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Financial performance of EU-27 fossil fuel companies and their counterparts after imposing energy sanctions on Russia: A comparative analysis

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Abstract

The conflict between Russia and Ukraine, along with the imposition of energy sanctions on Russian energy sources, has prompted a reassessment of the global energy market. Utilizing the difference in differences model, this study investigates the financial performance disparities among fossil fuel companies operating within the EU-27 bloc, Russia, and countries such as the United States, the United Kingdom, Qatar, Norway, India, China, UAE, and Saudi Arabia (countries that have benefitted from exporting fossil energy to the EU-27 as an alternative to Russia) during the period spanning from 2016 to 2023. The result reveals that fossil fuel companies from the United States, the United Kingdom, Qatar, Norway, India, China, UAE, and Saudi Arabia experienced significant advantages from substituting Russia in supplying oil, natural gas, and LNG to the EU-27. This is evidenced by a notable enhancement in their financial performance compared to both Russian and EU-27-based fossil fuel companies. For fossil fuel companies, the study highlights the urgency of diversifying export and import markets, broadening partnerships for fossil fuel trading and refining, transitioning to the production of lower-emission energy forms, and enhancing sustainable development practices to mitigate risks. At the national level, the research results indicate that countries reliant on imported fossil energy, akin to most countries within the EU-27, must swiftly diversify their energy sources and focus on developing renewable energy. This strategy is crucial to avoid unexpected shocks in the energy market in the era of geopolitical conflicts and uncertainty.

Keywords: fossil fuel, fossil energy, security, EU-27, Russian energy sanctions, Russia–Ukraine conflict.
JEL classification: G30, G32, Q40, Q43.

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1. Introduction

The ramifications of the Russia–Ukraine conflict prompted a series of punitive sanctions against the Russian energy sector, posing challenges to energy policies across the European Union (EU-27) member states. As reported by Colgan et al. (2023), by December 31, 2022, Europe incurred an additional EUR 643 billion in excess market costs due to elevated fossil fuel energy prices since October 2021. Fossil fuel companies within the EU-27 bloc encountered significant challenges as well. For instance, in 2022, the German government intervened to rescue Uniper, one of its largest energy firms, with initial investments of EUR 15 billion in July 2022 and an additional EUR 25 billion in November 2022, attributed to the sharp spike in fossil fuel prices associated with the conflict between Russia and Ukraine (Steitz et al., 2022; Steitz and Käckenhoff, 2022).

Despite widespread efforts to foster renewable energy sources, fossil fuels are anticipated to remain the primary energy source in Europe in the foreseeable future (IEA, 2022). Consequently, following endeavors to curtail fossil fuel imports from Russia, several EU-27 countries have transitioned their gas dependence to the United States, the United Kingdom, Norway, Qatar, and North Africa (European Council, 2024). Some countries, notably India and China, also benefit from increasing their crude oil and diesel exports to the EU (Narayan et al., 2023). Financial reports from British fossil fuel companies indicate substantial shareholder payouts, with Shell disbursing an extraordinary USD 23 billion in 2023. BP's payouts exceeded their pre-Russia–Ukraine conflict average by over 50%, while in the United States, ExxonMobil and Chevron distributed USD 58 billion to investors. This dichotomy underscores the disparity in financial performance between fossil fuel companies in the EU-27 bloc and their counterparts elsewhere.

On the other hand, Hartvig et al. (2024) argue that in 2022, Russia was evidently using its energy leverage to exert pressure on European states that supported Ukraine in the conflict. In response, Western governments have aimed to curtail Russia's oil revenues through the implementation of a price cap (Braw, 2023). Consequently, Russia redirected its crude oil exports from Europe to alternative markets, including India and China (Babina et al., 2023; Hilgenstock et al., 2023). The Russia–Ukraine conflict and the unprecedented sanctions targeting Russia, particularly its energy sector, have introduced complex variables and interconnections within the global energy market, significantly altering the strategies of fossil fuel suppliers and consumers, especially from the perspective of the EU-27. Compared to previous studies that focused on the national level (Rokicki, 2023; Chen et al., 2023; Panda, 2024; Tichý and Dubský, 2024) or oil prices (Li et al., 2024; Miller, 2024), and research on crude oil stock price fluctuations (Li et al., 2022; Küçükçolak et al., 2024), this study concentrates on analyzing the financial performance of fossil fuel companies. It aims to determine who truly benefits and who bears the losses by examining the financial performance of fossil fuel companies from three groups: the EU-27, Russia, and alternative exporting countries (as termed by the EU-27) in the era of geopolitical and uncertainty.

The results of this study, from a microeconomic perspective, will enable fossil fuel companies to assess potential risks in the context of significant unexpected disruptions. This will allow them to prepare strategies such as diversifying export and import markets, broadening partnerships for fossil fuel trading and refining, transitioning to the production of lower-emission energy forms, and enhancing sustainable development practices to mitigate risks. From a macroeconomic perspective, the study holds policy implications for both exporting and fossil fuel-dependent countries in economic development. In an era marked by geopolitical conflicts and instability, the research underscores the necessity for countries to diversify their energy sources, particularly by encouraging the increased production of renewable energy, to ensure energy independence.

2. Literature review

2.1. The impact of war and geopolitical conflict on the fossil energy sector and energy security

The impact of war and geopolitical conflict on the fossil energy sector is a subject of substantial scholarly inquiry, characterized by a multifaceted array of effects that reverberate across global energy systems. Such events invariably disrupt the production, transportation, and availability of fossil fuels, engendering supply shortages and price volatility within international energy markets (Månsson, 2014; Zakeri et al., 2022; Creutzig, 2022). Directly affected regions often witness considerable impairment to critical infrastructure essential for fossil fuel extraction and distribution, including pipelines, refineries, and maritime terminals (Henderson, 2024; de Jong, 2023; Stegen et al., 2023). The resultant disruptions can yield temporary or protracted interruptions in the supply chain, profoundly affecting both domestic and international energy markets (Basdekis et al., 2022; Xin and Zhang, 2023). Moreover, the specter of geopolitical conflicts may further prompt countries to impose sanctions or embargoes on energy exports from belligerent states, amplifying constraints on fossil fuel availability in global markets (Cui, 2022). Beyond immediate market fluctuations, geopolitical conflicts wield enduring influence over long-term energy policy formulations and strategic planning (Sauvageot, 2020; Romanova, 2021). States compelled by security imperatives may reevaluate their dependence on fossil fuels, charting pathways toward diversification and renewable energy investment to mitigate vulnerability to geopolitical disruptions (Kuzemko et al., 2022; Osička and Černoch, 2022).

