performed better than in 2022, a decrease can be observed in Germany, Spain, and the other countries. Lower prices of oil products mainly explain the lower results for the latter.

In France, the better net profit margins were however sufficient to compensate those lower prices for TotalEnergies and Rubis. In the Netherlands, the increase in volumes sold and better net margins explain the 75% increase observed in 2023.

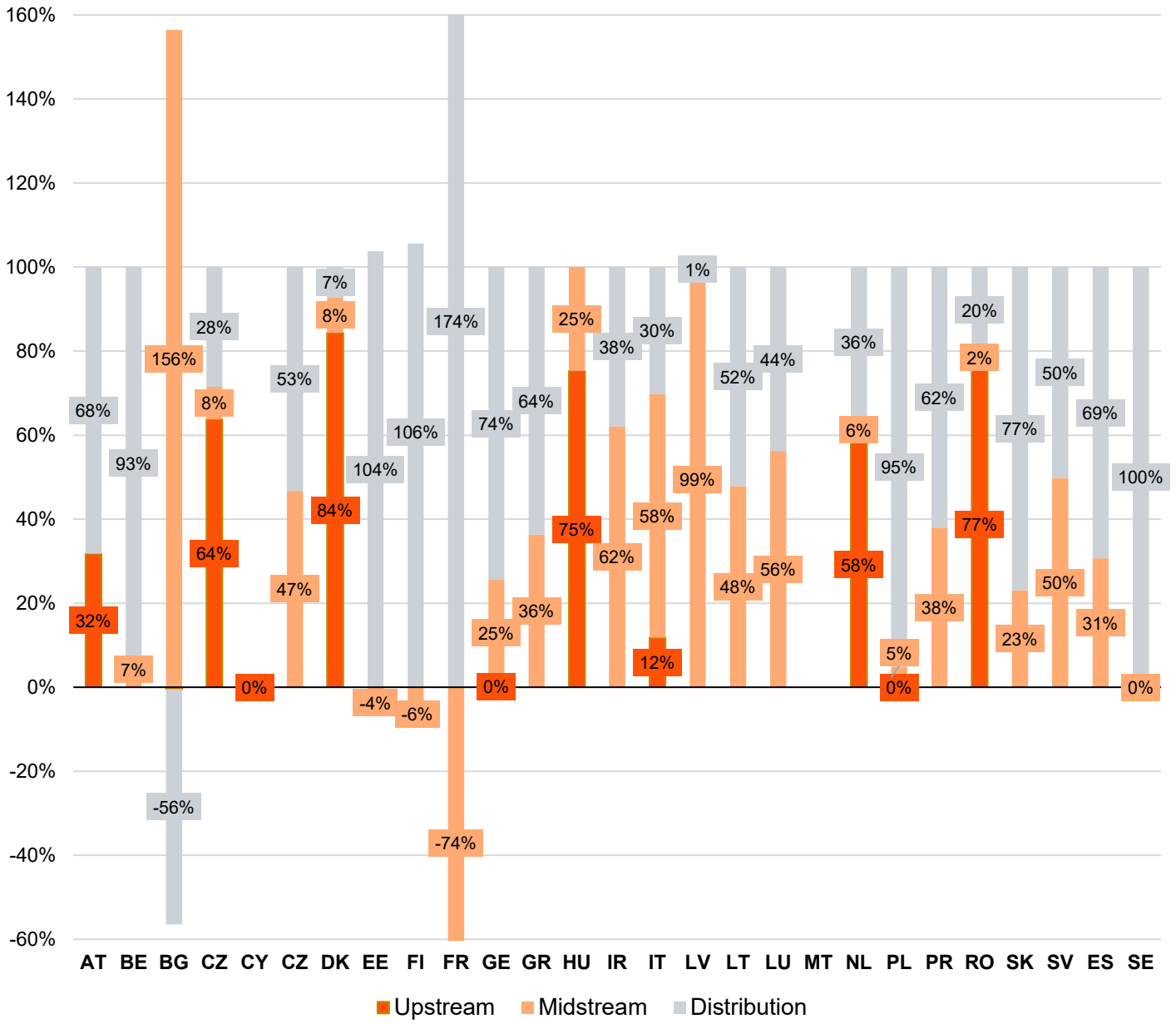
Regarding the price of oil products in 2023, the average value is still around 37% higher than in 2021, but still 11.5% lower than in 2022.

