ESG and Geopolitics: Stock Returns in the Ukraine-Russia Conflict

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Abstract

Geopolitical events have emerged as critical drivers of financial market uncertainty. The recent Ukraine-Russia conflict, followed by an energy shortage, has had profound consequences on both financial and energy markets, emphasizing ESG as a corporate risk factor. This paper aims to explore the interplay between stock returns, geopolitical risk and the role of ESG during the Ukraine-Russia conflict. Employing an event study methodology complemented by a Difference-in-Difference (DiD) analysis, the study finds a positive ESG-return relationship during the first quarter of the conflict, which subsequently dissipates, reverting to neutrality. Furthermore, this paper extends the explanations of Pedersen et al. (2021)'s E-CAPM and finds that firms with superiority in particular ESG pillars have inherent properties of high profitability and, more importantly, enhanced resilience to corporate-level geopolitical and energy risks. These attributes have contributed to their superior performance compared to low-ESG firms during the geopolitical turmoil. This study highlights ESG's critical role in enabling firms to better navigate the challenges posed by geopolitical and energy crises.

1 Introduction

Geopolitical events, such as the recent Ukraine-Russia conflict, has destabilized global financial markets, leading to widespread economic shocks across various countries. The energy supply shock caused by the conflict has driven up energy prices, which

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in turn evolved into an inflation that spread across all sectors, increasing corporate vulnerability; meanwhile, central banks' tightening monetary policies in response to the rising inflation has amplified investor pessimism, posing a significant threat to the overall financial system stability. These disruptions greatly affected global equity markets, where firms' stock returns declined sharply (Neely (2022), Yousaf et al. (2022), Ahmed et al. (2023), Kamal et al. (2023)) while the volatility soared (Umar et al. (2022), Izzeldin et al. (2023)). Furthermore, the asset price turmoil was not limited to equities; it extended to commodities, currencies, bonds and cryptocurrencies, all of which also experienced the fluctuation of asset prices (*Cf.* Chortane and Pandey (2022), OECD (2022), Wang et al. (2022), Taera et al. (2023)). For example, gas prices increased by over 180%, coal prices by approximately 130%, and oil prices by around 40% in the first two weeks following the outbreak, while the Euro depreciated against US dollar by 3.5% from March to June 2022, as shown by ECB (2022).

Geopolitical events not only have significant financial consequences but are also closely linked to corporate-level ESG performance. Company activities related to environmental, social, and governance pillars are particularly affected during such conflicts. One potential direct cause is that the geopolitical risk is related with fossil energy risk (Qin et al. (2020)), which brings firms' and investors' concerns about energy transition back to table (Wang et al. (2023), Zhang et al. (2025)). On the other hand, companies exposed to higher levels of geopolitical risk often encounter challenges in sustaining and advancing their sustainability initiatives and thus suffer from ESG performance downgrades (Abdullah et al. (2024), Jiang et al. (2024)). While these dynamics under the stable market contexts are known, few studies have explored how ESG performance interacts with geopolitical event when the geopolitical risk or energy risk is heightened. This gap illustrates the necessity to investigate whether and how ESG performance influences company resilience and financial performance during geopolitical events, such as the Ukraine-Russia conflict.

There is a void in the literature regarding whether ESG affects stock return during geopolitical conflicts. While disputes about ESG premium (or ESG-related premium) during the general periods are widespread and studies have examined the financial role of ESG throughout the financial crises or pandemics (Lins et al. (2017), Bolton and Kacperczyk (2021), Ding et al. (2021), Coqueret et al. (2025)), little attention has been paid to the ESG-return linkage in the context of geopolitical conflict circumstance. Furthermore, the potential impact of firm-level geopolitical risk on this linkage remains unexplored, leaving a critical aspect of ESG's role in geopolitical event scenarios unexamined. Thus, an event study is needed to address these questions.

This study examines the impact of ESG by focusing on the Ukraine-Russia conflict as the observed event and employing the event-study methodology. As the most recent war involving a NATO partner country and Russia,[1] this conflict caused a di-

[1]According to NATO's website, until the date when this paper is last drafted, Ukraine is not yet a member country of NATO but is granted a partnership, while Russia's NATO partnership is currently

rect shock to financial markets across many western developed countries (Boubaker et al. (2022), Ahmed et al. (2023)). Meanwhile, the stronger policy endeavors waken by the Ukraine-Russia conflict have re-structured the global energy landscape, partially by accelerating renewable energy development and expanding its projected capacity by 2.5 times (IEA (2024)). Conversely, investor expect the energy transition process to slow down, shown by a positive transition risk premium (Deng et al. (2022)). These dynamics imply that the ESG-return relationship possibly experiences significant shifts during such geopolitical disturbances. Considering these factors, the Ukraine-Russia conflict represents a compelling case study for understanding the interplay between stock return, geopolitical risk and the role of ESG.

The first research objective of this paper is to investigate the existence of a ESG-return relationship during the Ukraine-Russia conflict. With the cumulative event returns calculated from 3-month to 12-month horizon, this study finds that those returns are averagely negative and are positively correlated with ESG scores at the initial stage of the geopolitical conflict. The central empirical contribution lies in Difference-in-Difference (DiD) models. Referring to high- or low- ESG as the treatment cohort, the analysis is carried out first with canonical two-way fixed effect (TWFE) estimates and subsequently following the approach of Sun and Abraham (2021). The key findings of these DiD models confirm the baseline results where ESG-return relationship shifts positively during the observed geopolitical event while it only maintains for the beginning three months and then goes on its track to neutrality. Additionally, the performance of the GMB portfolio which are constructed in terms of ESG performance is illustrated.

Second, the paper investigates the mechanism behind the short-lived positive ESG-return linkage, based on the explanation provided by Pedersen et al. (2021), where an ESG-adjusted efficient frontier and Capital Asset Allocation Model (CAPM) are proposed. Pedersen et al. (2021) suggest that a positive ESG-return relationship occurs when the profitability channel outweighs the investor demand channel. This study confirms that this dynamic held true during the Ukraine-Russia conflict. The findings also highlight that during such a geopolitical conflict, ESG-unaware investors are the market majority, exceeding the ESG-motivated ones.

Third, this study explores whether the firms' geopolitical or energy risk resilience is strengthened by their ESG profile during the studied geopolitical conflict. Unlike previous research, which primarily focuses on the macro-level geopolitical risks and ESG performance, this study constructs corporate-level geopolitical and energy risk vulnerability measure following the methodology of Zhang et al. (2024). The findings from the Ukraine-Russia conflict reveal that governance pillar negatively reduces both geopolitical and energy risk vulnerabilities, while the environmental pillar specifically mitigates energy risk vulnerability. These results suggest that firms with superiority in these two dimensions could withstand geopolitical and energy

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risk better than their counterparts.

The contribution of this paper lies in extending the understanding of ESG as a risk factor by demonstrating its relevance in the context of a geopolitical event. This paper also introduces a novel mechanism that links ESG to corporate risks, particularly the geopolitical and energy risk vulnerabilities, while confirming an established theoretical framework on the ESG anomaly mechanism. This paper further provides empirical evidence on the interplay between ESG, firm resilience, and stock returns during a geopolitical turmoil. Providing that geopolitical risk has become a critical sources of market uncertainty and corporate vulnerability, this study highlights ESG's critical role in enabling firms to better navigate the challenges posed by geopolitical and energy crises, which offers valuable insights for investors, corporate managers and policymakers.

The rest of this paper is organized as follows. Section 2 reviews the existing literature on ESG performance, geopolitical risk and their impacts on firm performance. Section 3 presents the data sources, sample construction and the descriptive statistics. Section 4 conducts an event-study to investigate the ESG-return relationship during the Ukraine-Russia conflict. Section 5 explores the underlyng mechanisms driving this relationship, focusing on the two channels provided by the E-CAPM theory and the roles of geopolitical and energy risk vulnerabilities. Section 6 concludes.

2 Literature Review

2.1 The role of ESG

The relationship between sustainability level and stock return is under a continuous discussion. Previous literature has been debating on whether the ESG or other sustainability proxies have a positive, negative, or a neutral relationship. Bolton and Kacperczyk (2021) observe higher stock returns in companies with high carbon emissions, because investors require a compensation premium due to their exposure to the comparatively high carbon risk. Similarly, results by Pástor et al. (2021) unveil that the investors' preference to ESG endows the green stocks with negative alphas while the brown stocks have positive alphas. However, regarding the equity return, Khan et al. (2016) show that firms with a high material sustainability level outperform those with a low material sustainability level. Heterogeneous biodiversity risk premiums are found by Coqueret et al. (2025), where their low-minus-high biodiversity factor shows both positive and negative signs under different return contexts. Meanwhile, Demers et al. (2021) finds no statistically significant linkage between the ESG proxy and stock return during COVID-19.

In contrast, the protective role of ESG in enhancing firm resilience and mitigating negative impacts during crises has been widely acknowledged in the literature. As shown in previous research, ESG, defined as companies' engagement in environ-

mental, social and governance practices, could be positively linked with strong firm performance (Eccles et al. (2014), Cornett et al. (2016), Ferrell et al. (2016), Homroy (2023)). Although whether this linkage could evolve into a positive relationship between ESG and stock return is disputable, ESG's protection role during a crisis period is confirmed by various literature. The study by Lins et al. (2017), focusing on the Subprime Crisis, finds a positive premium among those firms with high social capital. Recent research also shows that companies with more sustainable activities are also less undermined by the COVID-19 crisis (Broadstock et al. (2021), Garel and Petit-Romec (2021)). Through evaluation of the connection between firm characteristics and stock returns, Ding et al. (2021) find milder drop in stock return among the firms with better Corporate Social Responsibility (CSR) performance during COVID-19 pandemic. The insurance-like effect of ESG on stock return is also confirmed by Li et al. (2025), while they also detect the effect provided by different ESG pillars in low-supply chain-concentration companies and high-supply chain-concentration companies.

So far, similar studies regarding the role of ESG during Ukraine-Russia conflict are still scarce, with existing research only focusing on the safe haven effect that ESG provides for other assets. For example, Ahad et al. (2024) find that during the energy shortage period caused by the Ukraine-Russia war, sustainable investment could play the safe haven role for Natural gas or Brent oil investors. However, the topic on ESG and stock return during the Ukraine-Russia conflict is overlooked. Even though Tsang et al. (2024) mention the stock return advantages of ESG priorities during the Ukraine-Russia conflict, it emphasizes more on the ESG's stabilizing effect on the supply chain disruption. Hence, this paper is to fill in the literature void, investigating the relationship between ESG and stock return during the Ukraine-Russia conflict and determining whether the positive relationship exists during such a turbulent period.

