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The Relationship of the Russia-Ukraine War with Environmental and Financial Factors in the Energy Market: Evidence from the EU

Rusya-Ukrayna Savaşının Enerji Piyasasındaki Çevresel ve Finansal Faktörlere Etkisi: AB'den Kanıtlar

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Abstract

The Russia-Ukraine war caused great fluctuations in global markets and left the whole world, especially the European Union countries, facing an energy crisis. The fact that the the European Union countries carry out the highest energy consumption in the world and the dependence of the European Union countries on Russia is the most important reason for the study to be conducted on energy companies in the European Union. In this study, the environmental and financial factors of businesses during the Russia-Ukraine war were examined and an evaluation was made about the energy companies in the EU, which were most affected by the war due to their proximity to the two warring countries and intense commercial relations. In addition, the study concluded that the Russia-Ukraine war caused a two-way change in company performance regarding environmental and financial factors. This result stems from the difference in the reactions of the companies in the sample to the war situation, legal regulations, energy market conditions, culture, and transparency of the countries in which they operate.

Keywords: Russia- Ukraine War, Financial Performance, Sustainability, Energy Sector.

Öz

Rusya-Ukrayna savaşı küresel piyasalarda büyük dalgalanmalara neden olmuş, başta Avrupa Birliği ülkeleri olmak üzere tüm dünyayı enerji kriziyle karşı karşıya bırakmıştır. Dünya genelinde en fazla enerji tüketiminin Avrupa Birliği ülkeleri tarafından gerçekleştirilmesi ve Avrupa birliği ülkelerinin Rusya ya bağımlılıkları, çalışmanın Avrupa Birliğindeki enerji şirketleri üzerinde yapılmasının en önemli sebebidir. Bu çalışmada, Rusya-Ukrayna savaşı sırasında işletmelerin çevresel ve finansal faktörleri incelenmiş ve savaşan iki ülkeye yakınlığı ve yoğun ticari ilişkileri nedeniyle savaştan en çok etkilenen AB'deki enerji şirketleri hakkında bir değerlendirme yapılmıştır. Ayrıca çalışmada, Rusya-Ukrayna savaşının çevresel ve finansal faktörler açısından şirket performansında iki yönlü bir değişime neden olduğu sonucuna ulaşılmıştır. Bu sonuç, örneklemdeki şirketlerin faaliyet gösterdikleri ülkelerin savaş durumuna, yasal düzenlemelerine, enerji piyasası koşullarına, kültürlerine ve şeffaflıklarına verdikleri tepkilerin farklılığından kaynaklanmaktadır.

Anahtar Kelimeler: Rusya-Ukrayna Savaşi, Finansal Performans, Sürdürülebilirlik, Enerji Sektörü

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Introduction

The war between Russia and Ukraine had global economic impacts that disrupted the international supply chain (Balbaa et al. 2022). Moreover, the war has led to a transformed EU policy prioritizing energy supply diversification (Lambert et al., 2022). Because Europe was one of the first clean energy markets to react to war (Umar et al. 2022). European Union (EU) countries, which have been implementing policies about the environment and climate change for many years and moving away from the use of fossil fuels, have had to change this approach due to the Russia-Ukraine war. As a precaution against the energy crisis that deepened with the Russia-Ukraine war, these countries have turned back to fossil fuels, which they had avoided for years. Monitoring and interpreting the effects of this new trend on the environmental and financial indicators of companies in the EU energy sector is important in terms of sustainability policies. Russia, one of the main actors in the energy market, reacted by restricting exports of global commodities such as oil, natural gas, wheat etc., of which it is a major export leader, prompting policymakers around the world to seek alternative means of survival (Mbah & Wasum, 2022). The conflicts between Russia and Ukraine that started in February 2022 seriously affected the global financial markets and the energy market. Research on the environmental and financial effects of the Russia-Ukraine war is ongoing (Kuzemko et al., 2022; Nerlinger & Utz, 2022; Orhan, 2022; Liadze et al. 2023; Izzeldin et al. 2023). Global stock markets reacted suddenly and rapidly to the Russia-Ukraine war (Izzeldin et al. 2023), and these reactions reduced the economic growth rate of countries and caused various financial problems (Liadze et al. 2023; Izzeldin et al., 2023). In another study on the effects of the war, Orhan (2022) analysed the effects of the Russia-Ukraine conflict on the global economy. The study has shown that the global economy was affected by three main issues: financial sanctions, increases in commodity prices, and disruptions in the supply chain. Chen et al. (2023), in their research on the economic effects of the Russia-Ukraine war, emphasised that with the outbreak of the war, energy sanctions would cause economic damage to all parties, increase inflation worldwide, and direct the EU's energy imports to markets other than Russia. Moreover, Chen et al. (2023) determined that Russia's energy exports will also shift to Asian markets and energy trade between the two economies will be significantly affected. Chen et al. (2023) pointed out in their study that these effects would have a profound impact on the world economy and society, leading to social instability and a decline in total production. Nerlinger & Utz (2022) investigated whether the Russia-Ukraine war affected the stock prices of energy companies and conducted a study based on a global sample of 1630 energy firms. As a result of the study, it was determined that the cumulative average abnormal returns of the firms during the war were positive, that is, energy firms outperformed the stock exchange market. The result of this study provides evidence that energy firms performed better in export markets which compete with Russian suppliers of renewable energy sources, fossil fuels and uranium after the Russia-Ukraine war. Furthermore, Kuzemko et al. (2022) argue that energy policy measures imposed in response to the war will negatively affect companies in terms of lasting and sustainable policies on issues such as environmental sustainability and fossil fuel phase-out. Further studies on the effects of war in the energy sector in terms of environmental and financial factors are expected.