Natural Gas

2021 net profit by segment per country



2022 net profit by segment per country

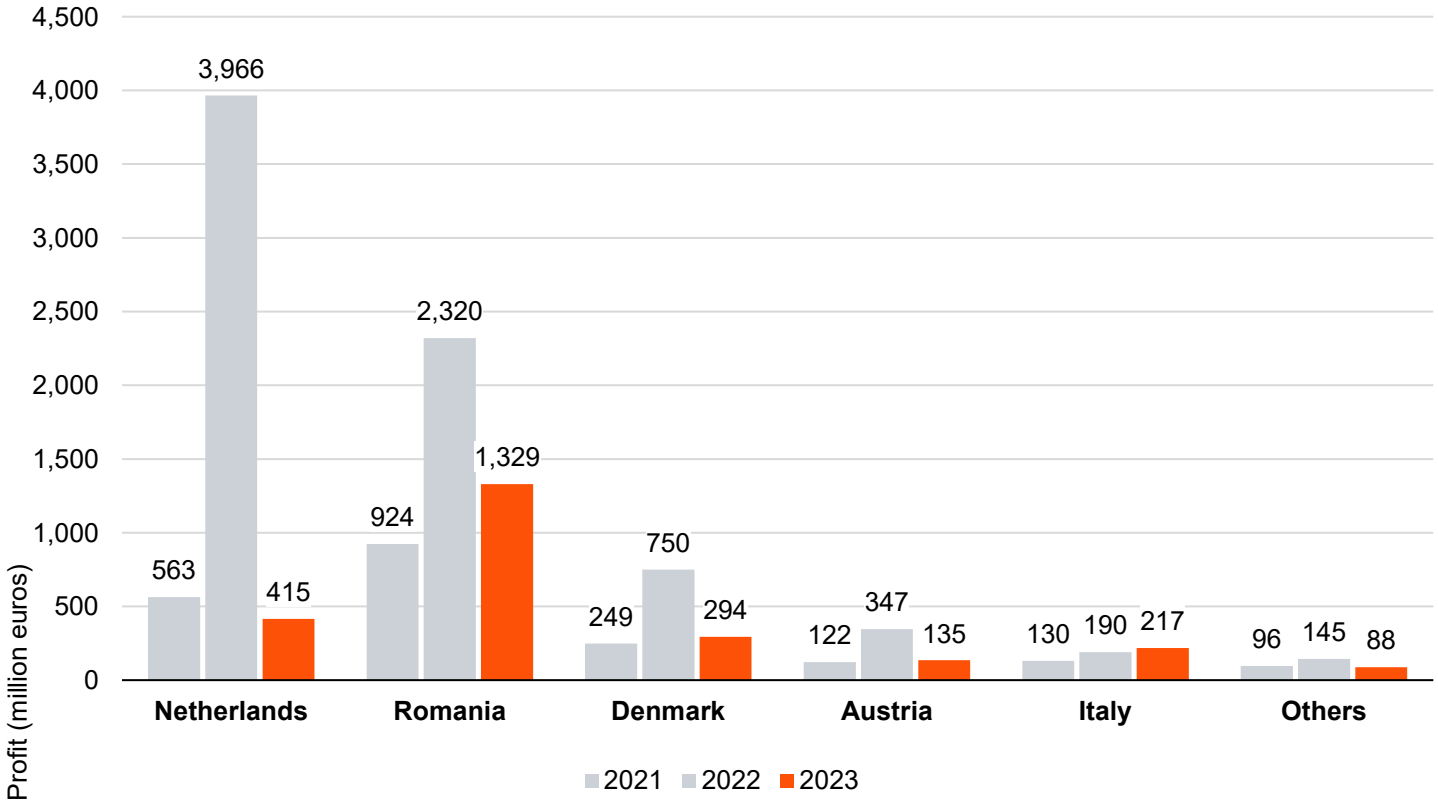


Exploration and production

Eight countries are active in the upstream segment. For Denmark, Romania, and Hungary, profits are primarily derived from this segment. In other countries, such as the Netherlands, Italy, Austria, and Croatia, upstream profits are lower, and these countries also generate significant profits from the midstream and distribution segments. Germany, while having some upstream profit, concentrates most of its profitability in the distribution segment. Regarding the midstream segment, most countries are involved to some extent. For countries like Bulgaria and Latvia, nearly all profits come from midstream activities. In other countries, the share of profits from midstream varies considerably. In Germany, Belgium, Poland, Finland, Estonia and Sweden, natural gas profits are almost exclusively generated through the distribution segment. Bulgaria presents a unique case, with a significant negative profit in the distribution segment, while midstream segment is making a profit.

When taking the average of years 2021, 2022 and 2023 at EU level, it is quite difficult to draw clear conclusions. In 2022, the Netherlands achieved record figures with 3.9 billion euros of estimated net profits coming from the exploration and production of natural gas. This result was a combination of two factors for the main natural gas producer of the country (but not limited to), the Nederlandse Aardolie Maatschappij (volumes around ten times higher than in 2021, and net profit margins that have doubled due to increase in natural gas prices) [124].

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the natural gas exploration and production segment



For all other countries, higher net profits generated from the production of natural gas occurred in 2022 (due to higher prices on the markets) despite a drop of almost 10% of volumes extracted in 2022 compared to 2021 (Romania being an exception here, with a slight increase of volumes extracted).

For 2023, all the main countries active in natural gas extraction recorded lower net profits than in 2022, mainly due to lower prices, combined with a decrease of almost 20% in total volumes extracted compared to 2022. These factors contributed to lower the net profit margins for most of the companies active in the segment. Despite that, Italy still saw net profit margins of almost 10%, while the Netherlands even recorded figures above 20% in 2023. For 2023, Romania was the main contributor to the net profits observed, accounting for approximately 55% of the total generated in the EU. This performance can be explained by the high profitability of OMV and Romgaz, with net profit margins slightly above 13% and 30% respectively for this activity segment in the country.