Energy security refers to the uninterrupted availability of energy resources at affordable prices to meet the needs of a nation's economy and population (IEA, 2023). It encompasses various dimensions, including the reliability and resilience of energy supply, the diversity of energy sources, and the ability to manage and mitigate risks associated with energy production, distribution, and consumption (Tutak and Brodny, 2022). Energy security aims to safeguard against disruptions in energy supply that could negatively impact economic stability, national security, and the well-being of citizens (Doğan et al., 2023; Belaïd et al., 2023; Lee et al., 2022). The Russia–Ukraine conflict and the sanctions imposed by the West on Russia have prompted a global reevaluation of the energy security situation within their respective countries. Within the EU, some member states continue to pursue individual energy policies to safeguard their energy security. A case in point is Bulgaria, which maintains subsidies for the thermal power industry despite opposition from climate agencies and other member states within the bloc, given that electricity exports constitute a vital industry for Bulgaria (Aleksieva and Tcolova, 2023). Another example is Hungary, where the country continues to import energy from Russia despite calls for sanctions from the EU bloc. This decision is driven by the simple reason that the top priority of the Hungarian government is their own energy security. From a holistic perspective, the disruption of energy flow from Russia to the EU through the Nord Stream, Yamal–Europe Pipeline, or other pipelines crossing Ukrainian territory has resulted in the EU losing access to stable and affordable energy sources (a fundamental tenet of the definition of energy security). While some perspectives argue that excessive fossil fuel imports from Russia are increasing the EU's dependence on Russian energy or compromising its energy autonomy (Jääskeläinen et al., 2018; Proedrou, 2018), it must be acknowledged that the cheap and stable energy supply from Russia constitutes a foundational element for economic development in many EU-27 member states (Proedrou, 2018). The Russia–Ukraine conflict and subsequent sanctions have exposed a vulnerability in the EU's energy security, particularly during the period from mid-2022 to mid-2023. Despite assertions by McWilliams et al. (2023) that the EU is nearly immediately replacing at least 50% of Russia's gas supplies, the cost implications are significant, necessitating more than a twofold increase in subsidies for fossil fuels (European Commission, 2023) and procurement of LNG from countries such as the United States, where costs are nearly double those of Russian gas (TASS, 2018).

2.2. Impact of energy-related sanctions on Europe

The sanctions instituted by the European Union against Russia in response to its conflict with Ukraine were initiated in 2014. Nevertheless, owing to the European Union's reliance on Russian energy resources, sanctions targeting fossil fuels have demonstrated limited efficacy (Schmidt-Felzmann, 2019). Indeed, these measures represent a dual-edged instrument, inflicting adverse consequences not only upon the Russian economy but also upon those of European Union member states (Giumelli, 2017).

In 2022, driven by opposition to Russia amidst the current conflict, a majority of EU member states and their Western counterparts opted to intensify sanctions against Russia to unprecedented levels (Meissner and Graziani, 2023; Sanus et al., 2024). Among the primary objectives pursued by the EU and its allies was the deliberate imposition of a short-term economic downturn on Russia through the curtailment of revenue derived from Russian oil and gas exports (Gaur et al., 2023). Concurrently, the EU sought to diminish reliance on Russian energy resources, which were perceived as posing a threat to their energy security, by imposing an embargo on Russian oil and gas (McWilliams et al., 2023). Additionally, the EU articulated aspirations to expedite the advancement of renewable energy technologies within the bloc by diminishing dependence on Russian energy, with the overarching aim of achieving complete reliance on renewable energy sources by the year 2050 (Zastempowski, 2023).

However, recent studies have indicated that the European Union's energy strategies have not yielded the anticipated outcomes. Conversely, the EU has incurred losses in both its overall economy and the energy sector specifically (Baqaee et al., 2022). Chen et al. (2023), through an analysis of the diversion effect of energy trade and the impact of geographical risks on national economies, demonstrated that energy sanctions led to economic repercussions for both parties, with the EU experiencing a loss of 1.488%

and Russia 4.8%, alongside a global increase in inflation. Furthermore, Bachmann et al. (2022) and Di Bella et al. (2022) provide empirical evidence regarding recession risks and soaring inflation resulting from sanctions imposed on the Russian energy sector. Consequently, a series of inquiries have been undertaken to propose strategies for EU member states to address the energy deficit created by the dependency on Russian resources. Noteworthy among these endeavors is the framework introduced by Lau et al. (2022), suggesting compensation for natural gas shortages with coal, albeit this proposal is evidently infeasible as it conflicts with the EU's commitments to sustainable development. Mišík (2022) advocates for EU solidarity in ensuring the energy security of member states during the transitional phase, until domestically sourced low-carbon energy alternatives are fully established. Overall, the proposed solutions lack significant breakthroughs, primarily due to the enduring reliance of the EU on fossil energy sources (IEA, 2022).

Viewed through a microeconomic lens, there exists a paucity of research delineating variances in the performance of European enterprises pre- and post-the Russia–Ukraine conflict and ensuing sanctions. Predominantly, scholarly investigations concentrate on the examination of stock price shocks and abnormal returns (Boungou and Yatié, 2022; Boubaker et al., 2022). A few studies, such as that of Holger-Görg et al. (2023), demonstrate that firms with direct and indirect business relationships with partners in Russia have suffered significant losses due to the repercussions of sanctions imposed in 2014 targeting Russia, when compared to the current sanction scenario.

2.3. Research gap and hypotheses

Since the Russia–Ukraine conflict and the unprecedented sanctions against Russian energy, numerous studies have been conducted to examine the impact of these events on various stakeholders. Most of these studies focus on the macroeconomic perspective. For example, Chen et al. (2023) analyze the dual losses suffered by both the EU-27 and Russia, while others model energy policies for European countries in the absence of Russian energy (Zhang et al., 2024; Nikas et al., 2024). Research on business performance in the context of the Russia–Ukraine conflict tends to offer general analyses across all industries, lacking in-depth examinations specific to the fossil energy sector (Ferriani and Gazzani, 2023; Huynh et al., 2023). Meanwhile, studies that do focus on fossil fuel companies mainly address stock price fluctuations (Olayungbo, 2024; Köseoğlu et al., 2024; Bagchi et al., 2024).