In this context, the study aims to evaluate the environmental and financial conditions of the companies in the energy market during the Russia-Ukraine War through comparison. The most common problem in empirical studies in the energy sector is missing data. In addition, the most frequently reported problem in literature studies involving energy sampling is the poor level of access to data (Ma et.al, 2020). A significant amount of missing data arises in the interpretation of data regarding the financial situation of energy companies. This situation reduces the data quality in energy-related research (Mazzucato & Semieniuk, 2018) and causes deviations in statistical analyses. Therefore, companies with missing data should be excluded from the sample (Trimble et.al., 2016). Due to lack of data, in this study, 11 EU countries / 35 companies with a complete data set among 27 EU countries / 403 energy companies listed in Refinitiv Eikon Datastream were included in the research.

The study, a paired samples t-test is used to compare the pre-war and post-war situation by using the data of 35 selected firms from the EU energy sector for 2021 and 2022; principal component analysis (PCA) technique is applied to compare the overall performance of the firms and general causal factor (GCF) methods are used based on the first principal component scores. In this way, the performance rankings of firms according to their environmental, and financial factors for pre-war and post-war periods were made.

1. Literature Review

The war between Russia and Ukraine, the sanctions and similar reactions of other countries have come together and produced economic results. This situation has led to many early studies on the economic effects of the Russia-Ukraine war. When the relevant literature summarized in Table 1 is examined, it is seen that the studies are classified as studies investigating economic, environmental, financial and sustainability-related effects.

The studies in the literature mainly focus on various economic effects of the war (Khudaykulova et al., 2022; Liadze et al., 2022; Shah and Gedamkar, 2022; Tank, 2022; Mhlanga, et al. 2023; Ozili, 2024).

In addition, studies such as Deng, et al., (2022), Nerlinger and Utz, (2022), Tong, (2024) have examined the direct effects of the Russia-Ukraine war on stock returns. Other researchers have evaluated how sustainability issues are affected by the war in their studies (Bin-Nashwan et al., 2022; Deng, et al., 2022; Kuzemko et al., 2022; Sasmoko et al., 2023). The common findings of all these studies, which examined the different effects of the Russia-Ukraine War, can be summarized as follows:

- It disrupted sustainability efforts and targets worldwide,
- It increased the sustainable food problem,
- It increased the need for renewable energy sources,
- It increased inflation worldwide,
- European countries were the most economically affected countries due to their high dependence on Russian energy sources,
- The EU's energy imports will be directed to markets outside of Russia,
- Russian energy exports will shift to Asian markets,
- Energy trade between the EU and Russian economies will decrease significantly,
- It caused financial sanctions, increased commodity prices and supply chain disruptions,
- It significantly affected metal, agricultural and energy commodities,
- It negatively affected the market values and stock market returns of businesses.