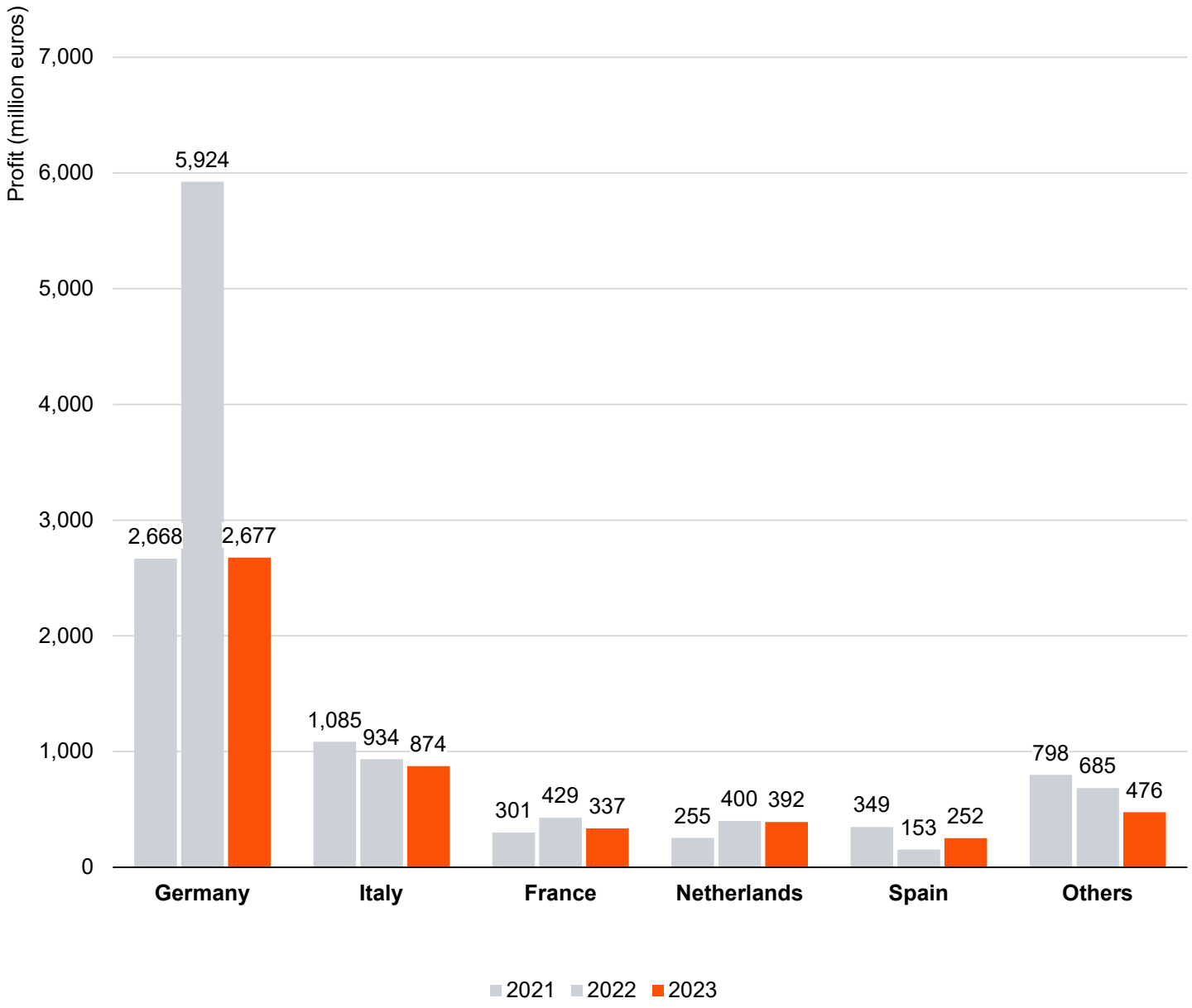
[124] (Nederlandse Aardolie Maatschappij, 2024)

Transportation and storage

The transport and storage activity segment is one of the most stable in the case of natural gas, being mainly linked to the volumes transported (i.e. import and exports, as well as storage levels and inland consumption). The most important countries for transport of natural gas are the same as the ones identified as consuming the most oil in the previous section. Those countries have three main factors explaining their larger share:

1. They operate a vast network of pipelines,
2. They have important maritime ports, which serve hold terminals for inflow and outflow of natural gas through pipelines,
3. Their populations are the largest in Europe, hence a higher level of natural gas consumption requiring more transport to industries and households.

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the natural gas transport and storage segment



As such, Italy, France and the Netherlands are responsible for around 65% of the net profits generated through transport and storage activities in 2023. While net profits are on a downward trend from 2021 to 2023, this is heavily linked to the lower demand for natural gas in the EU [125] (falling for example by 9% in Spain, 14% in France and 16% in Germany). Moreover, lower production (as already explained) emphasizes this downward trend. If France and the Netherlands observed lower levels of natural gas supplies in 2022, higher net profits are still observed due to an increase of net profit margins. As an illustration, the two main natural gas transport companies in France saw net profit margins increase (from around 18% to 20% for GRT Gaz and from 10% to 21% for Terega) between 2021 and 2022 in this activity segment.

Distribution, marketing and end-use

The largest part of the net profits generated by the natural gas industry comes from the last activity segment, namely distribution, marketing and end-use. In 2023, it accounted for around 85% of the total net profits generated in EU. Most of the net profits generated came from Germany and France, with these two countries accounting for 21.3 billion euros of net profits in 2023, or a bit above 70% of the total net profits generated in the EU.