To date, we have found that almost no research has addressed a very urgent issue: "*How fossil fuel companies operate in the context of the Russia–Ukraine conflict and Russian energy sanctions, especially when considering fossil fuel companies from countries with different interests?*" Therefore, in this study, we categorize fossil fuel companies into three groups: the EU-27, Russia, and alternative exporting countries (this group includes the United States, the United Kingdom, Qatar, Norway, India, China, UAE, and Saudi Arabia; in other words, these are countries that have benefited from exporting fossil energy to the EU-27 as an alternative to Russia). We then compare the financial performance of fossil fuel companies from these three groups in pairs. Based on the analyses, we propose the following research hypotheses:

H1: The financial performance of fossil fuel companies from alternative exporting countries tends to show better growth compared to those from the EU-27 and Russia.

H2: Fossil fuel companies from both the EU-27 and Russia have encountered difficulties due to the sanctions targeting the Russian energy sector.

3. Methodology and data selection

3.1. Data selection

In this study, we selected oil and gas companies to represent fossil fuel companies in general. In the EU-27 region, the chosen companies are key players in their respective countries and the EU region, such as TotalEnergies, Repsol, Eni, Uniper, etc. In countries with increased fossil fuel exports to the EU, including the UK, the US, Qatar, Norway, China, Saudi Arabia, UAE and India, we only selected fossil fuel companies operating within the EU or exporting gas, oil, and LNG to the EU region, such as Chevron, ExxonMobil, Shell, Equinor, Indian Oil Corporation, QatarEnergy, etc. For the case of Russia, only key players such as Gazprom, Rosneft, Lukoil, etc. are chosen. Additionally, since our study spans from 2016 to 2023, fossil fuel companies must have financial data for the year 2023. In total, we selected a study sample consisting of 77 companies from the EU-27 region and 93 companies from the group of alternative exporting countries and 31 companies from Russia (Table 1).

3.2. Methodology

To explore the financial performance disparity between fossil fuel companies within the EU-27 region and those in areas benefiting from increased fossil fuel exports to the EU — such as the UK, the US, Qatar, Norway, and India — amidst the Russia–Ukraine conflict and sanctions on Russian energy, we consider the adoption of Average Treatment Effect (ATE) and Average Treatment Effect on the Treated (ATT) as potential analytical metrics. The ATE denotes the average causal impact of a treatment or intervention across the entire population, encompassing both treated and untreated individuals, thereby gauging the overall influence of the treatment regardless of treatment receipt. This metric quantifies the mean difference in outcomes between entities subjected to the intervention and those assigned to the control (placebo) group (Imbens, 2004). Conversely, the ATT concentrates specifically on treated individuals or units that have actually undergone the treatment (Fig. 1). It assesses

Table 1
Distribution of fossil fuel companies by country.

Country	Number of companies
EU-27	77
Alternative exporting countries	93
United States	38
United Kingdom	8
Norway	4
Qatar	3
India	16
China	11
Saudi Arabia	6
UAE	7
Russia	31

Source: Compiled by the authors.

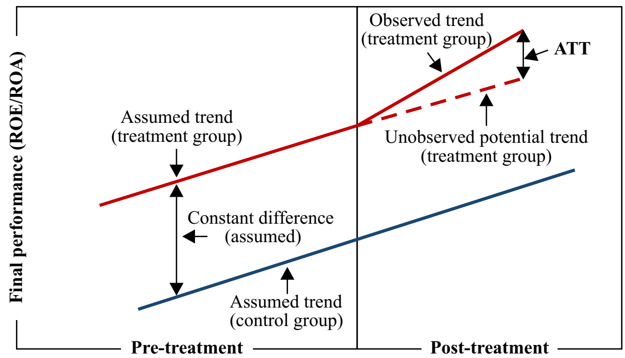

Fig. 1. The identification of Average Treatment Effect on the Treated (ATT).

Source: Compiled by the authors.

the average causal impact of the treatment on the subset of the population that has received it. Within the realms of economics and policy evaluation, the ATT is often regarded as the pertinent and sought-after measure for policymakers (Heckman and Vytlacil, 2001). Luedicke (2022), referencing a generalized difference-in-differences (DID) model as articulated by Angrist and Pischke (2009) and Wing et al. (2018), expounds on the presence of the ATT in a traditional DID framework as follows:

$$Y_{ist} = \propto_s + \propto_t + Z_{ist}\beta + D_{st}\delta + \varepsilon_{ist}, \tag{1}$$

where: Y_{ist} is the outcome of the i-th observation in group s at time t; $\propto_s$ are group fixed effects; $\propto_t$ are time-fixed effects; Z_{ist} are covariates; β are the coefficients on the covariates; D_{st} is the (time-varying) treatment indicator; δ is the coefficient on the treatment indicator, i.e., the ATT, and ε_{ist} are the residual errors.

The identification of the ATT hinges upon maintaining the parallel trends assumption. This assumption posits that the trajectories observed in both the treated and control groups exhibit similarity prior to the intervention, and in the absence of it, these trajectories would have persisted unchanged. It serves as a crucial assumption for identifying treatment effects, as estimations of such effects become untenable if this assumption is violated. Directly assessing this assumption proves impractical, given the inability to ascertain the hypothetical outcomes in the absence of intervention. Indirectly gauging this assumption typically involves scrutinizing whether trends preceding the intervention are congruent or, at the very least, comparable. The rationale underlying this approach is that if pre-treatment trends demonstrate consistency, they would likely follow similar trajectories in the absence of intervention.

Testing for parallel trends. Testing for parallel trends is a critically important procedure for examining the validity of the estimated ATT. The results of parallel trend tests are interpreted from the linear-trends model and the Granger model. For the linear-trends model, we first rewrite equation (1) as:

$$Y_{ist} = DID_{ist} + \varepsilon_{ist}. \tag{2}$$

The linear-trends model augments the above model with two more terms:

$$Y_{ist} = DID_{ist} + w_i d_{t,0} t\vartheta_1 + w_i d_{t,1} t\vartheta_2 + \varepsilon_{ist}. \quad (3)$$

The augmentation terms consist of two 3-way interactions between $d_{t,0}$, w_i and t, and $d_{t,1}$, w_i and t. $d_{t,0} = 1(d_t = 0)$ is a variable indicating pretreatment periods; $d_{t,1} = 1(d_t = 1)$ indicating post-treatment time periods. $w_i = 1$ if ever treated, and 0 if never treated. The coefficient ϑ_1 captures the differences in slopes between the treatment group and control group in pre-treatment periods, while ϑ_2 captures the differences in slopes in post-treatment periods. If ϑ_1 is 0, the linear trends in the outcome are parallel during pre-treatment periods. In this context, we employ a Wald test of ϑ_1 against 0 to assess whether the linear trends are parallel prior to treatment. The *DID* variable is formulated as the product of Time multiplied by Treatment. In this context, Time represents a binary indicator, assuming a value of 0 if the observation occurs before the intervention year and 1 if it occurs after the intervention year. Similarly, Treatment is also a binary indicator, assuming a value of 0 for observations in the control group and 1 for observations in the treatment group. Consequently, the *DID* variable is likewise a binary indicator, assuming values of either 0 or 1.