Table 1. Literature Review

Author(s)	Period	Scope	Results
Bin-Nashwan et al.,2022	-	This study aims to investigate the effects of the Russia-Ukraine war on the advancement of sustainable development worldwide.	It shows that the war threatens the achievement of sustainable development goals.
Deng, et al., 2022	2021-2022	This study investigates the effects of the Russia-Ukraine war on ESG and stock returns.	Overall, the results reveal the difficult economic impacts of the Russia-Ukraine war.
Khudaykulova et al., 2022	2021-2022	This study investigates the potential effects of the Russia-Ukraine war on local economies and the global economy.	The results show that the war has negative economic effects related to inflation, restrictions on services, increased debt and daily economic life.
Kuzemko et al., 2022	2020-2022	This study investigates the Russia-Ukraine war on European energy policy.	It addressed energy supply as a geopolitical security issue and demonstrated that measures should be taken for sustainable policies and necessary transformations.
Liadze et al, 2022	2022-2023	This study measures the impact of the Russia-Ukraine war on the global economy.	It is shown that the war will cause an increase in global inflation of approximately 2% in 2022 and 1% in 2023, compared to the inflation projection at the beginning of 2022.
Mbah and Wasum, 2022	-	This study examines the economic impact of the Russia-Ukraine war on key global economic actors, particularly the countries that imposed financial sanctions on Russia as punishment, such as the US, Canada, the UK, and the EU.	The results show that while the consequences of the war had a significant impact on the Russian economy, the global economy is also beginning to feel the impact of this crisis.
Nerlinger and Utz, 2022	2022	The study investigates whether the Russian invasion of Ukraine generated an abnormal stock price reaction in energy companies.	The results provide evidence of the superior performance of energy companies competing with suppliers of renewable energy, fossil fuels and uranium following the Russia-Ukraine invasion.
Orhan, 2022		The purpose of this article is to search the effects of the Russia-Ukraine war on global trade.	The results show that the conflict between Russia and Ukraine affected the global economy in terms of financial sanctions, increased commodity prices and supply chain disruptions.

Shah and Gedamkar, 2022	2021	This study investigates the global economic impacts of the Russia-Ukraine war.	It was concluded that the war had a major impact on the global economy and caused economic losses.
Tank, 2022	2022-2023	This study investigates the global economic impacts of the Russia-Ukraine war.	The results show that sanctions against Russia reduce foreign direct investment, lead to capital outflows and reduce long-term potential growth rates.
Chen et al., 2023	2021-2022	This study investigates the effects of the Russia-Ukraine war on EU-Russia and world energy trade.	The results show that energy sanctions negatively affect both Russia and the EU, reduce Russian energy exports to the EU, and have a negative impact on reducing carbon emissions and transforming the energy consumption structure.
Chishti et al.,2023	2021-2022	This study investigates the asymmetric effects of the Russia-Ukraine War on various markets including energy, metals and agriculture.	The results show that the Russia-Ukraine War significantly affected metal, agricultural and energy commodities.
Mbah & Wasum, 2022		This study investigated the effects of the Russia-Ukraine war on the global economy.	The results indicated concerns that the war and international sanctions imposed on Russia would further increase food, commodity and energy shortages, and poverty and hunger.
Izzeldin et al.,2023	2008-2023	This study investigates the stock market and commodity market reactions to the Russia-Ukraine war.	The results show that the war affected the exports of wheat and nickel, which are the most important commodities of Russia and Ukraine.
Mhlanga, et al. 2023	2021-2022	This study investigates the economic effects of the Russia-Ukraine war.	The results show that the war significantly and permanently increased financial stress, and that energy, food, and metal prices increased.
Rose et al., 2023	2022	This study analyzes the economic impacts of the disruptions in grain exports caused by the Russia-Ukraine War in its first year.	The results show that the war did not only affect Ukraine and Russia, but also had significant economic impacts in other world regions.
Sasmoko et al., 2023	1995-2020	This study investigates the impact of the Russia-Ukraine war on global carbon emissions.	The results showed a positive correlation between war and global carbon emissions.
Ozili, 2024	2021-2022	This study investigates the global economic consequences of the Russia-Ukraine war.	The results showed that the war led to a significant increase in the world prices of food and crude oil, increased inflation in Russia and Ukraine, and increased inflation in countries not involved in the war.
Tong, 2024	2021-2022	This study examines the impact of the Russia-Ukraine war on energy stock returns.	The results showed that countries heavily dependent on oil imports in Russia saw a significant increase in energy stock returns, while countries imposing sanctions did not have major energy security issues. Furthermore, renewable energy companies experienced greater increases in returns than their non-renewable counterparts, suggesting a potential shift towards renewable energy during times of geopolitical tension.

The literature summarized in Table 1 shows that the vast majority of studies are conducted on financial and economic variables, with less emphasis on non-financial studies such as sustainability. In addition, the studies conducted are predominantly based on the year of the beginning of the Russia-Ukraine war. This draws attention to the time constraints in the studies.

2. Materials and Methods

This study aims to analyse the changes in the energy market during the Russia-Ukraine War and to analyse and interpret the market's response to the war situation regarding environmental and financial factors. Europe is the region affected most, given trade links its proximity to Ukraine and Russia and its reliance on energy and food supplies from

those countries (Liadze et al, 2022). So, the research framework of this study is to assess the situation of the European energy market, which is most affected by this war, given its proximity to Ukraine and Russia and its trade links with energy and food supplies from these countries. In the study, econometric analysis techniques were applied using 2021 and 2022 indicators of publicly-traded firms operating in the energy market of EU countries. In comparing the two periods, the findings analyze the period of the Russia-Ukraine War. As it is known, the Russia-Ukraine War has a significant impact on EU energy companies (Balbaa et al. 2022). Studies show that European countries are the most economically affected due to their high dependence on Russian energy resources, disrupting sustainability efforts and goals worldwide.