Concerning this lack of coherence on the direction of the sustainability-return linkage, Pedersen et al. (2021) provide a possible explanation. In their ESG-adjusted Capital Asset Pricing Model (E-CAPM), depending on the type of dominant investors, ESG could impact the stock return either positively, barely or negatively. When the ESG-unaware investors prevail, high-ESG stocks outperform their counterparts due to their superior financial performance. In contrast, under the market condition where the majority is motivated by ESG, investors will adjust their preferences towards stocks of companies with a high sustainability level (Hartzmark and Sussman (2019), Cornell (2021)) and ask for an excess return to compensate their holdings of low-ESG stocks. Then, we expect a negative effect of ESG impact on stock returns. For a market filled with the ESG-aware investors, namely those who acknowledge companies' ESG activities but still hold the mean-variance belief, there could be no prominent evidence showing the relationship between ESG and stock return. Hence, as summarized by Darolles et al. (2023), the ESG information could affect the stock return through two channels: (I) the investor demand channel where the compar-

ative stock returns in the low-ESG group are bid up by the investors' preference, confirmed by Hong and Kacperczyk (2009), Bolton and Kacperczyk (2021) and Pástor et al. (2021); (II) the fundamentals (profitability) channel, given that the stock returns in the high-ESG group could be improved after the firms' promoting financial performance. The affected financial performance could be extended to many aspects, not limited in the profitability mentioned by Pedersen et al. (2021) (also see Margolis et al. (2009) and Chen et al. (2023)). It also concerns the operation and management capacity (Eccles et al. (2014), Zhou et al. (2022), Li et al. (2025)), and risk profile (Abdullah et al. (2024), Fiorillo et al. (2024)). To understand how ESG exerts its potential impact on stock return, this paper tests the significance of the above two mechanisms of E-CAPM. In terms of the special nature of Ukraine-Russia conflict, namely both a geopolitical conflict and an energy disruption, the geopolitical and energy risk profile is also considered as being driven by ESG proxy in the possible channel in the following study.

2.2 Geopolitical Dynamics, Financial Market and ESG

First, a mainstream geopolitical measure is proposed by Caldara and Iacoviello (2022), wherein the authors develop a geopolitical risk index with a designed technique that calculates the proportion of articles referencing negative geopolitical events in major newspapers from the United States, the United Kingdom, and Canada. Based on this index, most of the literature in the geopolitical finance domain focuses on the relationship between geopolitical risk and market risk, particularly the stock market risk. Salisu et al. (2022) find that geopolitical risk moves in the same direction with the volatility of emerging stock markets. Smales (2022) reaches a similar conclusion while it is further found that geopolitical risk is negatively linked with stock returns. By decomposing geopolitical risk into threats and acts, Fiorillo et al. (2024) detect the increasing stock crash frequency associated with the soaring geopolitical threats.

Whilst most studies investigate the relevance between return volatility and geopolitical risk, Mertzanis and Tebourbi (2024) shift the focus to the impact of geopolitical risk on green bond issuance, finding a positive association between the two variables. This relationship remains robust even after decomposing geopolitical risk.

Beyond its effects on financial markets, existing research also highlights a connection between geopolitical risk and corporate-level ESG performance. Some studies, regarding geopolitical risk as an independent variable, argue that geopolitical risk could negatively affect firm's ESG performance (Abdullah et al. (2024), Jiang et al. (2024)). Other studies treat ESG as a mediating factor, influencing the relationship between geopolitical risk and financial outcomes such as firm performance (Reyad et al. (2024)) or equity risk (Fiorillo et al. (2024)).

3 Data and Descriptive Statistics

This study focuses on the ESG's impact on the stock performance among non-energy and non-financial U.S. companies.[2] The key variable, the ESG score, is obtained from the LSEG Refinitiv Workspace. This proxy contains three aspects, E-Pillar, S-Pillar, and G-Pillar, which stand for firms' environmental performance, social performance, and governance performance, respectively. Each pillar is assigned a score, which is then weighted and combined to form the overall Refinitiv ESG Score. The E-Pillar measures factors such as resource use, emissions, and environmental innovation, assessing how well a company is managing its impact on the climate. The S-Pillar evaluates aspects like workforce management, human rights, community relations, and product responsibility, reflecting how the company interacts with and impacts its employees, customers, and other stakeholders in broader society. The G-Pillar focuses on board structure, compensation practices, shareholder rights, and business ethics, capturing the effectiveness of corporate governance mechanisms in ensuring accountability and sustainability. This aggregated score ranges from 0 to 100, where higher values indicate stronger ESG performance and more transparent sustainability information disclosure.[3] In order to rule out the impact of the potential ESG policy change because of the conflict, I observe ESG proxies one year ahead the conflict to define the firms' sustainability. The logarithmic transformation of the Refinitiv ESG Score is made to reduce the sensitivity of estimates to outliers.[4]

Based on Lins et al. (2017) and Bae et al. (2021), the control variables consist of five financial variables (*Ln(Cap)*, *Cash*, *BM*, *Leverage* and *Profitability*), Fama-French 5 factor loadings by Fama and French (2015) and the momentum factor loading by Carhart (1997). *Ln(Cap)* is the logarithmic market capitalization. *Cash* is calculated as the Cash and Cash Equivalents divided by the Total Assets. *BM* is calculated as the Book Value divided by the Market Value. *Leverage* is computed as the Total Liabilities divided by the Total Assets. *Profitability* is computed as the Operating Profit divided by the Total Assets. Fama-French factor loadings are estimated from a 60-month window regression prior to the observed month.[5]

After filtering out financial companies, energy companies and companies without valid ESG scores and control variables, our sample encompasses 1,613 companies. Monthly stock returns from January 2021 to February 2024 are computed. I do not include the return data in 2020 to rule out the COVID-19 pandemic downturn, where

[2]The filtering process of energy and financial firms is based on firms' MSCI Global Industry Classification Standard (GICS) information, which is obtained from the LSEG Refinitiv Workspace. The detailed GICS methodology and sector definitions are clarified on: the MSCI's website.

[3]The detailed ESG score construction methodology is presented on the LSEG's website

[4]The E-Pillar is treated specially because there are a number of firms with zero Environmental Pillar Scores. For E-Pillar scores, all the negative logarithmic scores are set as zero.

[5]To estimate the factor loadings, returns are regressed on the Fama-French 5 factors and the momentum factor, all of which are obtained at Kenneth French's website. Stocks without more than 18-month valid data during the estimation window are ruled out.

stock returns are severely crashed by the global economic shutdown. The study dates the outbreak of the Ukraine-Russia Conflict to February 2022, when Russia officially declared war on Ukraine. To better present the conflict circumstances, cumulative stock returns *r[0,t]* from the event month, February, 2022, to the *t*-th month after the event month are calculated. As shown in Table 1, the cumulative stock returns exhibit an overall negative trend during the conflict period. In the prior three months of the conflict, the average stock return crashes to -13.76%, with a median return of -10.51%. The negative trend persists over the six-months period after the outbreak, with a mean value declining sharply to -17.05%, the median at -14.35% and the 25th percentile at -31.82%. Hence, in such periods of stock market downturns, investors are likely to focus on equities of firms with robust fundamentals and stronger resilience to the soaring risk.

Table 1 also reports the key independent variable of interest, the logarithmical ESG-related scores, from the year preceding the conflict. The average and median ESG score are 3.66 and 3.73 respectively. Among all the three pillars, the Environmental Pillar has the highest volatility, with a standard deviation at 1.66, a minimum at 0 and a maximum at 4.58. This variability indicates that there exists great disparities in firms' movements towards the environmental concerns before the Ukraine-Russia conflict.

4 Event Study on Stock Return and ESG Performance

4.1 Baseline Results

Several regression results showing the relationship between pre-conflict ESG performance and event returns are provided in Table 2. Financial variables and the six factor loadings (the five Fama and French (2015) factors plus momentum) are included in the model to control effects from other aspects. Industry dummies are also added. The overarching columns represent different dependent variables, the cumulative returns over 3 months to 12 months after the conflict. As shown in columns (1), (5) and (9), while stock returns benefit from high ESG performance at the beginning three months, there are no significant results showing that the impact consists after 6 months. However, *Profitability* does protect the stock return since the outbreak, while *Cash* and *BM* have the similar impact at the very beginning stage of the conflict.

I further decompose the ESG score to E-Pillar, S-Pillar and G-Pillar and study the impact of each pillar score. Table 2 contains the results of regression with the single pillars as the independent variable and the same control variables in Table 2. These results suggest the protection role of the E-Pillar in driving the event returns. The coefficient is the most significant in the beginning 3 months after the war outbreak. 1 unit of logarithmic increase in the E-Pillar score could generate a cumulative return increase by 1.6%. This positive relationship is also positive for the 6-month, 1-year

Table 1: **Descriptive Statistics**

The sample includes 1,613 non-energy or non-financial companies listed in the U.S. stock market with available return, ESG and control variable data from the LSEG Refinitiv Workspace. $r[0,t]$ is the cumulative stock return from the event month, February, 2022, to the t-th month after the event month. ESG-related proxies are measured at the month end of January, 2021. *ESG* stands for the overall ESG score calculated by Refinitiv, whilst *E-Pillar*, *S-Pillar* and *G-Pillar* represents the Environmental, Social and Governance Pillar respectively. All the financial variables are measured at the month end of January, 2022. *Ln(Cap)* is the logarithmic market capitalization. *Cash* is calculated as the Cash and Cash Equivalents divided by the Total Assets. *BM* is calculated as the Book Value divided by the Market Value. *Leverage* is computed as the Total Liabilities divided by the Total Assets. *Profitability* is computed as the Operating Profit divided by the Total Assets. Returns are winsorized at the 0.5-th and 99.5th percentile.