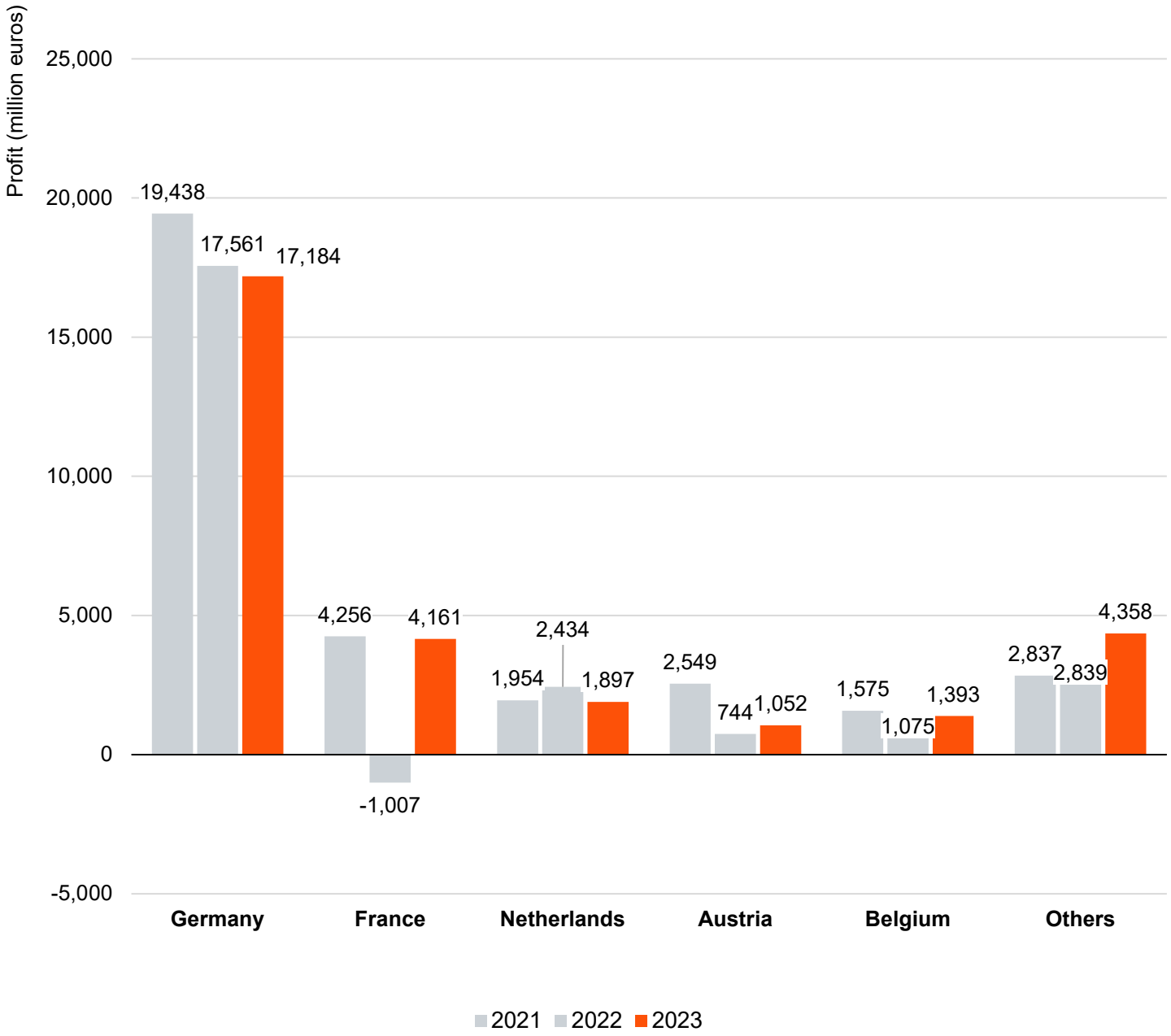
When comparing the five countries with the highest net profits estimated in 2023 with the volumes of natural gas used in national consumption, a discrepancy is noticed. The seven most important consumers of natural gas in 2022 in terms of volumes were Germany, Italy, France, Spain, the Netherlands, Poland and Belgium [126] . However, Belgium has on average been generating more net profits than Italy, Spain and Poland. The difference does not lie in the volumes as consumption decreased in these countries, nor does it lie in the price difference but depends on the companies that were active on the territories examined.

As an example, TotalEnergies in Belgium had a net profit margin of around 7% in 2022, while Edison, which operates in Italy, had a margin of slightly less than 1%. This creates disparities in the results observed. Hence, we believe that the observed differences among countries are attributable to differences in performances from the companies active there. As there are instances where net profit margins were retrieved from the global financial statements (and not from the segment views that some companies directly report on), other activities (e.g. activity segments, other fossil fuels, renewables, carbon capture, etc.) may therefore also impact the total profitability.

[125] (Bruegel, 2024)

[126] (Eurostat, 2024)

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the natural gas transport and storage segment