For the purposes of this study, we used data available in the Refinitiv Eikon Datastream. The database provides accounting-based figures for listed firms operating worldwide. For instance, Refinitiv Eikon Datastream recently utilized Duque-Grisales et al, 2019 for the energy sector; it was also used by Shahbaz et al, 2020 and Wieczorek-Kosmala et al, 2021. We requested data for the period 2021-2022 on publicly traded companies operating in European countries in the energy sector, and 403 energy companies from 27 EU countries were listed. To select companies operating in the energy sector, we checked both the Refinitiv Eikon Datastream industry classification (TRBC- The Reference data Business Classification), the NAICS (NAICS- The North American Industry Classification System) international industry name, and the NAICS industry group name. We also manually checked the accuracy of the industry classification for each firm in our sample. Accordingly, Table 2 shows the entire sample (27 EU countries and 403 energy companies).

Table 2. Full of Sample

Countries	Listed of energy firms*	Sample**	Percentage of sample (%)***
Austria	8	2	6
Belgium	9	1	3
Bulgaria	10	NA****	NA
Czechia	NA	NA	NA
Croatia	4	NA	NA
Cyprus	4	NA	NA
Denmark	4	1	3
Estonia	NA	NA	NA
Finland	9	5	14
France	57	3	9
Germany	51	10	29
Greece	21	NA	NA
Hungary	2	NA	NA
Ireland	3	NA	NA
Italy	23	2	6
Latvia	1	NA	NA
Lithuania	3	NA	NA
Luxemburg	NA	NA	NA
Malta	1	NA	NA
Netherlands	11	3	9
Poland	50	2	6
Portugal	6	NA	NA
Romania	27	NA	NA
Slovak Republic	1	NA	NA
Slovenia	3	NA	NA
Spain	16	1	3
Sweden	79	5	14
Total	403	35	100

** All energy companies listed by Refinitiv Eikon Datastream.*
***Energy companies with a complete data set.*
****Percentage distribution of companies with complete data sets by country.*
*****No data available in Refinitiv Eikon Datastream.*

As mentioned in Mazzucato and Semieniuk, 2018 and Ma et.al, 2020, there is a significant amount of data loss in research on financial data of energy companies. In Table 1, due to lack of data, 11 EU countries/ 35 companies with a

complete data set among 27 EU countries/ 403 energy companies listed in Refinitiv Eikon Datastream were included in the research.

At the first stage, descriptive statistics of the indicators of the firms are presented. In the analysis phase, paired samples t-test was used to compare the indicators of the firms between 2021 and 2022. In addition, principal component analysis (PCA) technique was applied to compare the overall performance of the firms and general causal factor (GCF) scores were calculated based on the first principal component scores. Based on the GCF scores, the performance rankings of the companies according to environmental and financial factors for the years 2021-2022 were made. Furthermore, firms were grouped according to the second quantiles (Q2) of the calculated GCF scores.

PCA is a statistical method that reduces the dimensions of correlated variables. The aim of this method is to extract important information from the data and express this information as a set of summary indices called the principal components. It helps to determine correlations between data points, such as whether there is a correlation between two groups of variables (Jackson, 1991). PCA assumes that the correlations among the variables are caused by the important principal components. Moreover, a big part of correlations among variables emerges due to impact of only one component. This component is called as general causal factor in literature. PCA assumes that correlations between variables arise from significant principal components. In this research, it is assumed that there is a general causal factor that affects all indicators and causes the indicators to interact (Albayrak, 2005; Ersungur et al, 2007; Sezgin & Erkal, 2012).

In this research, it is assumed that there is a general causal factor which effects to all indicators and causes the interaction of indicators. PCA is utilized to obtain the general causal factor (GCF) from the first component. It can be used to have an index value to compare the units. Our data set includes numerical variables, and it is appropriate to get GCF values. We can compute an index for each firm and evaluate the rankings and clusters by applying PCA (Bulut & Öner, 2017).