Variables	Mean	Std.	Median	Min.	Max.	25th Percentile	75th Percentile
$r[0,3]$	-0.1376	0.2594	-0.1051	-1.2306	0.6087	-0.2461	0.0280
$r[0,6]$	-0.1705	0.3279	-0.1435	-2.1856	1.1874	-0.3182	0.0221
$r[0,12]$	-0.1567	0.4099	-0.0953	-1.9459	0.9992	-0.3490	0.0905
ESG	3.66	0.53	3.73	1.27	4.54	3.34	4.09
E-Pillar	2.55	1.66	3.22	0.00	4.58	0.88	4.00
S-Pillar	3.71	0.55	3.79	0.63	4.58	3.38	4.14
G-Pillar	3.80	0.59	3.96	0.66	4.60	3.49	4.23
Ln(Cap)	21.91	1.85	21.86	16.79	28.69	20.62	23.12
Cash	0.2006	0.2343	0.1054	0.0000	0.9937	0.0358	0.2692
BM	0.3995	0.3493	0.3130	0.0005	3.6052	0.1580	0.5463
Leverage	0.5410	0.2205	0.5487	0.0085	1.0272	0.3947	0.7017
Profitability	0.0083	0.0534	0.0146	-0.3932	0.4379	0.0002	0.0284

cumulative returns. As for the other two pillars, S-Pillar only shows significant positive impact during the 3 prior months, with 2.6% return increase brought by one unit of S-Pillar improvement, while G-Pillar never exhibits such effects throughout the observed period. In summary, an insurance-like effect of superior environmental performance does exist during the Ukraine-Russia Conflict, in line with the findings of Tsang et al. (2024) and Chen et al. (2023).

Table 2: **ESG Measures and Event Return: Cross-Sectional Results**

The table reports the cross-sectional regression results of the cumulative event returns on the ESG pillars during different event periods.

$$r_i[0,t] = \gamma_0 + \lambda_j + \gamma_1 ESG_i + \sum_{k=1}^{5} \gamma_{k+1} X_{k,i} + \sum_{m=1}^{6} \gamma_{m+6} F_{m,i} + \epsilon_i \tag{1}$$

where $r_i[0,t]$ is company i's cumulative stock return from the event month, February, 2022, to the t-th month after the event month. ESG_i stands for the ESG score or its single-pillar score measured at the month end of January 2021, including *E-Pillar*, *S-Pillar* and *G-Pillar* which represents the logarithmic Environmental, Social and Governance Pillar respectively. The sample includes non-energy or non-financial companies listed in the U.S. stock market with available return, ESG and control variable data from the LSEG Refinitiv Workspace. All the financial variables $X_{k,i}$ are measured at the month end of January, 2022. *Ln(Cap)* is the logarithmic market capitalization. *Cash* is calculated as the Cash and Cash Equivalents divided by the Total Assets. *BM* is calculated as the Book Value divided by the Market Value. *Leverage* is computed as the Total Liabilities divided by the Total Assets. *Profitability* is computed as the Operating Profit divided by the Total Assets. Factor loadings $F_{m,i}$ are obtained from the regression on the monthly Fama-French 5 factors (Fama and French (2015)), MKT factor, SMB factor, HML factor, RMW factor and CMA factor, plus the monthly Momentum (MOM) factor (Carhart (1997)) 60 months ahead of the crisis outbreak. Industry Dummies λ_j are set on the GICS Sector level. Returns are winsorized at the 0.5-th and 99.5th percentile. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

	r[0,3]				*r*[0,6]				*r*[0,12]			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ESG	0.027**				0.002				0.018			
E-Pillar		0.016***				0.013**				0.022***		
S-Pillar			0.026**				0.015				0.023	
G-Pillar				-0.004				-0.006				0.016
Ln(Cap)	-0.001	-0.003	0.000	0.005	-0.001	-0.007	-0.004	-0.000	-0.008	-0.015*	-0.010	-0.006
Cash	-0.093***	-0.082**	-0.095**	-0.096***	-0.052	-0.041	-0.052	-0.053	-0.066	-0.022	-0.069	-0.066
BM	0.070***	0.076***	0.079***	0.084***	0.019	0.013	0.017	0.020	0.001	-0.006	0.000	0.003
Leverage	0.028	0.022	0.025	0.031	-0.021	-0.028	-0.024	-0.021	-0.034	-0.029	-0.038	-0.030
Profitability	1.043***	1.177***	1.194***	1.171***	0.767***	0.770***	0.777***	0.767***	1.278***	1.296***	1.286***	1.272***
Six Factor Loadings	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-Square	25.1%	25.7%	25.3%	25.2%	11.0%	11.2%	11.0%	11.0%	15.1%	14.0%	15.1%	15.1%

4.2 Difference-in-Difference Analysis

Empirical evidence so far indicates that stocks of companies with outperformance at some sustainability proxies have higher stock returns during a certain period of the Ukraine-Russia war. Hereafter, in this subsection, a Difference-in-Difference (DiD) analysis is employed to study whether this potential positive return gap is a general phenomenon or exists exclusively during the Russia-Ukraine conflict. The analysis could help detect the change of the ESG-return relationship before and after the event outbreak.

In the Ukraine-Russia conflict context, all the sample companies are treated at the same time. Following the DiD guidance from Roth et al. (2023), the canonical DiD and Dynamic Two-Way Fixed Effect (TWFE) should be employed. Dealing with the panel dataset from January 2021 to February 2023, the canonical Difference-in-Difference model with traditional binary group specification is written in Equation 14. Regarding the research question, the conflict is quantified as the time when the treatment is played in the DiD model, as C_t in the Equation 14, which equals 1 posterior to February 2022 and 0 otherwise. D_i represents the treatment, with both high-ESG and low-ESG treatment considered. For example, while dealing with high-ESG treatment, the treatment group ($D_i = 1$) consists of firms with ESG scores higher than the 4th quintile as the others are included in the control group ($D_i = 0$). When the low-ESG treatment is inserted into the model, firms are separated into the treatment group ($D_i = 1$) containing firms with ESG scores lower than the 1st quintile and the control group ($D_i = 0$) with the rest of companies. The interaction term, $D_i * C_t$ is studied as the key independent variable, representing the marginal effect on monthly stock returns during the conflict period. The model is thus

$$r_{i,t} = \beta_0 + \beta_1 D_i C_t + \sum_{k=1}^{5} \gamma_k X_{i,t-1}^{[k]} + \sum_{m=1}^{6} \delta_m F_{i,t-1}^{[m]} + \tau_t + \zeta_i + \epsilon_{i,t}, \tag{2}$$

where $r_{i,t}$ is the return proxy of company i at time t, C_t is a dummy variable which equals 1 since February 2022 (with the event month included), $X_{i,t-1}^{[k]}$ and $F_{i,t-1}^{[m]}$ stand for the financial variables and six factor loadings as in Table 2. The model controls both the firm fixed effect, ζ_i and the time fixed effect τ_t.

Table 3 presents the results of the canonical Difference-in-Differences (DID) analysis on the ESG score and single pillars, which indicate that firms with high ESG scores experienced a positive and statistically significant impact on returns during the Ukraine-Russia conflict, whereas firms with low ESG scores exhibited a negative and highly significant effect. For firms in the High ESG group, the coefficient in column (1) indicates that these firms experienced an additional monthly return of approximately 0.40% during the conflict period compared to the non-conflict period. Conversely, firms in the Low ESG group witness a reduction in monthly returns of approximately 0.95% during the one year after the conflict, as indicated by the co-

efficient -0.0095 in column (2). These findings suggest that firms with superior ESG performance demonstrated greater resilience amidst this geopolitical disruption.

Among three individual ESG pillars, Table 3 also shows that the Environmental pillar displayed the most pronounced benefit, with outperforming firms achieving 0.47% (column (3)) monthly returns, while low-performing firms experienced a substantial -1.16% (column (4)) under-performance. It is worth noted that the effects of S and G pillar are asymmetric. As shown in column (5), an additional monthly return of approximately 0.41% is observed in the high-S group but no significantly negative returns are found in the low-S counterparts during the studied period. The results regarding the G-pillar are reversed, as column (7) does not show a significant coefficient in the group with superior Governance performance but deteriorating returns (approximately -0.82% shown in column (8)) are seen among those with poor Governance performance. The findings reveal that high-ESG firms, particularly those strong in Environmental and Social pillar, demonstrated greater resilience during the Ukraine-Russia crisis, as evidenced by positive and significant return effects. Conversely, low-ESG firms, especially those weak in Environmental and Governance pillars, suffered significant negative impacts.

Section 4.1 indicates that the positive impact of ESG on returns is more significant in the early stage of the Ukraine-Russia conflict, while its significance diminishes within 12 months after the conflict outbreak. This implies that the relationship between ESG and returns may vary across different phases of the war. Hence, in the following canonical DiD analysis, I apply DiD analysis in two crisis stages to study the potential heterogeneity of the ESG-return relationship. While studying the initial stage, the crisis dummy, C_t, equal to 1 from February 2022 to May 2022, otherwise 0. The definition of the initial stage is rooted in the previous results in Table 2. In the other case where the subsequent months are studied, the crisis dummy, C_t, equal to 1 from June 2022 to February 2023, and 0 otherwise.

The coefficient of the interaction term between the conflict stage dummy and the ESG treatment variable could help with the interpretation of the ESG impact in two stages, the beginning stage I and the later stage II. Table 4 presents canonical DiD results revealing distinct impacts of ESG performance on stock returns across different stages of the Ukraine-Russia conflict. In the initial conflict stage, as shown in Panel A, firms in the High ESG group experienced a significant positive return of 1.77% per month, whereas firms in the Low ESG group saw a significant negative return of -1.90% per month. The return advantage and disadvantage are also seen among the single pillars. Among the individual ESG pillars, the Environmental (with the coefficient 1.60%), Social (with the coefficient 1.53%), and Governance (with the coefficient 1.44%) pillars all demonstrate significant positive impacts for high-performing firms and significant negative impacts for low-performing firms during this period. These findings suggest that ESG performance have a strong protection effect in the early conflict stage. During the later phase of the conflict, the effect reverses, as shown in Panel B, where the coefficients for the High ESG group become significantly negative,

Table 3: **ESG Groups and Event Return: Canonical Difference-in-Difference (DiD) Analysis**

The table reports the Difference-in-Difference regression results of the following model from January 2021 to February 2023.

$$r_{i,t} = \beta_0 + \beta_1 D_i C_t + \sum_{k=1}^{5} \gamma_k X_{i,t-1}^{[k]} + \sum_{m=1}^{6} \delta_m F_{i,t-1}^{[m]} + \tau_t + \zeta_i + \epsilon_{i,t} \quad (2)$$