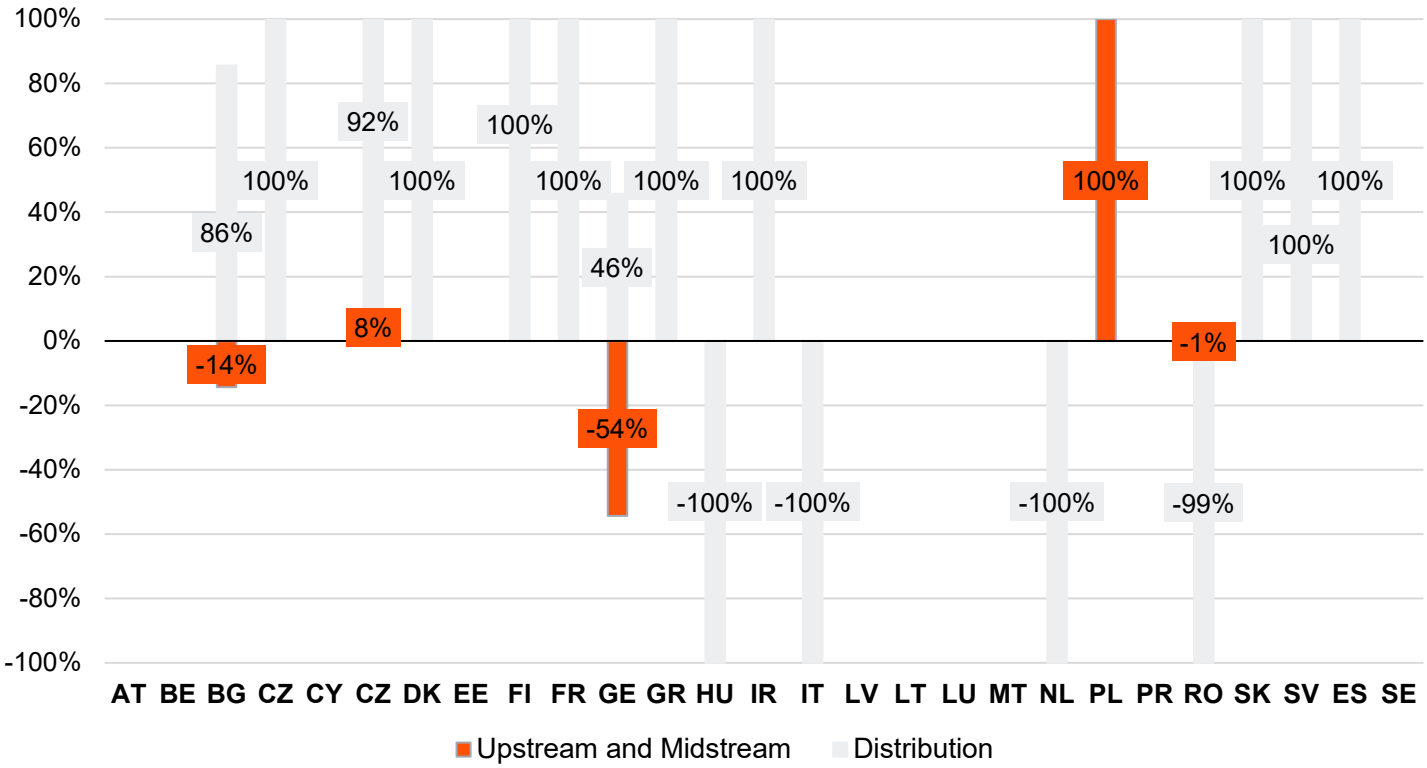


Net profits stemming from the retailing and wholesaling of natural gas are impacted by the lower volumes consumed within the EU (2021: 378 Mtoe; 2022: 329 Mtoe). In the absence of data available for 2023 at the time of writing, it has to be noted that the computations used the average of 2021 and 2022 to extrapolate the volumes consumed in 2023. As first analyses show a decrease of natural gas demand by more than 7% in 2023 [127] , further research on actualised 2023 data would be useful to better understand the behaviour observed at companies and country levels, as well as their actual positions in the ranking. In such a scenario, with decreasing natural gas prices and volumes consumed, key players of the industry could see profits follow along.

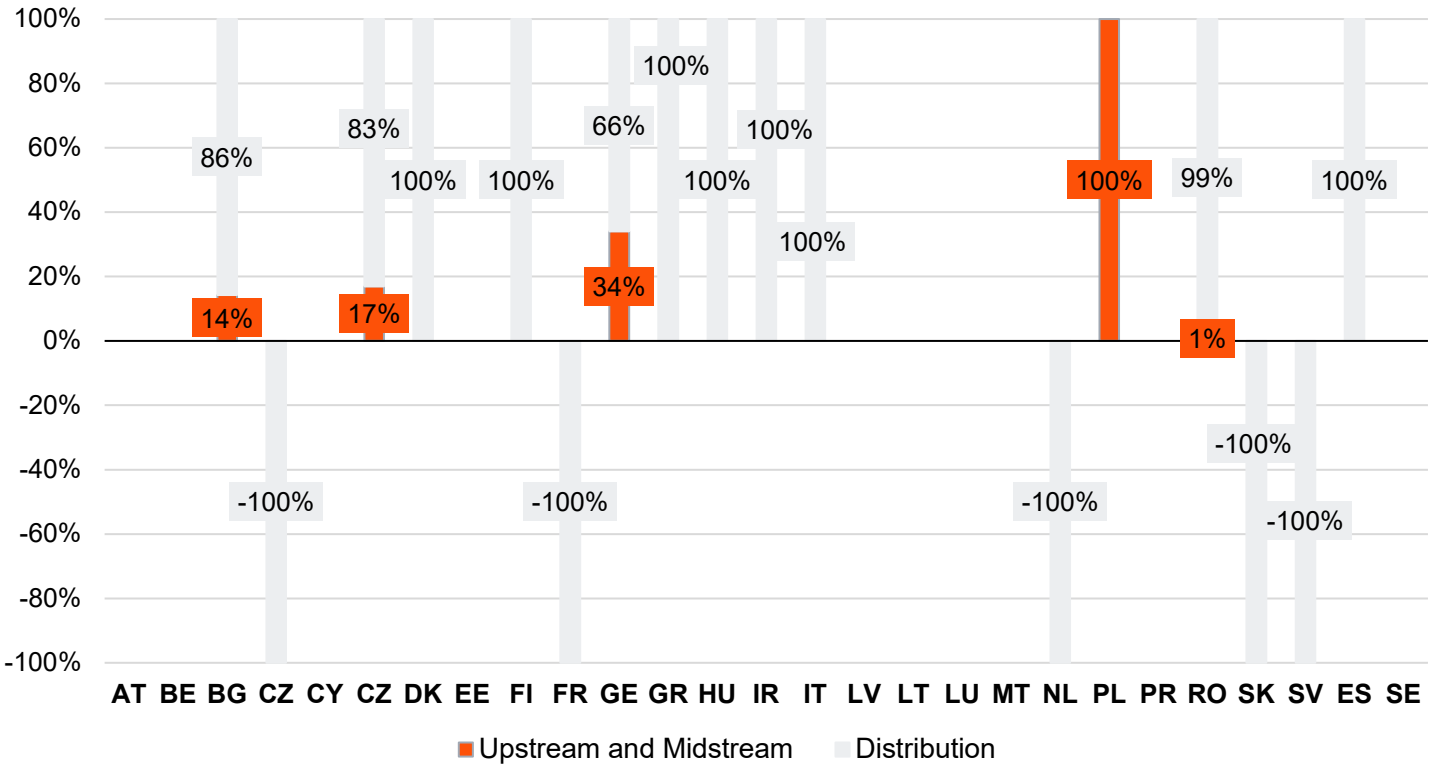
[127] (Eurostat, 2024)