In this study, PCA analysis was performed with environmental and financial variables selected from the literature in accordance with the research purpose and a summary condition score was obtained from these variables. With this method, it was possible to extract important information about the effects of various variables on the environmental and financial status of the energy sector companies in the sample and to determine the correlation between the variables. In the study, principal component analysis represents the environmental and financial performance levels of companies by calculating GCF scores. From this point of view, the first principal component with the highest performance value according to the variables and the proportion of variance explaining it were defined as the GCF (Bulut & Öner, 2017). In order to fulfil the purpose of the research, some environmental and financial variables were selected from the reviewed literature that are frequently used and relevant to the research purpose. For environmental variables, ESG score, environmental score and also CO2 emission scores were used. Financial variables were determined as return on assets, leverage, firm size, profit, net sales and inventory turnover. Energy companies which operate in EU countries, which are most affected by the Russia-Ukraine war due to their energy needs, were analysed in terms of selected variables.

According to the data obtained through Refinitiv Eikon Datastream, 35 energy companies from 11 countries operating in the publicly traded energy market in the EU and for which complete data on environmental and financial variables are available were selected as the sample of 403 companies in the EU energy market. The sample consists of two Austrian, one Belgian, one Danish, five Finnish, three French, ten German, two Italian, three Dutch, two Polish, one Spanish and five Swedish energy companies.

3. Findings and Results

The United Nations (UN) set a goal within the Paris Climate Agreement of 2015 to limit the global temperature increase below 2 degrees Celsius by the end of the 21st century, or even to 1.5 degrees Celsius. To achieve this goal, countries are required to reduce carbon emissions worldwide to zero by 2050. Despite the decisions taken, the Russia-Ukraine conflicts that started in February 2022 turned into a war that caused an energy crisis affecting the whole world. This war situation caused postponement of the UN goals and the decisions taken in the Paris Climate Agreement. Energy companies in some European countries in search of various measures against the energy crisis have attracted the attention of researchers. For instance, while the production from existing coal mines in EU countries was increased, some countries such as the UK and Poland have started to prepare new coal mining projects.

This research seeks answers to the impact of the Russia-Ukraine war on environmental and financial factors in the energy market. In this context, the variables selected in accordance with the research question were categorised into two groups as environmental and financial factors, and 35 energy companies with complete data were comparatively

analysed as pre-war (2021) and post-war (2022). In the research, econometric analysis was carried out with the data of the selected companies for 2021 and 2022. Accordingly, Table 3, shows the descriptive statistics of the variables for the years 2021-2022 for 35 companies.

Table 3. Descriptive Statistics of Variables of Firms in 2021-2022

	2021				2022			
Variable	**Avg**	**SD**	**Min**	**Max**	**Avg**	**SD**	**Min**	**Max**
ESG	70.145	14.623	31.494	93.188	72.085	13.670	37.884	92.128
ENV	67.366	17.124	35.449	95.519	70.302	16.752	35.496	96.238
CO_2	8.390	41.928	-38.470	221.897	6.448	38.708	-44.586	192.720
ROA	0.014	0.060	-0.181	0.125	0.068	0.066	-0.058	0.348
LEV	0.232	0.133	0.000	0.489	0.224	0.128	0.012	0.551
SIZE	22.402	1.389	19.304	25.109	22.525	1.382	19.588	25.194
INVT	21.599	101.219	1.392	603.119	18.290	79.179	1.611	472.986
PROFIT (000) €	721.092	1.160.849	-560.000	6.018.000	578.561	981.464	-1.572.000	2.902.800
SALES (000) €	9.223.665	13.911.390	292.811	78.598.000	11.366.790	15.621.820	374.543	87.327.000

*Avg: Average, SD: Standard deviation, Min: Minimum, Max: Maximum. *Significance findings were assessed on importance levels of 1%, 5%, 10%. *ESG: Environmental, social, and corporate governance score reported in Refinitiv Eikon Datastream; ENV: Environmental score reported in Refinitiv Eikon Datastream; CO2: CO2 emission level reported in Refinitiv Eikon Datastream; ROA: The term return on assets; LEV: the ratio of a company's loan capital (debt) to the value of its ordinary shares (equity); SIZE: Business size measured as the logarithm of total assets; INVT: Inventories; PROFIT: Sales profit; SALES: Revenues*

As seen in Table 2, the most important change between two years (2021-2022) was in the INVT and PROFIT variables. Comparing the two years, although SALES increased by 23 percent, INVT decreased by 15 percent and PROFIT by 20 percent. It can be thought that this situation arises from the negativities experienced in the energy supply from Russia to the EU countries. When environmental factors are evaluated, it has been observed that CO2 emissions decreased due to the decrease in energy supply due to the Russia-Ukraine war. Due to the decreasing CO2, it can be said that the performance of the ENV variable of EU energy companies is higher than the ESG performance. Average comparison results of firms for 2021-2022 were given in Table 4.