The dependent variables in the model encompass financial metrics such as Return on Equity (*ROE*) and Return on Assets (*ROA*). As for the independent variables related to financial aspects, they include the current ratio, total assets, debt to equity ratio, debt to assets ratio, revenue, and Cost and Expenses. Regarding company-specific characteristics, the independent variable operational age is utilized. Additionally, macro-level control variables incorporated in

Table 2
Data description and sources.

Variable	Description	Source
ROE	Calculated by dividing the net income by the average of its equity	Authors' calculations based on companies' financial statements
ROA	Calculated by dividing the net income by the average of its total assets	Authors' calculations based on companies' financial statements
Current Ratio	Calculated by dividing the total current assets by its total current liabilities	Authors' calculations based on companies' financial statements
Ln(*Total Assets*)	Calculated by taking the logarithm of total assets	Authors' calculations based on companies' financial statements
Debt to Equity Ratio	Calculated by dividing the total liabilities by total shareholders' equity	Authors' calculations based on companies' financial statements
Debt to Assets Ratio	Calculated by dividing the total liabilities by total assets	Authors' calculations based on companies' financial statements
Ln(*Revenue*)	Calculated by taking the logarithm of revenue	Authors' calculations based on companies' financial statements
Ln(*Cost And Expenses*)	Calculated by taking the logarithm of cost and expenses	Authors' calculations based on companies' financial statements
Ln(*Company's Age*)	Calculated by taking the logarithm of company's age	Based on the establishment year information on the companies' official websites
GDP Growth Rate	The GDP growth rate of the country where the company is headquartered	Eurostat and World Bank
COVID-19 Support	Total spending for supporting the COVID-19 pandemic (% of GDP)	IMF (2021)

Source: Compiled by the authors.

Table 3
Treatment and control groups.

Panel	Treatment group	Control group
I	EU-27's fossil fuel companies	Alternative exporting countries' fossil fuel companies
II	EU-27's fossil fuel companies	Russian fossil fuel companies
III	Alternative exporting countries' fossil fuel companies	Russian fossil fuel companies

Source: Compiled by the authors.

the model encompass the GDP growth rate and government subsidy rate during the COVID-19 pandemic period (Table 2).

According to the requirements of ATT analysis, firstly, we need to divide the study sample into a control group and a treatment group (Table 3). The treatment year selected is 2022, the year of the Russia–Ukraine conflict and the initiation of a series of sanctions. Thus, the *DID* variable in our study will have a value of 0 for all observations in the control group. For observations in the treatment group, *DID* = 0 during the pre-treatment period (2016–2021) and 1 during the post-treatment period (2022–2023).

4. Results and discussion

4.1. Descriptive statistics of variables

Table 4 presents the statistical description of variables in the sample, categorized into three groups: EU-27, Russia, and alternative exporting countries. The results indicate that during the period from 2016 to 2023, the average ROE and ROA for Russian fossil fuel companies were 0.1415 and 0.0639, respectively. Following this, the group of alternative exporting countries achieved average ROE and ROA values of 0.0661 and 0.0341, respectively. The average ROE and ROA for fossil fuel companies within the EU-27 were only 0.0568 and 0.0286, respectively. For the entire sample, the minimum and maximum values of ROE were –6.2668 and 5.5026, respectively, both attributed to NHOA Energy in 2019 and 2017. The minimum value of ROA is –1.7264, belonging to Valaris in 2021, while the maximum value of ROA is 3.4362, associated with Imperial Petroleum in 2016. The longest-operating company in the sample is Italgas (Italy), established in 1837. Conversely, the youngest company in the research sample is TechnipFMC (France), founded in 2017. Due to TechnipFMC's case (all financial indicators in 2016 are equal to 0), the minimum values of the variables Ln(*Total assets*), Ln(*Company's age*), and Ln(*Costs and Expenses*) are set to 0. The company with the largest total assets in the research sample is Shell in 2022 ($443.02 billion). We acknowledge that the financial indicators in the research sample exhibit significant fluctuations during the period 2016–2023. However, this is a characteristic feature of the energy sector, particularly fossil energy, which is heavily influenced by policies, geopolitical conflicts, sanctions, or price manipulation by supplying countries.

Table 4
Descriptive statistics of variables.

Variable	Obs.	Mean	Std. dev.	Min	Max
Russia					
ROE	248	0.1415	0.4382	–6.2027	1.7460
ROA	248	0.0639	0.0916	–0.4691	0.5147
Current Ratio	248	1.3039	1.1948	0.0000	10.2464
Ln(*Revenue*)	248	20.8717	2.0206	6.5636	25.8699
Debt to Assets Ratio	248	0.2074	0.1730	0	0.9337
Debt to Equity Ratio	248	0.8662	3.4077	0	46.9915
Ln(*Total Assets*)	248	20.6181	2.6998	11.8486	26.6756
Ln(*Company's Age*)	248	3.1621	0.5896	1.0986	4.4886
Ln(*Costs and Expenses*)	248	19.1901	2.9731	6.2312	25.3656
GDP Growth Rate	248	0.0144	0.0263	–0.0265	0.0561
COVID-19 Support	248	0.0125	0.0217	0	0.0500
Alternative exporting countries					
ROE	744	0.0661	0.5000	–6.2616	5.0343
ROA	744	0.0341	0.1247	–1.7264	0.3498
Current Ratio	744	1.4449	1.2273	0.2205	11.2610
Ln(*Revenue*)	744	23.5891	2.3827	8.1235	29.7613
Debt to Assets Ratio	744	0.2912	0.1721	0.1256	0.9286
Debt to Equity Ratio	744	1.3991	4.4959	0.3525	50.0195
Ln(*Total Assets*)	744	24.3845	1.6297	20.6926	26.8169
Ln(*Company's Age*)	744	3.7581	0.8655	0.6931	5.2095
Ln(*Costs and Expenses*)	744	23.3158	2.6955	6.1598	29.7395
GDP Growth Rate	744	0.0274	0.0355	–0.1103	0.0905
COVID-19 Support	744	0.0428	0.0893	0	0.2540
EU-27					
ROE	616	0.0568	0.6755	–6.2668	5.5026
ROA	616	0.0286	0.3572	–0.4578	3.4362
Current Ratio	616	2.0906	4.0451	0	36.6259
Ln(*Revenue*)	616	21.0536	4.5129	0	26.6439
Debt to Assets Ratio	616	0.2930	0.2085	0	1.5029
Debt to Equity Ratio	616	1.3687	3.7208	0	45.7667
Ln(*Total Assets*)	616	22.1706	2.9356	0	26.4398
Ln(*Company's Age*)	616	3.3646	0.8690	0	5.2311
Ln(*Costs and Expenses*)	616	21.2122	3.2402	0	26.5334
GDP Growth Rate	616	0.0142	0.0421	–0.1133	0.1359
COVID-19 Support	616	0.0269	0.0528	0	0.1750