Coal

2021 net profit by segment per country



2022 net profit by segment per country

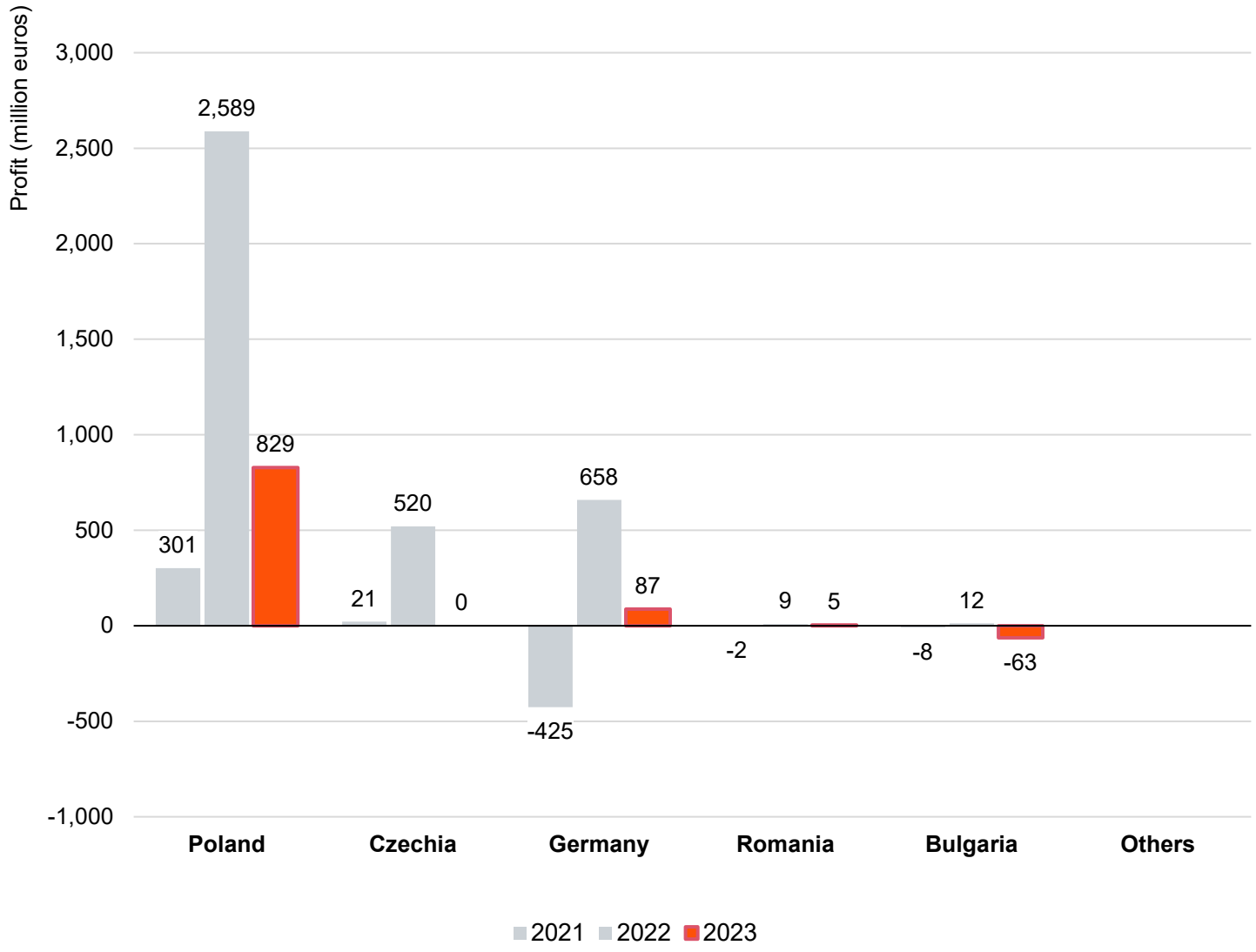


Exploration, production, transportation and storage

As previously explained, many countries are gradually transitioning away from coal as an energy source. Currently, only five countries Czechia, Poland, Germany, Romania, and Bulgaria remain active in upstream and midstream coal activities. The remaining countries focus solely on distribution. Additionally, no coal-related activities were identified in Austria, Belgium, Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta, Portugal, and Sweden, likely due to a lack of available data.

Coal is one of the oldest energy sources used in Europe. However, it is neither the most prominent, nor the most scalable anymore. The Green Deal introducing objectives for greenhouse gases emissions reductions, countries have consequently adopted plans to reduce emissions. All EU countries plan to phase out coal by 2040 (if not already done). For this reason, a decrease in volumes extracted (-53.4% over the last 10 years) [128] and used in coal-fired powerplants (-40.3% over the last 10 years) [129] has now been observed for several years.