The sample includes non-energy or non-financial companies listed in the U.S. stock market with available return, ESG and control variable data from the LSEG Refinitiv Workspace. $r_{i,t}$ is the monthly stock return of firm i at time t. D_i specifies the high or low ESG group to which company i belongs, with ESG and single pillars measured at the month end of January, 2021. C_t is the conflict dummy, which equals 1 from February 2022 to February 2023 and otherwise 0. The interaction term, $D_i * C_t$ is studied as the independent variable. All the control variables in the model are lagged by 1-month. Quarterly financial statement data are gathered and aligned with the monthly panel model by applying a backward-fitting approach, assigning each quarterly observation to the corresponding three months preceding the reporting date. *Ln(Cap)* is the logarithmic market capitalization. *Cash* is calculated as the Cash and Cash Equivalents divided by the Total Assets. *BM* is calculated as the Book Value divided by the Market Value. *Leverage* is computed as the Total Liabilities divided by the Total Assets. *Profitability* is computed as the Operating Profit divided by the Total Assets. Six factor loadings $F_{m,i}$ are obtained from the regression on the monthly Fama-French 5 factors (Fama and French (2015)), MKT factor, SMB factor, HML factor, RMW factor and CMA factor, plus the monthly Momentum (MOM) factor (Carhart (1997)) 60 months ahead of the observed time. Returns are winsorized at the 0.5-th and 99.5th percentile. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$HighESG \times Conflict$	0.0040**							
$LowESG \times Conflict$		-0.0095***						
$HighE \times Conflict$			0.0047**					
$LowE \times Conflict$				-0.0116***				
$HighS \times Conflict$					0.0041**			
$LowS \times Conflict$						-0.0028		
$HighG \times Conflict$							0.0030	
$LowG \times Conflict$								-0.0082***
Ln(Cap)	-0.0598***	-0.0602***	-0.0598***	-0.0609***	-0.0596***	-0.0595***	-0.0598***	-0.0602***
Cash	0.0339**	0.0345**	0.0339**	0.0332**	0.0340**	0.0341**	0.0338**	0.0340**
BM	0.0073*	0.0076**	0.0073*	0.0072*	0.0074**	0.0073**	0.0071*	0.0072*
Leverage	-0.0354**	-0.0343**	-0.0355**	-0.0341**	-0.0358**	-0.0361**	-0.0358**	-0.0353**
Profitability	0.1431***	0.1422***	0.1428***	0.1395***	0.1433***	0.1434***	0.1436***	0.1435***
Six Factor Loadings	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Entity Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	Month	Month	Month	Month	Month	Month	Month	Month
Adj. R-Square	28.3%	28.4%	28.3%	28.4%	28.3%	28.3%	28.3%	28.4%

while the Low ESG group exhibits no significant impact. Since June 2022, high-ESG companies experience an average monthly underperformance of -0.59%. For the individual pillars, all the three pillars (E, S and G) have negative and significant effects for better-performing firms during this period. These findings suggest that while better

ESG performance provides a clear advantage during the initial three months of the conflict, this positive correlation between ESG and returns diminishes and reverts to neutrality in the following months.

Table 4: **ESG Groups, Return and Conflict Stages: Canonical Difference-in-Difference (DiD) Analysis**

The table reports the Difference-in-Difference regression results of the following model from January 2021 to February 2023.

$$r_{i,t} = \beta_0 + \beta_1 D_i C_t + \sum_{k=1}^{5} \beta_{k+1} X_{k,i} + \sum_{m=1}^{6} \beta_{m+6} F_{m,i} + \tau_t + \zeta_i + \epsilon_{i,t} \tag{2}$$

The sample includes non-energy or non-financial companies listed in the U.S. stock market with available return, ESG and control variable data from the LSEG Refinitiv Workspace. $r_{i,t}$ is the monthly stock return of firm i at time t. D_i specifies the high or low ESG group to which company i belongs, with ESG and single pillars measured at the month end of January, 2021. C_t is the conflict event dummy with different values in different conflict stages as shown in each panel's head. All the control variables in the model are chosen and processed similarly as in Table 3. Returns are winsorized at the 0.5-th and 99.5th percentile. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Panel A: $C_t = 1$ when $t = [0, 3]$

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$HighESG \times C_t$	0.0177***							
$LowESG \times C_t$		-0.0190***						
$HighE \times C_t$			0.0160***					
$LowE \times C_t$				-0.0274***				
$HighS \times C_t$					0.0153***			
$LowS \times C_t$						-0.0090***		
$HighG \times C_t$							0.0144***	
$LowG \times C_t$								-0.0136***
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Entity Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	Month	Month	Month	Month	Month	Month	Month	Month
Adj. R-Square	28.4%	28.4%	28.4%	28.4%	28.4%	28.4%	28.4%	28.4%

Panel B: $C_t = 1$ when $t = [4, 12]$

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$HighESG \times C_t$	-0.0059***							
$LowESG \times C_t$		0.0007						
$HighE \times C_t$			-0.0042**					
$LowE \times C_t$				0.0036				
$HighS \times C_t$					-0.0044**			
$LowS \times C_t$						0.0022		
$HighG \times C_t$							-0.0051**	
$LowG \times C_t$								-0.0011
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Entity Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	Month	Month	Month	Month	Month	Month	Month	Month
Adj. R-Square	28.3%	28.3%	28.3%	28.3%	28.3%	28.3%	28.3%	28.3%

In the subsequent analysis, I employ the recently proposed TWFE model by Sun and Abraham (2021), as specified in Equation 3. This model accounts for contamina-

tion effects from other time periods, addressing the coefficient bias associated with such effects. More importantly, it relaxes the traditional TWFE assumption of Treatment Effects Homogeneity, which is particularly relevant in the context of this study where the divergence of ESG performance varies between high- and low-ESG groups. By applying the sample data to this model (Equation 3), the key coefficient estimator $\hat{\delta}_{i,l}$, is derived as shown in Equation 4. As proved by Sun and Abraham (2021), $\hat{\delta}_{i,l}$ stays unbiased while the treatment effect is heterogeneous.

$$ar_{i,t} = \tau_t + \zeta_i + \sum_{i \notin \mathbb{U}} \sum_{l \neq -1} \delta_{i,l} D_i C_t^{[l]} + \epsilon_{i,t} \tag{3}$$

with the coefficient estimator as:

$$\hat{\delta}_{i,l} = \frac{\mathbb{E}[(ar_{i,c+l} - ar_{i,t'}) * D_i]}{\mathbb{E}[D_i]} - \frac{\mathbb{E}[(ar_{i,c+l} - ar_{i,t'}) * U_i]}{\mathbb{E}[U_i]} \tag{4}$$

and:

$$C_t^{[l]} = \mathbf{1}(t - l = e) \tag{5}$$

where $ar_{i,t}$ is the abnormal return calculated as the residual from a prefix panel OLS regression of the stock return $r_{i,t}$ on all the control variables. $\mathbb{U}$ stands for the control cohort, which, in this case, defines non-high ESG group with high-ESG as the treated cohort while it defines non-low ESG group with low-ESG as the treated cohort. U_i is the dummy variable indicating the control cohort. e represents the outbreak time point, February 2022. And t' is the pre-event period.

The TWFE regression result is presented in Figure 1. In line with the previous findings, it highlights the protective role of ESG performance, particularly the Environmental Pillar, during the early stages of the conflict. For high ESG firms, significant positive effects are observed during the early post-event months, more precisely, from February 2022 (Post_0) to May 2022 (Post_3), with overall ESG contribution peaking at approximately 4.04% and significant pillar effects from the Environmental (4.19%), Social (3.18%), and Governance Pillar (2.76%) in April (the second post-event month). The confidence intervals in shaded area confirm the statistical significance of these results in the early months. However, the positive effects diminish after May 2022 (Post_3), as the coefficients decline and the confidence intervals begin to overlap the zero line, indicating the ESG-return relationship back to neutrality. Conversely, low ESG firms exhibit significant negative returns during the early post-event months, with overall ESG treatment intensity dropping by as much as -4.70% in April. Similar patterns are found among low-pillar treatments, where the firms with weak environmental performance suffer the most at the beginning stage with the coefficient in April (Post_2) being -5.87%. This negative effect also weakens after May. Furthermore, Figure 1 confirms that the Parallel Trend Assumption is met in the model setting as no coefficient of the interaction term between *pre* and treatment variable is significantly different from zero.