Table 4. Average Comparison Results of Companies for 2021-2022

	Variable	Years	*Avg.*	*SD*	*t*	*p*
Environmental	ESG	2021	70.145	14.623	-2.479	0.018
		2022	72.085	13.670		
	ENV	2021	67.366	17.124	-3.342	<0.01
		2022	70.302	16.752		
	CO_2	2021	8.390	41.928	0.196	0.846
		2022	6.448	38.708		
Financial	ROA	2021	0.014	0.060	-3.299	<0.01
		2022	0.068	0.066		
	LEV	2021	0.232	0.133	0.869	0.391
		2022	0.224	0.128		
	SIZE	2021	22.402	1.389	-7.692	<0.01
		2022	22.525	1.382		
	INVT	2021	21.599	101.219	0.886	0.382
		2022	18.290	79.179		
	PROFIT (000) €	2021	721.092	1.160.849	0.626	0.536
		2022	578.561	981.464		
	SALES	2021	9.223.665	13.911.390	-4.852	<0.01

	(000) €	2022	11.366.790	15.621.820		

*Significance findings were assessed on importance levels of 1%, 5%, 10%.

According to the test results, firms' ROA, ESG, ENV, SIZE and SALES averages for 2022 show a significant increase compared to 2021. However, no significant difference was found between 2021 and 2022 according to the averages of LEV, PROFIT, INVT and CO2. These results also prove statistically that the Russia-Ukraine war caused significant movements in the environmental and financial variables of the EU energy companies examined.

Table 5 shows the GCF scores and performance rankings of 35 companies for environmental and financial factors for the years 2021-2022. In terms of environmental factors, GER3 from Germany stands out as the most successful company in 2021 and 2022. In 2021, the company with the lowest performance in terms of environmental factors was IT2 from Italy, while in 2022 it was POL1 from Poland. The most successful company in terms of financial factors in 2021 and 2022 is GER3 from Germany, similar to environmental factors. In 2021 and 2022, the company with the lowest performance in terms of financial factors was NET3 from the Netherlands.

Table 5. Performance Ranking of Firms According to Environmental and Financial Factors

		Environmental Factors				Financial Factors			
		2021		2022		2021		2022	
Country	Firm[3]	GCF	Ranking	GCF	Ranking	GCF	Ranking	GCF	Ranking
Austria	AU_1	-1.684	31	-1.415	29	-1.680	32	-1.787	31
	AU_2	0.023	21	-0.069	22	0.131	17	0.674	11
Belgium	BEL_1	1.400	6	1.541	4	0.758	9	1.220	7
Denmark	DEN_1	0.486	15	0.274	19	0.804	8	-0.027	20
Finland	FIN_1	0.425	16	-0.015	21	-0.632	25	-0.268	22
	FIN_2	1.590	4	1.385	7	0.049	18	0.528	13
	FIN_3	0.293	19	0.363	16	-0.925	28	-0.961	28
	FIN_4	1.684	3	1.530	5	0.854	7	0.728	10
	FIN_5	0.916	10	0.449	15	1.198	4	1.295	5
France	FR_1	-0.619	25	0.936	11	2.259	2	2.393	2
	FR_2	0.303	18	0.644	13	-1.390	30	-1.854	32
	FR_3	1.294	8	1.073	10	-0.344	21	-0.272	23
Germany	GER_1	-1.496	30	-1.300	27	0.617	12	2.117	3
	GER_2	0.206	20	0.306	18	0.188	14	0.550	12
	GER_3	2.256	1	2.053	1	6.263	1	3.075	1
	GER_4	-2.961	34	-2.504	33	-1.590	31	-1.536	30
	GER_5	0.682	12	0.530	14	-0.479	23	-0.737	27
	GER_6	-1.188	29	-1.710	31	-0.862	27	-0.609	26
	GER_7	2.119	2	1.719	2	0.928	6	0.760	8
	GER_8	-1.176	27	-1.314	28	0.153	16	0.277	17
	GER_9	0.782	11	1.148	9	1.133	5	0.459	14
	GER_{10}	0.635	13	0.062	20	1.326	3	1.229	6
Italy	IT_1	0.015	22	0.715	12	0.688	10	1.782	4
	IT_2	-3.521	35	-1.896	32	-1.801	33	-2.110	34
Netherland	NET_1	0.498	14	-0.147	23	0.448	13	-0.286	24
	NET_2	-0.241	24	-0.516	25	-0.245	20	0.735	9
	NET_3	-2.310	33	-2.792	34	-3.684	35	-4.296	35
Poland	POL_1	-2.163	32	-3.066	35	-1.380	29	-1.466	29
	POL_2	-1.177	28	-0.793	26	-0.707	26	0.060	19
Spain	SP_1	1.378	7	1.225	8	-0.453	22	-0.234	21
Sweden	SWE_1	-1.065	26	-1.469	30	-0.095	19	0.141	18
	SWE_2	-0.162	23	-0.362	24	-1.821	34	-1.880	33
	SWE_3	1.549	5	1.478	6	0.181	15	0.287	16
	SWE_4	0.304	17	0.311	17	0.677	11	0.390	15
	SWE_5	0.927	9	1.625	3	-0.569	24	-0.375	25

[3] The 35 energy companies in the sample are numbered and coded with the names of the countries in which they operate. To the left of each company code, the country where the company operates is shown.