Note: All currency values have been converted to USD based on the average 12-month exchange rate for the respective year.
Source: Authors' calculations.

4.2. Results

A comparative analysis was conducted to assess the financial performance of fossil fuel companies from three distinct groups — EU-27, Russia, and alternative exporting countries — utilizing the ATT analysis method, as outlined in the respective panels of Table 3. The findings reveal that fossil fuel companies from alternative exporting countries demonstrated superior financial performance in comparison to those from the EU-27 and Russia (models 1, 2, 5, and 6 in Table 5). Conversely, there was no significant variance in financial performance between fossil fuel companies from the EU-27 and Russia post-2022 (models 3 and 4 in Table 5).

The results of the parallel trends test indicate that the assumptions regarding

Table 5
ATT analysis results.

Variable	EU-27 vs alternative exporting countries		EU-27 vs Russia		Alternative exporting countries vs Russia	
	ROE (1)	ROA (2)	ROE (3)	ROA (4)	ROE (5)	ROA (6)
ATT						
DID	–0.1772***	–0.1062***	0.4253	–0.003	0.2749***	0.0453***
(1 vs 0)	0.0829	(0.0570)	(0.0.2382)	(0.0848)	(0.0989)	(0.0201)
Controls						
Current Ratio	0.0021**	0.0018***	0.0014**	0.0050**	0.0270*	0.0098***
	(0.0011)	0.0004	(0.0090)	(0.0013)	(0.0195)	(0.0037)
Ln(*Revenue*)	0.0351	–0.0075	–0.5349	–0.1007	0.0190**	0.0068**
	(0.0284)	0.0138	(0.4389)	(0.1265)	(0.0174)	(0.0060)
Debt to Assets Ratio	–0.0089	–0.0301**	–1.8426**	–0.2907**	–0.0005	–0.0001
	(0.0662)	0.0148	(0.7246)	(0.1541)	(0.0001)	(0.0000)
Debt to Equity Ratio	–0.0021	–0.0094**	–0.0147**	–0.0010**	0.0001	0.0001***
	(0.0241)	0.0048	(0.0198)	(0.0007)	(0.0000)	(0.0000)
Ln(*Total Assets*)	0.1326***	0.1452***	0.2244***	0.0779***	0.0483**	0.0023**
	(0.0486)	0.0554	(0.1609)	(0.0448)	(0.0652)	(0.0176)
Ln(*Company's Age*)	–0.1335	0.1064	–0.1048	–0.1562	–0.1586	–0.1225
	(0.1215)	0.0820	(0.0789)	(0.0952)	(0.0886)	(0.0983)
Ln(*Costs and Expenses*)	–0.0159**	–0.0088**	–0.0030	–0.0082**	–0.0058	–0.0049*
	(0.0101)	0.0068	(0.0032)	(0.0044)	(0.0125)	(0.0021)
GDP Growth Rate	–1.4069*	–0.8990**	–1.6524*	–0.3431	0.1109	–0.08336
	(0.7545)	0.3886	(1.2176)	(0.3524)	(1.0364)	(0.2318)
COVID-19 Support	–0.6879**	–0.1286*	–0.6686	–0.0229	–0.7668	–0.2505
	(0.3337)	0.0796	(0.3025)	(0.1173)	(0.9889)	(0.4461)
Constant	2.8963***	2.1904***	2.8868***	4.0016***	–1.4525**	–0.5644***
	(1.1003)	(1.5236)	(1.1523)	(3.2603)	(1.4670)	(0.3832)
Parallel trends test	0.65	0.21	0.42	0.49	2.44	0.14
(H0: Linear trends are parallel)	[0.4205]	[0.6498]	[0.5195]	[0.4863]	[0.1216]	[0.7064]
Obs. in control group	744	744	552	552	552	552
Obs. in treatment group	616	616	304	288	248	248

Note: ATT estimate adjusted for covariates, panel effects, and time effects. We applied a new ATT estimation method proposed by STATA (2021) and as mentioned by Luedicke (2022), which is exclusively accessible on Stata software version 17 or subsequent versions. *** $p < 0{,}01$, ** $p < 0{,}05$, * $p < 0{,}1$; p-value of the F-tests are shown in the square brackets.
Source: Authors' calculations.

the trends in ROE and ROA for fossil fuel companies in models 1, 2, 3, 4, 5, and 6 suggest that the trends in financial performance for the three groups (EU-27, Russia, and alternative exporting countries) were parallel before the treatment year, validating the appropriateness of employing the ATT analysis.