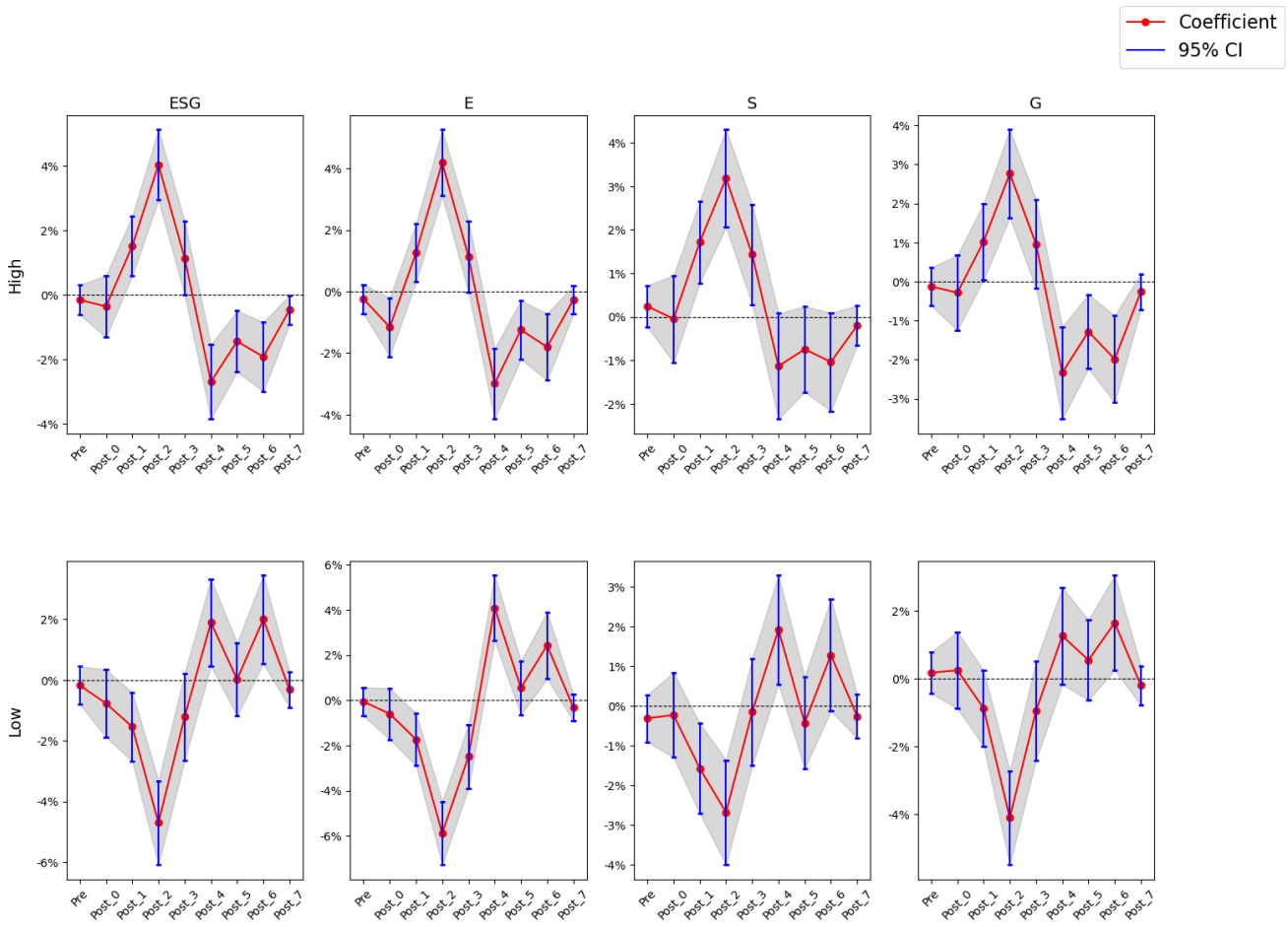

Figure 1: Dynamic TWFE Results: Crisis Return and ESG

This figure reports the dynamic Two-Way Fixed Effect (TWFE) regression coefficients of monthly return on the cohort-crisis interaction term, with the model specification given by Sun and Abraham (2021). The model takes a pre-event dummy *Pre* (which equals 1 from the 6th pre-event month to the 2nd pre-event month, with the 1st pre-event month dropped) and post-event dummies *Post_i* which equals to 1 at the *i*-th post-event month, except that *Post_7* equals 1 from the 7th post-event month to the 12th post-event month. The row (High or Low) and the column (ESG or the single pillar) specify the treatment cohort of each subplot, while the control conhort is the supplementary set of the treated firms. The shaded area stands for the confidence interval at 95% level. Financial variables and six factors (as in Table 3) are controlled. Standard errors are clustered at the entity level. Returns are winsorized at 0.5-th and 99.5-th percentile.

In summary, the Difference-in-Difference (DiD) analysis confirms the protective role of ESG on stock performance during the Ukraine-Russia Conflict. Consistent with the baseline findings in Section 4.1, this effect is primarily observed during the initial three months following the event; thereafter, it diminishes and reverts to neutrality. These results remain robust when continuous ESG measures are employed as treatment intensity variables, as demonstrated in Appendix A.

4.3 ESG Strategy Efficiency

Based on previous subsections with regression findings in the ESG-return linkage, particularly in its initial stages, this subsection now shifts focus to evaluating the performance of an ESG-based investment strategy over the Ukraine-Russia conflict. This subsection studies whether these early positive correlations manifest themselves as continuous returns, assessing the overall effectiveness and resilience of ESG-oriented investments during the conflict.

The ESG investment strategy is constructed as follows: According to the quintiles of company ESG scores, stocks are sorted into high-ESG group and low-ESG group. For each month, High-Low portfolio returns are given by the difference between stocks within the high quintile ESG group and stocks within the low quintile ESG group. For the result robustness, both equally-weighted and value-weighted portfolio returns are calculated. To address the overemphasis on large-growth stocks in the High-Low ESG portfolio (Pástor et al. (2022)), the Media Climate Change Concerns (MCCC) index proposed by Ardia et al. (2023) is further controlled [6].

Figure 2 depicts the monthly portfolio return trends following a high-low ESG-based strategy from January 2021 to February 2023. The first row reports the excess returns while the other rows report the abnormal return trends after controlling certain factors. The figure suggests that high-ESG firms outperform their low-ESG counterparts in excess return and CAPM alpha during Ukraine-Russia conflict, which is confirmed by increasing return trends. Noticeably, returns during the shaded period mostly increase, implying that the first phase of the conflict amplify the positive impact of ESG on stock return. This return superiority is most pronounced in the Environmental Pillar, where equally weighted portfolios show consistently positive excess returns and *alpha*s across different risk-adjusted models. These results indicate that smaller high-ESG firms may exhibit resilience or benefit from investor preference during turbulence periods, particularly those with better environmental practices. Nevertheless, value-weighted portfolios, dominated by larger firms, show more volatile performance, with generally lower excess returns and negatively abnormal returns after controlling for six risk factors. This implies that large-cap companies' better ESG engagement may be already priced in, leading to weaker stock performance once adjusted the risk factors. Overall, Figure 2 highlights that while applying ESG-focused investment strategy offers returns in the starting short term in Ukraine-Russia Conflict, this advantage diminishes with time and when more comprehensive risk adjustments are added. Moreover, Figure 2 illustrates flat six-factor alpha trends prior to the outbreak, further supporting the application of the DiD analysis in Section 4.2 by confirming the validity of the Parallel Trend Assumption.

[6] The MCCC data are obtained from sentometrics-research.com.

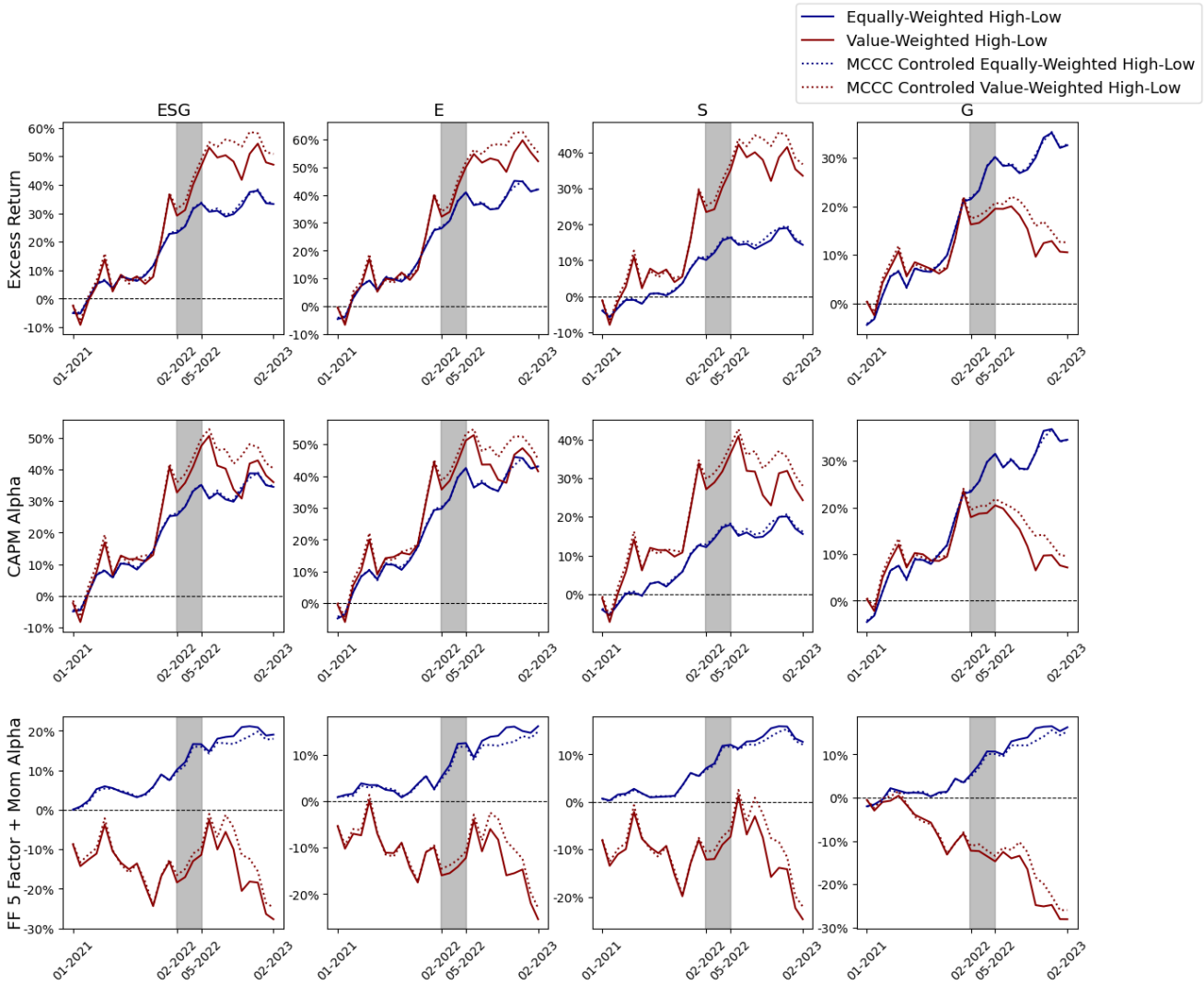

Figure 2: Abnormal Returns Based on ESG High-Low Strategy

This figure reports the excess return (in the first row) and the abnormal returns (*Alpha*, in the following rows) from different pricing models based on high-low ESG-related strategy. Results based on different ESG proxies are reported in different columns. The solid lines present returns of commonly-constructed High-Low portfolios while the dotted lines present results of the High-Low portfolios with Media Climate Change Concern (MCCC) Index controlled. Pricing factors are retrieved from the rolling 60-months window. The shaded area highlights the period from February 2022 to May 2022. Returns are winsorized at 0.5-th and 99.5-th percentile.

5 Unpacking the ESG-Return Relationship with the E-CAPM

Section 4 confirms the existence of the relationship between stock return and certain ESG pillars during the Russia-Ukraine Conflict. The E-CAPM theory by Pedersen et al. (2021) gives two determination channel of the ESG-adjusted asset price: (1) Profitability Channel; (2) Investor Demand Channel. Consequently, this section hereafter focuses on testing these two channels, in order to clarify the specific mechanism behind the positive ESG-return linkage shift on the onset of the Ukraine-Russia Conflict.

5.1 E-CAPM Channel I: ESG and Profitability

As stated by Pedersen et al. (2021), the positive linkage of ESG and stock return originates from the Profitability Channel: firms with robust ESG profile hold higher future profits, which could give rise to the stock return. I hereafter test the correlation between ESG proxies and firms' profitability through regression. If significant, the positive ESG-relationship found in Section 4 could be attributed to this mechanism.

In the test, ROA, calcualted as the Operating Profit over the Total Asset, during the first year after the outbreak is examined as the dependent variable. To keep the result robust, both the ROA at the end of February 2023[7] and the average quarterly ROAs during the first 12 months are analyzed. Following Pedersen et al. (2021), control variables including the logarithmic market capitalization, Price-to-Book ratio, the MKT *beta* and the ROA at the last term are chosen.