As seen in Table 4, as a result of the analysis, 11 EU countries and 35 energy companies were ranked in terms of their environmental and financial performance during the Russia-Ukraine war. The companies in question have shown a downward trend, especially regarding environmental performance, from 2021 to 2022. Negative environmental performance scores were reached for 13 energy companies in 2021 and 15 in 2022. In the same period, it was observed that the rankings of companies in terms of financial performance showed less variability. Negative financial performance scores were reached for 17 energy companies in 2021 and 16 in 2022.

Table 6 shows the groupings of the GCF scores of 35 firms for environmental and financial factors in 2021-2022, which are obtained through Q2 values. The Q2 value represents the boundary value that divides the series into two parts in terms of averages. In the Q2 classification analysis conducted in terms of the factors (environmental and financial) analysed, the companies that are below and above the calculated average performance score are named as low and high-performance groups. Accordingly, companies below the Q2 (average) value in terms of environmental factors are grouped as having low environmental performance, while companies above the Q2 (average) value are grouped as having high environmental performance. When the results are analysed, in terms of environmental factors, 17 companies were in the low environmental performance group in 2021 and 2022, while 18 companies were in the high environmental performance group. Likewise, in terms of financial factors, companies below the Q2 value are grouped as having low performance, while companies above the Q2 value are grouped as having high performance. When the grouping results are analysed, similar to the environmental factors in terms of financial factors, 17 companies are in the low- performance group in 2021 and 2022, while 18 companies are in the high-performance group.

Table 6. Grouping of Companies According to Environmental and Financial Factors

	Year	Group	Company		Year	Group	Company
Environmental factors	2021	<Q2	AU_1, AU_2, FIN_3, FR_1, GER_1, GER_2, GER_4, GER_6, GER_8, IT_1, IT_2, NET_2, NET_3, POL_1, POL_2, SWE_1, SWE_2	**Financial Factors**	2021	<Q2	AU_1, FIN_1, FIN_3, FR_2, FR_3, GER_4, GER_5, GER_6, IT_2, NET_2, NET_3, POL_1, POL_2, SP_1, SWE_1, SWE_2, SWE_5
		Q2≥	BEL_1, DEN_1, FIN_1, FIN_2, FIN_4, FIN_5, FR_2, FR_3, GER_3, GER_5, GER_7, GER_9, GER_{10}, NET_1, SP_1, SW_3, SW_4, SW_5			Q2≥	AU_2, BEL_1, DEN_1, FIN_2, FIN_4, FIN_5, FR_1, GER_1, GER_2, GER_3, GER_7, GER_8, GER_9, GER_{10}, IT_1, NET_1, SWE_3, SWE_4
	2022	<Q2	AU_1, AU_2, DEN_1, FIN_1, GER_1, GER_4, GER_6, GER_8, GER_{10}, IT_2, NET_1, NET_2, NET_3, POL_1, POL_2, SWE_1, SWE_2		2022	<Q2	AU_1, DEN_1, FIN_1, FIN_3, FR_2, FR_3, GER_4, GER_5, GER_6, IT_2, NET_1, NET_3, POL_1, POL_2, SP_1, SWE_2, SWE_5
		Q2≥	BEL_1,FIN_2, FIN_3, FIN_4, FIN_5, FR_1, FR_2, FR_3, GER_2, GER_3, GER_5, GER_7, GER_9, IT_1, SP_1, SWE_3, SWE_4, SWE_5			Q2≥	AU_2, BEL_1, FIN_2, FIN_4, FIN_5, FR_1, GER_1, GER_2, GER_3, GER_7, GER_8, GER_9, GER_{10}, IT_1, NET_2, SWE_1, SWE_3, SWE_4

Table 7 shows the changes in financial and environmental situations by country in the sample during the war period. Accordingly, in terms of financial performance, 17 out of 35 companies were below the average GCF performance value in 2021, while this number increased to 18 in 2022, with a small decrease in performance. In terms of environmental performance, no change was observed in the total number of companies from 2021 to 2022. While the total financial performance ranking of companies included in the sample from Denmark, Italy, the Netherlands and Sweden decreased from 2021 to 2022, the financial performance of the French company improved. In terms of environmental performance, only Denmark's performance declined, while environmental performance for all other countries remained the same. Another stunning finding in Table 7 is that the only company included in the sample from Belgium was in the top performance group in every test.