Figs. 2–3 visually depict the disparities in the trends of ROE and ROA when comparing fossil fuel companies from the EU-27 and alternative exporting countries. Fig. 2 illustrates a similar declining trend in ROE for both groups of fossil fuel companies from 2017 to 2020, followed by a notable upsurge in 2021. In 2022, while the ROE of fossil fuel companies from alternative exporting countries continued to ascend, the ROE of EU-27 fossil fuel companies experienced a decline before a slight recovery in 2023. Similarly, Fig. 3 demonstrates a parallel trend in ROA from 2016 to 2021, with a noticeable divergence in 2022: the ROA of fossil fuel companies from alternative exporting countries exhibited

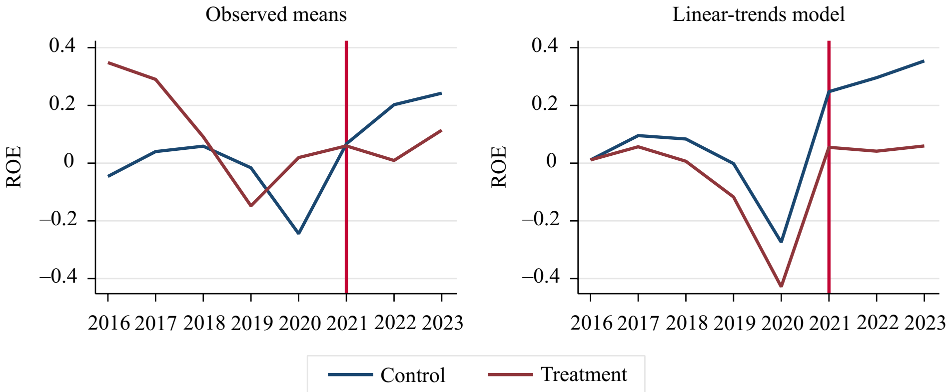

Fig. 2. Graphical diagnostics for parallel trends for ROE
(EU-27 vs alternative exporting countries).

Source: Designed by the authors using Stata 17.

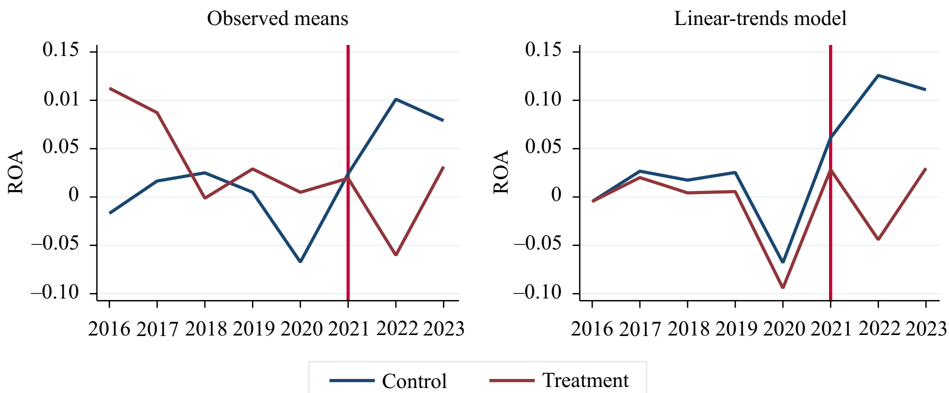

Fig. 3. Graphical diagnostics for parallel trends for ROA
(EU-27 vs alternative exporting countries).

Source: Designed by the authors using Stata 17.

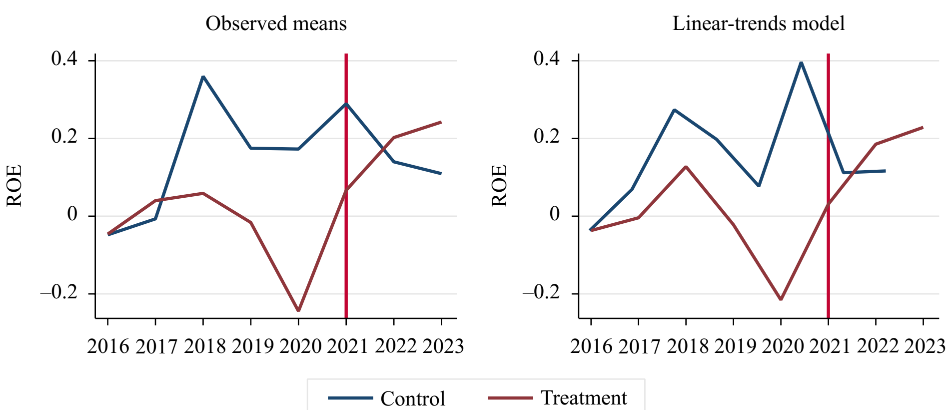

Fig. 4. Graphical diagnostics for parallel trends for ROE
(alternative exporting countries vs Russia).

Source: Designed by the authors using Stata 17.

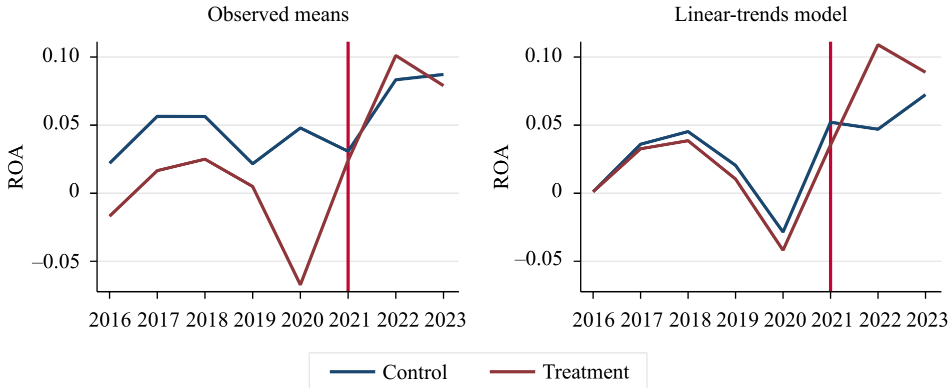

Fig. 5. Graphical diagnostics for parallel trends for ROA (alternative exporting countries vs Russia).

Source: Designed by the authors using Stata 17.

a sharp increase followed by a decline, whereas the ROA of EU-27 fossil fuel companies sharply decreased before rebounding in 2023.

Figs. 4–5 visually depict the disparities in the trends of ROE and ROA when comparing fossil fuel companies from alternative exporting countries and Russia. Fig. 4 shows that prior to 2022, the ROE of fossil fuel companies in both groups followed a similar trend. However, it is important to note that during an upward trend, Russian fossil fuel companies consistently performed better, and during a downward trend, their decline was less pronounced. In 2022, this pattern changed dramatically as the ROE of Russian fossil fuel companies experienced a sharp decline, while the ROE of fossil fuel companies from alternative exporting countries continued to rise. Fig. 5 illustrates a similar pattern for ROA, with the difference being that prior to 2022, the trends in ROA for fossil fuel companies in both groups were more closely parallel compared to the trends in ROE. The overall trend for ROA of fossil fuel companies from alternative exporting countries continued to increase in 2022 before declining in 2023. In contrast, the ROA of Russian fossil fuel companies decreased in 2022 before returning to an upward trend in 2023.