Regression results are exhibited in Table 5, which indicate that ESG performance, particularly the Environmental (E) and Governance (G) pillar, is positively associated with future profitability. In Panel A, where $ROA_{t=12}$ represents ROA 12 months later, the ESG score has a significant positive effect, with the E-Pillar showing the strongest impact, significant at the 1% level. This effect is also seen in Panel B, where the dependent variable is the average ROA; both the E and G pillars positively correlate with profitability, and the E-pillar once again shows robust significance. The control variables reveal that firms with large size and high historical profitability ($ROA_{t=-1}$) tend to maintain higher profitability, while market risk (MKT) negatively affects profitability in both panels. As a possible explanation to the positive relationship between ESG and stock return, these results suggest that firms with strong ESG performance, especially in Environmental and Governance dimensions, are more likely to sustain profitability, which is consistent with other studies indicating that firms with higher sustainability tend to achieve better financial performance (Hull and Rothenberg (2008), Pedersen et al. (2021), Yoo and Managi (2022), Zhou et al. (2022)). In particular, the

[7] As most of companies do not publish the financial statements in February, quarterly ROAs are backward fitted to obtain the value at the end of the mentioned month.

E-CAPM theory also indicates that this profitability channel functions effectively due to the presence of more ESG-unaware investors in financial markets, who, as defined by Pedersen et al. (2021), do not take ESG scores into investment consideration and only seek for maximizing the mean-variance utility. During the Ukraine-Russia conflict, when most firms face severe downside risks, these investors are more likely to dominate the financial market, as well-performing stocks become particularly scarce and thus more attractive.

Table 5: **E-CAPM Channel I: ESG and Profitability**

The table reports the regression results of ESG-related proxies on the crisis profitability based on the following model.

$$ROA_i = b_0 + \lambda_j + b_1 ESG_i + b_2 Ln(Cap_i) + b_3 P/B_i + b_4 MKT_i + b_5 ROA_{i,-1} + r_i \quad (6)$$

Panel A shows the results where the Return on Asset (ROA) 12 months after the crisis is treated as the dependent variable. Panel B shows the results where the average Return on Asset (ROA) during the first year after the crisis is treated as the dependent variable. ESG-related proxies are measured at the month end of January, 2021. *ESG* stands for the logarithmic overall ESG score, whilst *E-Pillar*, *S-Pillar* and *G-Pillar* represents the logarithmic Environmental, Social and Governance Pillar respectively. As control variables, *Ln(Cap)* is the logarithmic market capitalization and *P/B* is the Price-to-Book ratio, which are measured at the month end of January, 2022. *MKT* is the market *beta* derived from regressions on the MKT factor 60 months before the crisis. $ROA_{t=-1}$ is the firm profitability level before the crisis, measured at the end of January, 2022. Industry Dummies λ_j are set on the GICS Sector level. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Panel A: $ROA_{t=12}$					**Panel B:** $\overline{ROA}_{t=[0,12]}$				
Variables	(1)	(2)	(3)	(4)	Variables	(1)	(2)	(3)	(4)
ESG	0.090**				*ESG*	0.055*			
E-Pillar		0.048***			*E-Pillar*		0.038***		
S-Pillar			0.058		*S-Pillar*			0.006	
G-Pillar				0.052*	*G-Pillar*				0.054**
Ln(Cap)	0.125***	0.110***	0.028*	0.029*	*Ln(Cap)*	0.125***	0.109***	0.142***	0.133***
P/B	0.009	0.009	0.008	0.007	*P/B*	0.011	0.012	0.009	0.010
MKT	-0.070***	-0.068***	-0.071***	-0.068***	*MKT*	-0.041***	-0.039***	-0.040***	-0.039***
$ROA_{t=-1}$	0.581***	0.579***	0.583***	0.581***	$ROA_{t=-1}$	0.690***	0.688***	0.691***	0.689***
Industry Dummies	Yes	Yes	Yes	Yes	*Industry Dummies*	Yes	Yes	Yes	Yes
R-Square	56.7%	56.9%	56.6%	56.6%	*R-Square*	70.5%	70.7%	70.5%	70.6%

5.2 E-CAPM Channel II: ESG and Investor Demand

According to the E-CAPM theory, the investor demand channel of ESG is another potential mechanism of the negative ESG premium, as found in some studies focusing on general periods (*C.f.*, Hong and Kacperczyk (2009), Bolton and Kacperczyk (2021), Pástor et al. (2021), Wu et al. (2024)). Similarly, this channel is examined through regression models in Table 7, where the trading volume is selected as the dependent variable to represent the interest of investors in the stocks studied.

Table 6 shows the results of the ESG measures on the institutional ownership regression. The institutional ownership, obtained from Bloomberg, is the percentage of shares held by institutional investors to the total number of outstanding shares. Following Pedersen et al. (2021), the delayed effect from more than 3 months is studied. As revealed in the table, during the studied conflict time, better ESG performance attracts greater the institutional investors' preference. For example, the Social Pillar shows the strongest impact both during the short term, with 0.293% higher average institutional ownership associated with one-unit increase in the logarithmic Social Pillar score, and the long term, with 0.256% over 12 months. This highlights the institutional investors' preference for socially responsible firms in times of financial instability. Meanwhile, the Environmental Pillar and the Governance Pillar show more moderate effects, with coefficients ranging from 0.055 to 0.142. These results suggest that institutional demand for ESG-compliant firms is strong during the observed period, with social responsibility being a key driver.

In Table 7, the relationship between ESG and trading volume in the event month and next 3, 6 and 12 months are respectively reported in Panel A, B, C and D. The regression results do not suggest that higher ESG scores are associated with increasing trading activity across different time horizons in the Ukraine-Russia Conflict (also in line with the finding of Pedersen et al. (2021)). Specifically, the total ESG score has a negative effect on trading activity in all models, indicating that firms with higher ESG scores tend to experience lower trading volumes. Among the ESG components, the E-Pillar consistently shows a significant negative relationship with trading activity, suggesting that strong environmental practices may be viewed by investors as a stabilizing factor, reducing investors' demand for frequent trading during the crisis. In contrast, the S-Pillar and G-Pillar do not exhibit significant effects on trading activity, implying that social and governance factors alone may not influence trading behavior as strongly as environmental factors do. Among the control variables, market capitalization has a positive and highly significant association with trading activity, suggesting that larger firms experience higher trading volumes. Similarly, overall market returns (MKT) are positively correlated with trading activity, reflecting that better market performance generally leads to increased trading.

The findings imply that firms with strong ESG scores, particularly in the environmental dimension, could be seen as more stable investments and thus do not lead to higher trading frequency. Thus, during the observed crisis period, the investor demand channel is not that apparent. The evidence during the conflict period can not prove the E-CAPM's assumption, indicating that investors have leaned interests in high-ESG stocks, which normally would heighten the stock prices and generate negative premiums for those stocks. The evidence also implies that the cause of this channel, the ESG-aware investors who have preferences for firms with better ESG performance according to Pedersen et al. (2021), is not seen or does not play a significant role during the geopolitical conflict period.

Table 6: **E-CAPM Channel II: ESG and Institutional Ownership**

The table reports the regression results of ESG-related proxies on the investors' demands during the Ukraine-Russia crisis. The model is written as below:

$$Insti_i = a_0 + \lambda_j + a_1 ESG_i + a_2 Ln(Cap_i) + a_3 P/B_i + a_4 MKT_i + \theta_i \quad (7)$$

Panel A, B, C and D show the results where the dependent variable is the average institutional ownership (in percentage) in the following 3, 6, 12 and 24 months respectively. The institutional ownership, obtained from Bloomberg, is the percentage of shares held by institutional investors to the total number of outstanding shares. ESG-related proxies are measured at the month end of January, 2021. *ESG* stands for the logarithmic overall ESG score, whilst *E-Pillar*, *S-Pillar* and *G-Pillar* represents the logarithmic Environmental, Social and Governance Pillar respectively. As control variables, *Ln(Cap)* is the logarithmic market capitalization and *P/B* is the Price-to-Book ratio, which are measured at the month end of January, 2022. *MKT* is the market *beta* derived from regressions on the MKT factor 60 months before the crisis. Industry Dummies λ_j are set on the GICS Sector level. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Panel A: $Insti_{t=0}$					**Panel B:** $\overline{Insti}_{t=[0,3]}$				
Variables	(1)	(2)	(3)	(4)	Variables	(1)	(2)	(3)	(4)
ESG	0.283***				*ESG*	0.289***			
E-Pillar		0.073***			*E-Pillar*		0.071***		
S-Pillar			0.305***		*S-Pillar*			0.293***	
G-Pillar				0.133**	*G-Pillar*				0.142**
Ln(Cap)	0.184***	0.205***	0.173***	0.252***	*Ln(Cap)*	0.217***	0.243***	0.212***	0.285***
P/B	0.039	0.032	0.043	0.029	*P/B*	0.040	0.034	0.043	0.031
MKT	-0.053*	-0.057*	-0.063**	-0.049	*MKT*	0.003	0.005	-0.007	0.010
Industry Dummies	Yes	Yes	Yes	Yes	*Industry Dummies*	Yes	Yes	Yes	Yes
R-Square	10.8%	10.3%	11.3%	10.0%	*R-Square*	12.8%	12.1%	13.0%	12.0%
Panel C: $\overline{Insti}_{t=[0,6]}$					**Panel D:** $\overline{Insti}_{t=[0,12]}$				
Variables	(1)	(2)	(3)	(4)	Variables	(1)	(2)	(3)	(4)
ESG	0.273***				*ESG*	0.256***			
E-Pillar		0.061**			*E-Pillar*		0.055**		
S-Pillar			0.279***		*S-Pillar*			0.263***	
G-Pillar				0.135**	*G-Pillar*				0.140**
Ln(Cap)	0.239***	0.269***	0.234***	0.304***	*Ln(Cap)*	0.244***	0.274***	0.238***	0.301***
P/B	0.047	0.040	0.050*	0.038	*P/B*	0.046	0.039	0.049	0.038
MKT	0.003	0.005	-0.007	0.010	*MKT*	-0.007	-0.006	-0.017	-0.001
Industry Dummies	Yes	Yes	Yes	Yes	*Industry Dummies*	Yes	Yes	Yes	Yes
R-Square	14.1%	13.4%	14.3%	13.4%	*R-Square*	13.6%	12.9%	13.8%	13.0%