Table 7. Financial and Environmental Factors Change Table

	Total sample	2021				2022				Changing	
		Financial		Environment		Financial		Environment			
		GCF>	GCF<	GCF>	GCF<	GCF>	GCF<	GCF>	GCF<	Financial	Environment
Austria	**2**	1	1	2	0	1	1	2	0	None	None
Belgium	**1**	0	1	0	1	0	1	0	1	None	None
Denmark	**1**	0	1	0	1	1	0	1	0	Worsened	Worsened
Finland	**5**	2	3	1	4	2	3	1	4	Noe	None
France	**3**	2	1	1	2	2	1	0	3	Improved	None
Germany	**10**	3	7	5	5	3	7	5	5	None	None
Italy	**2**	1	1	2	0	1	1	1	1	Worsened	None
Netherland	**3**	2	1	2	1	2	1	3	0	Worsened	None
Poland	**2**	2	0	2	0	2	0	2	0	None	None
Spain	**1**	1	0	0	1	1	0	0	1	None	None
Sweden	**5**	3	2	2	3	3	2	2	3	Worsened	None
	35	17	18	17	18	18	17	17	18	Worsened	None

Discussion and Conclusion

The Russia-Ukraine war has caused major fluctuations in global markets, leaving the whole world and especially the European Union countries facing an energy crisis. Since the start of the war in February 2022, European Union countries have reconsidered their energy policies and sought alternative ways. Renewable energy sources gained importance as the energy crisis came to the fore following Russia's invasion of Ukraine. While 2024-2025 still remains risky for Europe, the world will need as much renewable energy in the next 5 years as it did in the previous 20 years (IEA, 2022).

In this period, energy companies operating in the Eurozone have also taken some measures to reduce their dependence on Russia. In this study, the economic effects of the war on firms are analysed in terms of companies operating in the energy market within the scope of 2021-2022. The environmental and financial situation of companies has been evaluated comparatively.

In this study, 403 energy companies from 27 EU countries were listed from Refinitiv Eikon Datastream, and 35 energy companies from 11 EU countries with full and complete research data were ranked according to their environmental and financial performance during the Russia-Ukraine war. The companies in question have shown a downward trend, especially regarding environmental performance, from 2021 to 2022. Negative environmental performance scores were reached for 13 energy companies in 2021 and 15 in 2022. Our findings suggest that ESG reporting and environmental measures do not provide consistent guidance for companies during the war. Accordingly, investors tend to ignore ESG performance for investment decisions during times of crisis, such as war. This is supported by the fact that the companies in the sample did not show any significant change in environmental performance.

In the same period, it was observed that the rankings of companies in terms of financial performance showed less variability. Negative financial performance scores were reached for 17 energy companies in 2021 and 18 in 2022. When considered together with studies in the literature, the results suggest that during the war events cause significant deterioration in global financial conditions.

The financial impacts of war vary depending on countries' social, environmental and economic policies, trade agreements, economic power, military alliances and energy dependency (Deng et al., 2022). The study concluded that the Russian-Ukrainian war has a positive and negative effect on company performances in terms of environmental and financial factors from country to country and from firm to firm. This conclusion can be explained by the differences in the environmental and financial responses of the companies in the sample to the war situation, legal regulations, energy market conditions, voluntary and mandatory disclosure cultures and transparency levels of the countries in which the companies operate.

The research examines the changes which occurred in the energy market during the Russia-Ukraine war and analyses the response of this market to the war situation in terms of environmental and financial factors, the similarities of these

effects to other studies in the literature are discussed as well as the determination of the effects of variables. The difference of this study from the other studies is that the variables are categorized as environmental and financial and the indicators of the firms are compared by using statistical methods that have not been applied in the literature before. In this framework, the results of the study are expected to contribute to the literature. The study addressed the environmental and financial impacts of the Russia-Ukraine war that began in February 2022. Therefore, the period since the beginning of the war reveals the time constraint of the research. This constraint is seen in the studies in the literature. However, the long-term consequences of this war deserve to be analyzed more closely as time goes by. Another research constraint is that the energy companies in the sample are not transparent about non-financial and environmental indicators and data. This reduces the number of samples in the study. Public disclosure attitudes and transparency levels of companies in the energy sector on environmental and financial issues have remained much lower than in other sectors. This situation has shown itself to be a limitation in forming the research sample. In future studies, the sample can be kept more comprehensive provided that the information disclosure policies of the energy sector are improved.

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