Robustness tests. To ensure the robustness of our findings, we conducted a series of tests. Notably, within the alternative exporting countries group, a considerable proportion of observations, comprising 38 companies, originated from the United States, representing 41% of the sample in the group. Recognizing the potential for overrepresentation resulting from this distribution, we undertook robustness assessments across models 7, 8, 9, 10, 11, 12, 13, 14. In models 7 and 8, we conducted ATT analysis for both ROE and ROA, focusing on fossil fuel companies within the EU-27 bloc and those from the United States. In models 9 and 10, we performed ATT analysis for ROE and ROA concerning fossil fuel companies within the EU-27 bloc and a cohort of selected countries, encompassing the UK, Qatar, Norway, India, China, UAE, and Saudi Arabia. Similarly, in models 11 and 12, we conducted ATT analysis for both ROE and ROA, focusing on fossil fuel companies within Russia and those from the United States. In models 13 and 14, we performed ATT analysis for ROE and ROA concerning fossil fuel companies within Russia and a cohort of selected countries, encompassing the UK, Qatar, Norway, India, China, UAE, and

Table 6
Robustness tests results (EU-27 vs alternative exporting countries).

Variable	EU-27 vs US		EU-27 vs UK, Qatar, Norway, India, China, UAE, and Saudi Arabia	
	ROE (7)	ROA (8)	ROE (9)	ROA (10)
ATT	–0.1643***	–0.1268***	–0.0818***	–0.0889***
DID (1 vs 0)	(0.0686)	(0.0468)	(0.0686)	(0.0386)
Controls	Yes	Yes	Yes	Yes
Parallel trends test	0.90	0.01	2.44	0.01
(H0: Linear trends are parallel)	[0.3451]	[0.9246]	[0.1216]	[0.7569]
Obs. in control group	304	304	440	440
Obs. in treatment group	616	616	616	616

Note: ATT estimate adjusted for covariates, panel effects, and time effects. We applied a new ATT estimation method proposed by STATA (2021) and as mentioned by Luedicke (2022), which is exclusively accessible on Stata software version 17 or subsequent versions. *** $p < 0{,}01$, ** $p < 0{,}05$, * $p < 0{,}1$.; p-value of the F-tests are shown in the square brackets.
Source: Authors' calculations.

Table 7
Robustness tests results (alternative exporting countries vs Russia).

Variable	US vs Russia		UK, Qatar, Norway, India, China, UAE, and Saudi Arabia vs Russia	
	ROE (11)	ROA (12)	ROE (13)	ROA (14)
ATT	0.2068***	0.0328***	0.0666***	0.0189***
DID (1 vs 0)	(0.0728)	(0.0186`)	(0.0468)	(0.0097)
Controls	Yes	Yes	Yes	Yes
Parallel trends test	0.88	0.02	2.46	0.19
(H0: Linear trends are parallel)	[0.3521]	[0.8883]	[0.1156]	[0.6627]
Obs. in control group	288	288	288	288
Obs. in treatment group	304	304	440	440

Note: ATT estimate adjusted for covariates, panel effects, and time effects. We applied a new ATT estimation method proposed by STATA (2021) and as mentioned by Luedicke (2022), which is exclusively accessible on Stata software version 17 or subsequent versions. *** $p < 0{,}01$, ** $p < 0{,}05$, * $p < 0{,}1$.; p-value of the F-tests are shown in the square brackets.
Source: Authors' calculations.

Saudi Arabia. Importantly, the outcomes of the ATT analysis and the parallel trends test remained consistent with those derived from models 1, 2, 5 and 6, reinforcing the validity and coherence of our previous analyses (Tables 6–7).

Therefore, based on the results of the ATT analysis and the robustness tests, we conclude the research hypotheses that fossil fuel companies from alternative exporting countries are the primary beneficiaries in the context of the volatile energy market resulting from the Russian energy sanctions. Both fossil fuel companies from the EU-27 and Russia exhibit similar fluctuation trends before and after 2022, indicating no clear advantage between these two groups. While Russia seeks new import partners, the EU-27 must explore new partners for purchasing or collaborating in the production of fossil fuels.

4.3. Discussion

Drawing from the analyzed data in sections 1–2, and the research findings in section 4, we aim to discuss the following key issues.

From the perspective of fossil fuel companies, our analysis indicates that prior to 2022, Russian fossil fuel companies consistently outperformed companies from the EU-27 and alternative exporting countries in terms of financial performance indicators such as Return on Equity (ROE) and Return on Assets (ROA). This trend persisted even amidst the significant downturn in global oil and gas industry profits in 2020 (Filimonova, 2020). Russia's abundant fossil fuel reserves, specialized expertise in oil and gas extraction and transportation, and favorable export policies have enabled them to generate substantial profits from fossil fuels, contributing to economic growth (Wang et al., 2023). However, facing sanctions from countries considered "unfriendly" by Russia, Russian fossil fuel companies have encountered challenges in diversifying their markets, particularly in increasing exports to countries like India and China. In contrast, EU-27 fossil fuel companies, lacking extensive fossil fuel resources, typically pursue two primary business strategies: collaborating with Middle Eastern and North African countries for oil and gas extraction and refining, or procuring crude oil for refining and natural gas for distribution to various industries. This underscores the significant reliance of numerous EU-27 countries on external fossil fuel suppliers (Macedo and Marques, 2023). The loss of a key partner, Russian fossil fuel companies, has presented substantial hurdles for many EU-27 fossil fuel companies (Steitz et al., 2022; Steitz and Käckenhoff, 2022). Conversely, in 2022, fossil fuel companies from alternative exporting countries surpassed Russian companies in financial performance for the first time, primarily attributed to the sanctions imposed on Russian energy. This shift was particularly evident for countries such as the United States, the United Kingdom, Qatar, Norway, and Saudi Arabia, which were not reliant on Russian fossil energy and benefitted from increased exports to the EU-27. On the other hand, China and India seized the opportunity to procure significant and stable quantities of fossil fuels from Russia to meet their energy needs. Furthermore, they could acquire fossil fuels from Russia and resell them to the EU-27 at higher prices, a scenario that appeared improbable before 2022. It is evident that for fossil fuel companies, particularly those from countries susceptible to geopolitical fluctuations, as in the case of this study with fossil fuel companies from the EU-27 and Russia, it is crucial to implement strategies such as diversifying export and import markets, broadening partnerships for fossil fuel trading and refining, transitioning to the production of lower-emission energy forms, and enhancing sustainable development practices to mitigate risks.