5.3 Channel: ESG and Risk Vulnerability

Having investigated both the profitability channel and investor demand as factors in the positive relationship between ESG and returns, I now propose another potential mechanism: the risk vulnerability channel. The so-called risk vulnerability proxy measures how sensitive stock returns are to the studied risk index. This channel suggests that high-ESG firms, which generally exhibit lower susceptibility to geopolitical or energy risks (Fiorillo et al. (2024), Jiang et al. (2024)), might be more likely to gen-

Table 7: **E-CAPM Channel II: ESG and Trading Volume**

The table reports the regression results of ESG-related proxies on the investors' demands during the Ukraine-Russia crisis. The model is written as below:

$$Trading_i = c_0 + \lambda_j + c_1 ESG_i + c_2 Ln(Cap_i) + c_3 P/B_i + c_4 MKT_i + s_i \quad (8)$$

Panel A shows the results where the trading volume on the Ukraine-Russia crisis onset month is treated as the dependent variable. Panel B, C and D show the results where the dependent variable is the trading volume in the following 3, 6 and 12 months respectively. ESG-related proxies are measured at the month end of January, 2021. *ESG* stands for the logarithmic overall ESG score, whilst *E-Pillar*, *S-Pillar* and *G-Pillar* represents the logarithmic Environmental, Social and Governance Pillar respectively. As control variables, *Ln(Cap)* is the logarithmic market capitalization and *P/B* is the Price-to-Book ratio, which are measured at the month end of January, 2022. *MKT* is the market *beta* derived from regressions on the MKT factor 60 months before the crisis. Industry Dummies λ_j are set on the GICS Sector level. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Panel A: $Trading_{t=0}$					**Panel B:** $\overline{Trading}_{t=[0,3]}$				
Variables	(1)	(2)	(3)	(4)	Variables	(1)	(2)	(3)	(4)
ESG	-0.078*				*ESG*	-0.087*			
E-Pillar		-0.032**			*E-Pillar*		-0.034**		
S-Pillar			-0.025		*S-Pillar*			-0.034	
G-Pillar				-0.044	*G-Pillar*				-0.038
Ln(Cap)	0.630***	0.634***	0.613***	0.612***	*Ln(Cap)*	0.652***	0.656***	0.636***	0.631***
P/B	-0.005	-0.005	-0.003	-0.002	*P/B*	-0.005	-0.006	-0.004	-0.003
MKT	0.111***	0.110***	0.111***	0.110***	*MKT*	0.096***	0.095***	0.097***	0.096***
Industry Dummies	Yes	Yes	Yes	Yes	*Industry Dummies*	Yes	Yes	Yes	Yes
R-Square	39.3%	39.3%	39.2%	39.2%	*R-Square*	41.1%	41.2%	41.0%	41.1%
Panel C: $\overline{Trading}_{t=[0,6]}$					**Panel D:** $\overline{Trading}_{t=[0,12]}$				
Variables	(1)	(2)	(3)	(4)	Variables	(1)	(2)	(3)	(4)
ESG	-0.090*				*ESG*	-0.082*			
E-Pillar		-0.038**			*E-Pillar*		-0.034**		
S-Pillar			-0.036		*S-Pillar*			-0.024	
G-Pillar				-0.035	*G-Pillar*				-0.042
Ln(Cap)	0.659***	0.666***	0.642***	0.637***	*Ln(Cap)*	0.648***	0.654***	0.630***	0.630***
P/B	-0.001	-0.002	0.000	0.002	*P/B*	0.001	0.001	0.003	0.003
MKT	0.091***	0.089***	0.091***	0.090***	*MKT*	0.079***	0.078***	0.080***	0.078***
Industry Dummies	Yes	Yes	Yes	Yes	*Industry Dummies*	Yes	Yes	Yes	Yes
R-Square	41.9%	42.0%	41.8%	41.8%	*R-Square*	41.1%	41.2%	41.0%	41.0%

erate higher stock returns. In this context, companies with strong ESG profiles would be protected from the geopolitical conflict, as their higher sustainability participation could mitigate to the negative impact of geopolitical and energy shocks ((Yang et al. (2024), Tsang et al. (2024))). Through investigating the risk vulnerability channel, this subsection is made to determine whether lower risk vulnerability serves as an additional cause behind the better performance of high-ESG firms during Ukraine-Russia war.

As the nature of Ukraine-Russia war is a geopolitical conflict and an energy in-

cident, two risk vulnerabilities are worth investigating: the GeoPolitical Risk (GPR) and the Energy Risk (ER). Figure 3 shows the time trend of these two risk proxies on a daily basis from January 2021 to June 2024, where geopolitical risk is represented by the index by Caldara and Iacoviello (2022)[8] and energy risk is represented by the volatility of Brent Crude Oil return on a 21-day rolling window. The geopolitical risk (in blue) reaches its peak as soon as Russia announced a war on February 24, 2022, reflecting the rapid escalation of the geopolitical tensions. However, the Energy Risk index gives a delayed response, as it reaches the local maximum at the end of March. This lag implies that the negative impact on the energy market, especially on the energy supply, brought by the political conflict, cumulates over the first month and soon reaches at its peak on March 29th, 2022. During such a period with soaring risk in both geopolitical and energy aspect, firms' resilience to these risks could vary and this difference would potentially further cause the difference in returns.

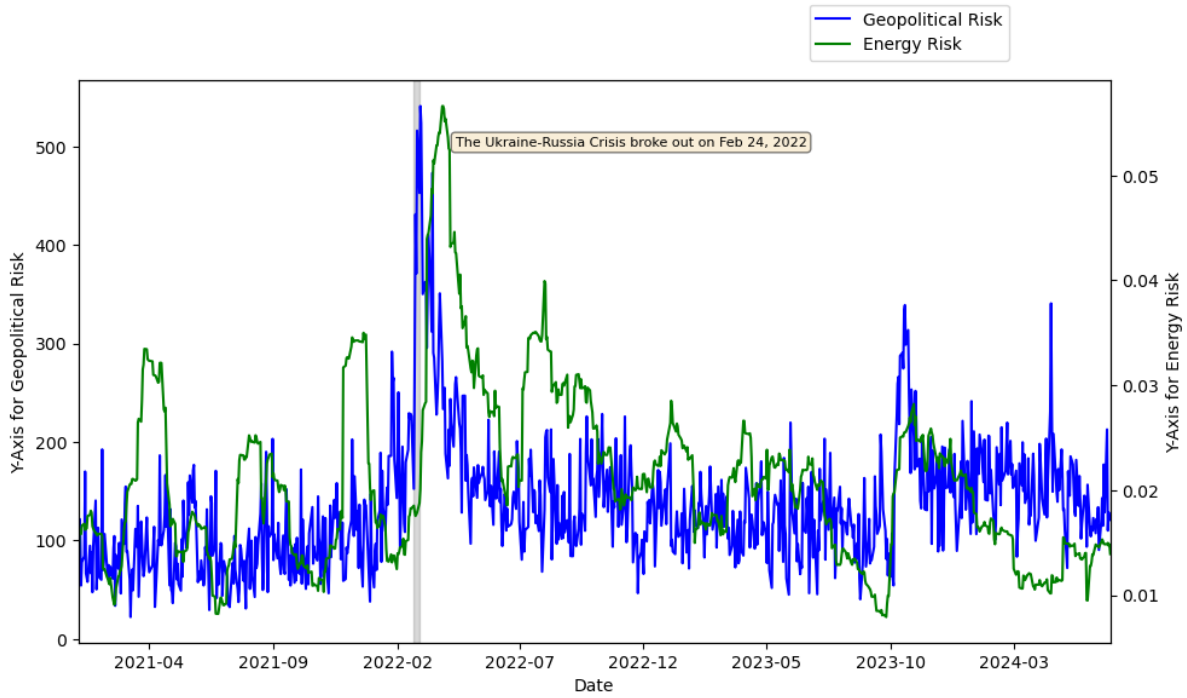

Figure 3: Geopolitical Risk and Energy Risk

The figure presents the daily Geopolitical Risk (in blue) and Energy Risk proxy (in green) from January 2021 to June 2024. The geopolitical risk index, constructed by Caldara and Iacoviello (2022), is obtained from Matteo Iacoviello's website, while the energy risk proxy is represented by the volatility of Brent Crude Oil return on a 21-day rolling window. The shaded area stands for the onset of the Ukraine-Russia crisis.

Companies' geopolitical risk and energy risk vulnerability are measured follow-

[8]The geopolitical risk index is provided at Matteo Iacoviello's website.

ing the process below. First, an AR-based model with return $R_{i,t}$ and risk proxy $Risk$ is established to measure the geopolitical risk exposures on the current month t and the lagged month $t-1$. The model is written as:

$$Risk_t = \psi_0 + \psi_1 Risk_{t-1} + \chi_t \tag{9}$$

Then the stock return $r_{i,t}$ is regressed on residuals χ_t and χ_{t-1}:

$$r_{i,t} = \phi_{[0]} + \phi_{[1],i}\chi_t + \phi_{[2],i}\chi_{t-1} + \phi_{[3],i}MKT_t + \xi_{i,t}, \tag{10}$$

where $Risk_t$ stands for the studied risk proxy and the market factor is written as MKT_t. Both monthly data and daily data in the 12 post-event months are fitted.[9] Based on regression results of Equation 10, the risk vulnerability is calculated in next step[10], which is written as:

$$Vul_{i,t} = |\phi_{[1],i} + \phi_{[2],i}| \tag{11}$$

As highlighted in Table 8, there is indeed a negative correlation between ESG-related scores and vulnerability to both geopolitical risk and energy risk, measured both monthly ($[m]$) and daily ($[d]$) data. During the Ukraine-Russia conflict, the companies with better ESG performance are less susceptible to these risk aspects, confirmed by the negative correlations between ESG score with both geopolitical risk (-0.1694 for monthly and -0.2290 for daily) and energy risk (-0.2324 for monthly and -0.2704 for daily). These correlations suggest that firms with higher ESG scores tend to exhibit lower risk exposure. Among the three pillars, Environmental Pillar has the strongest negative correlations with both geopolitical risk and energy risk vulnerability, especially with the energy risk (-0.2999) estimated daily. Although this correlation slightly weakens while shifting to daily, it still highlights the importance of the environment-friendly actions in reducing vulnerability to energy-related disruptions.

The relationship between geopolitical risk and ESG is further examined in Table 9, by running cross-sectional regressions on ESG-related proxies and the geopolitical risk Vulnerability, with the vulnerability measured over the monthly estimations (in Panel A) and daily estimations (in Panel B) after the onset of the Ukraine-Russia conflict. The overall ESG score shows a significant negative relationship with risk vulnerability (with coefficient as -0.124 in monthly data and -0.148 in daily data), which comes from the nagative impact from G pillar, as it exhibits the strongest and most consistent effect across both monthly (-0.138) and daily (-0.128). This implies that firms with higher governance pillar score could better mitigate geopolitical risks. Firms' geopolitical risk resilience also significantly benefits from the environmental performance with the monthly coefficient as -0.048 and the daily coefficient as

[9]The monthly energy risk index is calculated as the intra-month volatility of the Brent Crude Oil return.