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the coal exploration, production, transportation and storage segments



[128] (Eurostat, 2024)

[129] (Eurostat, 2024)

The years 2021 and 2022 were however marked by an increase of coal extraction, due to the need of securing energy supply across the EU (due to the lower supply of energy stemming from the halted supply of gas from Russia, because of which the demand for energy in the EU could potentially not have been met). The production increased by 5% in 2022, while imports increased by 16% [130]. However, it did not last more as levels of production decreased by more than 21% the next year. These patterns are observable for each of the countries producing coal in the EU, notably Bulgaria, Poland, Romania, Czechia and Germany (there are no significant other producers in the EU).

While lower profits and losses were observed in 2021, net profits have increased steeply the next year, in all countries. This was caused by the increase of coal prices, as well as the higher demand for energy in the same period [131]. On the other side, while coal became more expensive to mine due to lower prices of alternative sources, its profitability decreased for 2023 [132].

The highest net profits stemming from coal production are generated in Poland with an estimated 0.8 billion euros in 2023, followed by Czechia (i.e. lack of data for 2023) and Germany with comparatively low (though positive) profits, with 87 million euros.

Distribution, marketing and end-use

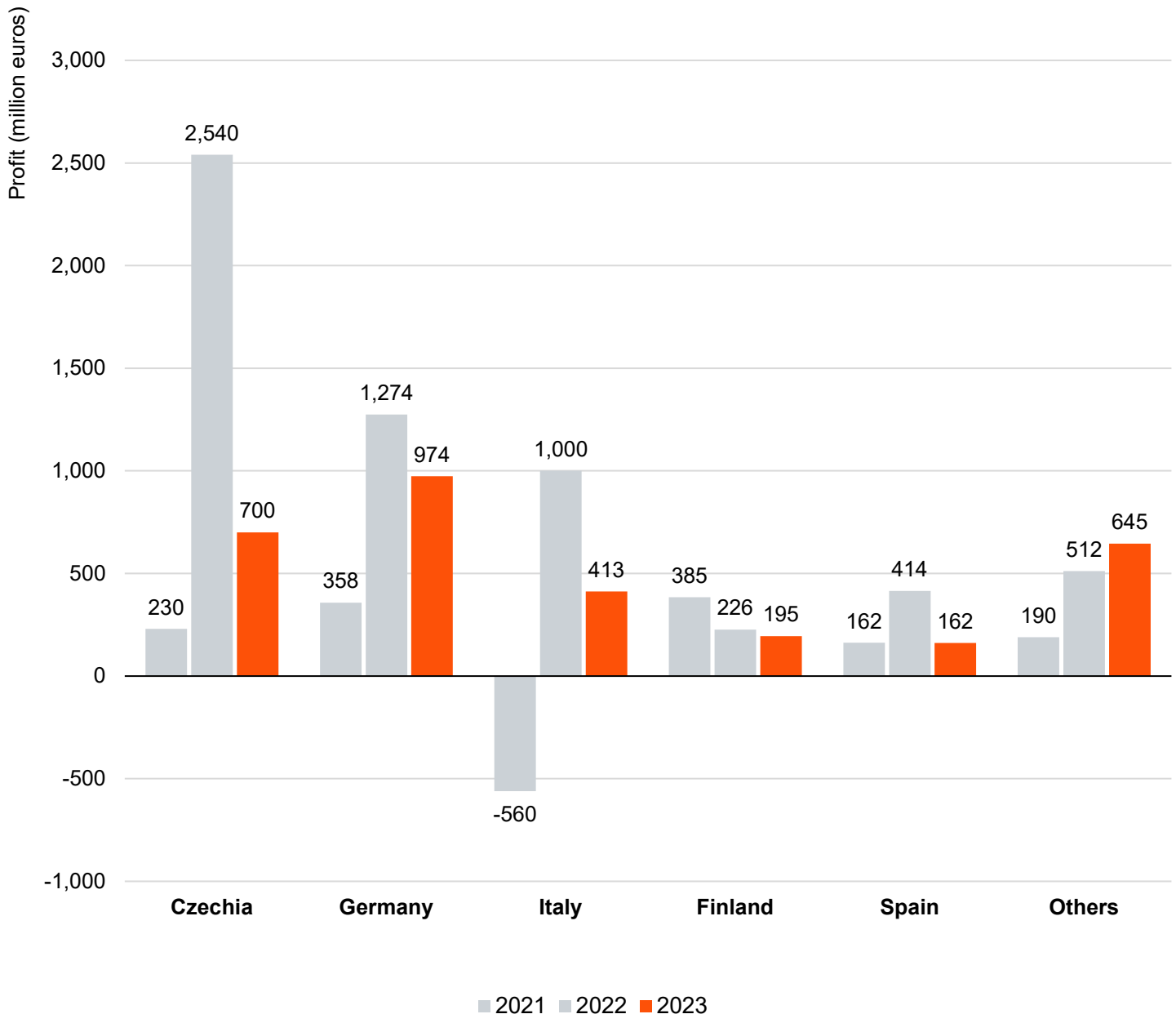
Comparatively to the analysis made for the coal production segment, companies across the EU generated in 2023 less profits than in 2022 (around 40% less) but more than in 2021 (around 120% more). The main contributors to these profits have been, over the last three years, been Czechia, Germany and Italy. This is explained by the low number of mines still active in the EU, and the low number of companies still operating them in a context where almost all EU countries plan to phase out coal by 2040.