At the national level, in accordance with the latest European Council report (2024), the proportion of natural gas supplied via pipelines from Russia to the EU experienced a notable decline, dropping from over 40% in 2021 to approximately 8% by 2023. This reduction is further pronounced when considering both pipeline gas and LNG, with Russia's contribution accounting for less than 15% of the EU's total gas imports. This trend is viewed within the EU-27 countries as a symbolic victory in their strategic pursuit of energy decoupling from Russia in forthcoming scenarios. However, mitigating reliance on Russian energy does not inherently guarantee immediate energy security for the EU-27 bloc. According to the "2023 Report on energy subsidies in the EU" by the European Commission (2023), despite a decrease of EUR 2 billion compared to 2020, subsidies for the renewable energy sector still reached EUR 86 billion in 2021, 1.54 times more than the subsidies for fossil fuels. This indicates that, until 2021, Europe continued to sustain its momentum in reducing subsidies for fossil energy and prioritizing the development of renewable energy in a remarkably impressive manner. Unfortunately, this trend was disrupted in 2022 as a direct consequence of Europe's response to the energy crisis. Fossil fuel subsidies more than doubled from 2021 to 2022 (from EUR 56 billion to EUR 124 billion, with subsidies for natural gas increasing from EUR 15 billion to EUR 46 billion, and subsidies for oil increasing from EUR 26 billion to EUR 56 billion). These figures partly demonstrate a series of unprecedented punitive measures aimed at the Russian energy sector, akin to a double-edged sword returning to damage both the overall economy of the EU-27 and the energy sector of the EU-27 in particular, as well as their policies on sustainable development independent of fossil energy.

In the case of EU countries during the 2022 energy crisis, it is noteworthy that they had to significantly increase energy subsidies for transportation by 280% and subsidies for heating and household utilities by 500% in 2022 (European Commission, 2023). The intensification of conflicts and sanctions to the extent of reducing gas imports from Russia from 150 billion cubic meters (bcm) in 2021 to less than 80 bcm in 2022 and further to less than 43 bcm in 2023 (European Council, 2024) does not unequivocally signify the EU's complete energy independence. This is evidenced by their necessity to escalate subsidies for fossil fuels to record levels, compensate for the deficient energy supply by importing fossil fuels from higher-cost suppliers, and implement energy consumption reduction policies even during winter. Clearly, the gradual reduction of fossil fuels is an effective policy towards a sustainable future, yet it must be better aligned with the capacity to offset production from renewable energy sources, a task that the majority of EU countries evidently have yet to achieve. Many studies argue that the Russia–Ukraine conflict presents an opportunity for the EU to completely sever ties with Russian energy, moving towards full autonomy, and assert that the EU's decisions have been entirely correct from the outset (Gatto et al., 2024; Pata et al., 2024). However, we do not entirely agree with this perspective because the process of achieving energy autonomy through renewable energy in the EU is mapped out until 2050, with their immediate goal being the complete phasing out of subsidies for fossil energy by 2030. This implies that the EU requires more time in the transition from fossil energy to renewable energy, and at the present moment, they still heavily rely on affordable and stable supplies of fossil energy. Emergency subsidies for fossil energy and the shift away from dependence on Russian energy towards sources such as the US, the UK, Norway, Qatar, UAE, Saudi Arabia or purchasing Russian crude oil via third parties like India and China illustrate that Europe's hurried actions are somewhat deviating their energy security policy. Secondly, in the near future, fossil fuels will continue to be the primary source of energy worldwide (IEA, 2022). This highlights the reason why, amid the ongoing energy crisis in Europe, states replacing Russian fossil fuel exports to the European market such as the alternative exporting countries are reaping enormous benefits.

5. Conclusion

Researching the impact of war and geopolitical conflict on the fossil energy sector and energy policy holds significant scholarly importance owing to its multifaceted implications. By delving into this subject matter, scholars can gain insights into the vulnerabilities inherent in energy supply chains disrupted by geopolitical tensions and armed conflicts. Through rigorous analysis, researchers can assess the associated risks, thereby aiding policymakers in formulating effective strategies to mitigate them and ensure energy resilience. In terms of policy implications, our study provides crucial empirical evidence for fossil fuel companies' managers to diversify export and import markets, broaden partnerships for fossil fuel trading and refining, transition to the production of lower-emission energy forms, and enhance sustainable development practices. At the national level, in the near future, most countries will still need to rely on fossil fuels for economic development. Therefore, diversifying fossil fuel import and export sources is crucial to ensure the stability of these fuel supplies. Securing energy for consumption and production is vital for every country, making it essential to seek and collaborate with reliable partners as a key national policy, rather than merely a business strategy for fossil fuel companies. We believe that the trend of forming alliances based on fossil fuel interests is inevitable in the coming years. In the long term, to ensure energy security and move towards sustainable development, it is necessary for each country to implement subsidy policies and increase the share of renewable energy in their energy consumption mix.

Although our study does not comprehensively cover and explain the absolute energy security of the EU as a whole and the performance of fossil energy companies within the EU specifically in the context of the current geopolitical conflict, and sanctions, it derives its findings from an examination of energy import policies and subsidies for fossil fuels within the EU bloc, as well as disparities in the financial performance of fossil fuel companies within the EU and the group of countries benefiting from exporting fossil fuels to the EU since the Russia–Ukraine conflict and energy sanctions on Russian fossil fuels. Through this analysis, we have contributed insights to address one of the most pressing issues today: "*Who truly benefits from the EU-27's energy decoupling from Russia?*" In the future, we believe that it is possible to expand the research by comparing the performance and subsidies of the fossil fuel sector and the renewable fuel sector by governments of countries within the EU-27 before and after the Russia–Ukraine conflict, thereby providing further empirical evidence on the transformation and adaptation of energy security and climate policies of the EU-27 bloc in the era of geopolitical conflict and uncertainty.

Limitations of the study. Since this research primarily focuses on explaining the trends in the financial performance of fossil fuel companies from the EU-27, Russia, and alternative exporting countries during 2022–2023, under the condition that the trends in financial performance of these three groups are similar, it does not provide detailed explanations for the financial performance of fossil fuel companies during the 2016–2021 period, especially during the COVID-19 pandemic. Furthermore, although we consider this an opportunity for renewable energy to demonstrate its importance and increase its share in the energy mix as a crucial national energy policy, we have not yet provided an answer to whether renewable energy companies truly performed effectively compared to fossil fuel companies during 2022–2023. We hope that future research can address these limitations.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, Duc Huu Nguyen, upon reasonable request.