[130] (Eurostat, 2024)

[131] (Statista, 2023)

[132] Data for 2023 are partially incomplete, either due to the lack of transparency in annual reports of coal mining operators, or in the reports not being out yet at the time of writing.

Top 5 countries with the largest average net profits in the EU between 2021 and 2023 for the coal distribution, marketing and end-use segment



The generation of electricity as well as the need for coal in materials manufacturing did fall during 2023, according to some early reports [133] . This translated into lower prices for coal (dropping from 279 EUR/T to 106EUR/T). However, electricity prices staying stable over the same period, this encouraged companies having stocks of coal to continue using it in power-generation activities (hence the limited drop in profitability).

Czechia's net profits accounted for an estimated 43% of the market in 2022, but its share decreased to 23% in 2023 due to the highly volatile performance of companies in the country. On the contrary, a rather stable performance of the industry is observed in most of the other countries except for Italy and Spain.

[133] (International Energy Agency, 2024)

Major companies by country and segment used in the data sampling

Oil

Exploration and production

Legend:

Out of scope

No activity

No information about the activity

Oil

Refining

Legend:

Out of scope

No activity

No information about the activity

Oil

Distribution, marketing and end-use

Legend:

Out of scope

No activity

No information about the activity

Natural gas

Exploration and production

Legend:

Out of scope

No activity

No information about the activity

Natural gas

Transportation

Legend:

Out of scope

No activity

No information about the activity

Natural gas

Distribution, marketing and end-use

Legend:

Out of scope

No activity

No information about the activity

Coal

Exploration and production

Legend:

Out of scope

No activity

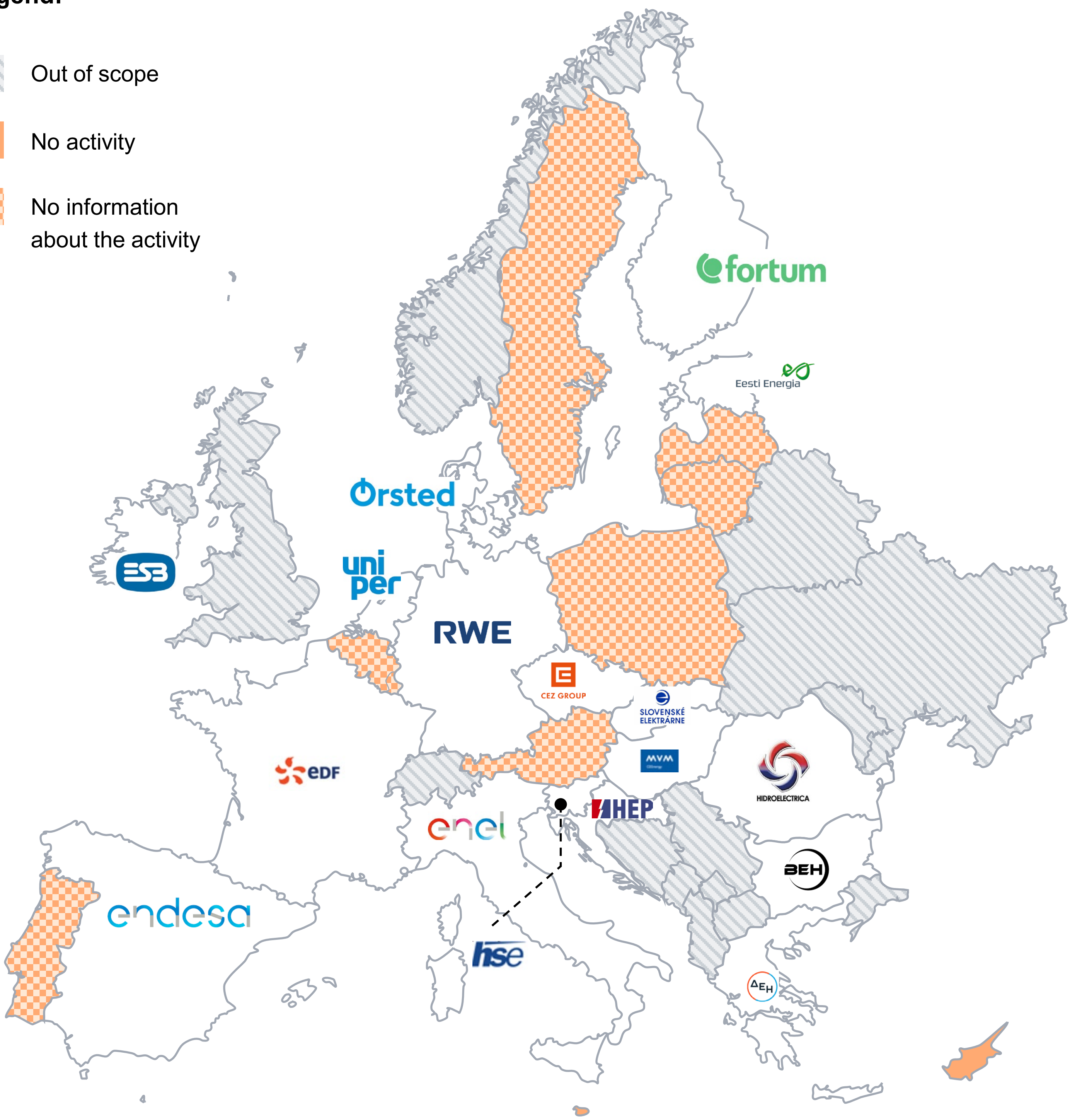
No information about the activity

Coal

Distribution, marketing and end-use

Legend:

- Out of scope
- No activity
- No information about the activity



pwc.be