[10]During the estimation window, stocks without more than 6-month valid data are excluded.

Table 8: **Correlation Matrix of ESG and Risk Vulnerability**

This table reports the Pearson correlation coefficients between ESG, its pillars, Geopolitical Risk vulnerability (GPR) and Energy Risk vulnerability (GPR). $GVul_i^{[m]}$ and $EVul_i^{[m]}$ are the geopolitical risk vulnerability and energy risk vulnerability of *i*-th company estimated on the Equation 10 from monthly data from February, 2022, to February, 2023, while $GVul_i^{[d]}$ and $EVul_i^{[d]}$ follow a similar construction yet from the daily data. ESG-related proxies are measured at the month end of January, 2021. *E*, *S* and *G* represents the logarithmic Environmental, Social and Governance Pillar respectively.

	ESG	*E*	*S*	*G*	$GVul_i^{[m]}$	$GVul_i^{[d]}$	$EVul_i^{[m]}$	$EVul_i^{[d]}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG	1.0000	0.7658	0.8629	0.7361	-0.1694	-0.2290	-0.2324	-0.2704
E		1.0000	0.6391	0.4288	-0.1971	-0.2555	-0.2660	-0.2999
S			1.0000	0.4006	-0.1062	-0.1589	-0.1666	-0.2212
G				1.0000	-0.1479	-0.1901	-0.1983	-0.1947
$GVul_i^{[m]}$					1.0000	0.3316	0.2175	0.1209
$GVul_i^{[d]}$						1.0000	0.2341	0.3318
$EVul_i^{[m]}$							1.0000	0.2687
$EVul_i^{[d]}$								1.0000

-0.034. Other results of control variables exhibit a significant negative impact of market capitalization and profitability on the geopolitical risk vulnerability, suggesting that larger or more profitable companies bear lower exposure to the geopolitical risk.

The results so far explain the source of excess return superiority by applying the high-low-governance strategy during the geopolitical conflict, leaving the positive environmental premium unexplained. Regarding this premium, Table 10 provides a possible explanation, demonstrating that a better environment-side performance could help mitigate the energy risk. This table presents the regression result where the energy risk vulnerability over monthly data (in Panel A) and daily data (in Panel B) following the Ukraine-Russia conflict is the dependent variable. A higher ESG score is related with lower energy risk vulnerability, with the coefficient on the daily vulnerability being -1.79% and slightly weaker to -1.73% on a monthly horizon. Among the three pillars, the impact of G-Pillar is pronounced with the coefficient on the monthly measure as -0.154 and daily one as -0.109. The role of Environmental Pillar is stable throughout the conflict, with a significant coefficient as -6.0%, which is slightly stronger than that (-5.9%) over daily measure. This potentially accounts for the stronger protection role of Environmental Pillar on returns mostly in the initial stage of crisis. However, the S-Pillar does not show similarly consistent impact.

Table 9: **Channel: ESG and Geopolitical Risk Vulnerability**

The table reports the regression results of ESG-related proxies on the geopolitical risk vulnerability during the Ukraine-Russia crisis, with the following model:

$$GVul_i = l_0 + \lambda_j + l_1 ESG_i + l_2 Ln(Cap_i) + l_3 P/B_i + l_4 Lev_i + l_5 Prof_i + l_6 Cash_i + \eta_i \quad (12)$$

$GVul_i^{[m]}$ shown in Panel A is the geopolitical risk vulnerability of *i*-th company estimated on the Equation 10 from monthly data from February, 2022 to February, 2023, while $GVul_i^{[d]}$ in Panel B follows a similar construction yet from the daily data. ESG-related proxies are measured at the month end of January, 2021. *ESG* stands for the logarithmic overall ESG score, whilst *E-Pillar*, *S-Pillar* and *G-Pillar* represents the logarithmic Environmental, Social and Governance Pillar respectively. As control variables, *Ln(Cap)* is the logarithmic market capitalization and *P/B* is the Price-to-Book ratio, which are measured at the month end of January, 2022. Industry Dummies λ_j are set on the GICS Sector level. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Panel A: $GVul_i^{[m]}$					**Panel B:** $GVul_i^{[d]}$				
Variables	(1)	(2)	(3)	(4)	Variables	(5)	(6)	(7)	(8)
ESG	-0.124**				*ESG*	-0.148***			
E-Pillar		-0.048**			*E-Pillar*		-0.034*		
S-Pillar			0.011		*S-Pillar*			-0.043	
G-Pillar				-0.138***	*G-Pillar*				-0.128***
Ln(Cap)	-0.108***	-0.104***	-0.148***	-0.122***	*Ln(Cap)*	-0.154***	-0.170***	-0.185***	-0.159***
P/B	0.033	0.033	0.039	0.038	*P/B*	-0.007	-0.005	-0.004	-0.002
Leverage	0.013	0.016	0.008	0.005	*Leverage*	0.091***	0.091***	0.089***	0.082***
Profitability	-0.083***	-0.082***	-0.081***	-0.080***	*Profitability*	-0.112***	-0.110***	-0.111***	-0.109***
Cash	0.058*	0.052	0.067**	0.055	*Cash*	0.126***	0.127***	0.136***	0.126**
Industry Dummies	Yes	Yes	Yes	Yes	*Industry Dummies*	Yes	Yes	Yes	Yes
R-Square	8.7%	8.8%	8.5%	9.0%	*R-Square*	15.3%	15.1%	14.9%	15.4%

Table 10: **Channel: ESG and Energy Risk Vulnerability**

The table reports the regression results of ESG-related proxies on the energy risk vulnerability during the Ukraine-Russia crisis, with the following model:

$$EVul_i = g_0 + \lambda_j + g_1 ESG_i + g_2 Ln(Cap_i) + g_3 P/B_i + g_4 Lev_i + g_5 Prof_i + g_6 Cash_i + \omega_i \quad (13)$$

$EVul_i^{[m]}$ shown in Panel A is the geopolitical risk vulnerability of *i*-th company estimated on the Equation 10 from monthly data from February, 2022 to February, 2023, while $EVul_i^{[d]}$ in Panel B follows a similar construction yet from the daily data. ESG-related proxies are measured at the month end of January, 2021. *ESG* stands for the logarithmic overall ESG score, whilst *E-Pillar*, *S-Pillar* and *G-Pillar* represents the logarithmic Environmental, Social and Governance Pillar respectively. As control variables, *Ln(Cap)* is the logarithmic market capitalization and *P/B* is the Price-to-Book ratio, which are measured at the month end of January, 2022. Industry Dummies λ_j are set on the GICS Sector level. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Panel A: $EVul_i^{[m]}$					**Panel A:** $EVul_i^{[d]}$				
Variables	(1)	(2)	(3)	(4)	Variables	(5)	(6)	(7)	(8)
ESG	-0.193***				*ESG*	-0.185***			
E-Pillar		-0.060***			*E-Pillar*		-0.059***		
S-Pillar			-0.095*		*S-Pillar*			-0.126**	
G-Pillar				-0.154***	*G-Pillar*				-0.109***
Ln(Cap)	-0.094***	-0.102***	-0.123***	-0.127***	*Ln(Cap)*	-0.200***	-0.205***	-0.216***	-0.237***
P/B	0.006	0.007	0.008	0.013	*P/B*	0.025	0.026	0.025	0.032
Leverage	0.023	0.025	0.023	0.012	*Leverage*	0.086***	0.088***	0.089***	0.077***
Profitability	-0.073**	-0.071**	-0.073**	-0.069**	*Profitability*	-0.084***	-0.082***	-0.086***	-0.080***
Cash	0.161***	0.156***	0.172***	0.162***	*Cash*	0.100***	0.095***	0.109***	0.103***
Industry Dummies	Yes	Yes	Yes	Yes	*Industry Dummies*	Yes	Yes	Yes	Yes
R-Square	11.4%	11.3%	11.0%	11.5%	*R-Square*	18.6%	18.6%	18.4%	18.4%

6 Conclusion

This study reveals that firms with superiority in certain ESG pillars, especially the Environmental Pillar, achieved higher returns than their low-ESG counterparts during the first months of Ukraine-Russia Crisis. This effect is also seen in the Social Pillar in the early stage of the crisis, positively affecting cumulative crisis returns within the first three months before fading away over time. The DiD analysis confirms the positive ESG-return linkage shift in the crisis especially in its initial phase. Furthermore, based on the E-CAPM theory proposed by Pedersen et al. (2021), this paper examines the potential mechanisms behind this return anomaly, finding that the fundamental channel holds greater significance than the investor demand channel. This suggests that ESG-unaware investors dominated in the U.S. financial market during the crisis period. Additionally, this study purports that firms' varying geopolitical and energy risk vulnerability contribute to the observed ESG effect. Particularly, firms' better performance in Governance and Environmental pillar appear to enhance the resiliency in stock returns against geopolitical and energy shocks, respectively, during the geopolitical conflict.

This paper contributes to the sustainable finance field and geopolitical finance research. First, it provides a robust analysis of the ESG-return relationship in the context of a large-scale geopolitical- and energy-level crisis. It also offers insights into the role of ESG performance in enhancing firm resilience during a geopolitical shock. Based on the existing E-CAPM theory, the study extends the sustainable pricing literature by including ESG as a potential risk factor linked with geopolitical events, which provides a more comprehensive view of risk-adjusted returns in a sustainability context. Furthermore, the study emphasizes that single ESG pillars - E and G pillar - are key variables affecting the geopolitical or energy risk resilience. This finding contributes to the existing literature in the role of ESG in financial stability. Overall, the results thus provide empirical evidence for both investors and policymakers who seek to promote sustainable and geopolitically-immune business practices.

Future research could build upon this work by exploring the ESG-relationship across other energy or geopolitical events, where the consistency of the ESG's protective effect under varying conditions could be evaluated and compared. Additionally, industry-specific studies could be made to clarify whether the protection effect vary across different sectors.

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Online Appendix to the paper titled *ESG and Geopolitics: Stock Returns in the Ukraine-Russia Conflict*

A DiD Analysis with Continuous ESG Measures

Table 11: **Continuous ESG and Crisis Return: Difference-in-Difference (DiD) Analysis**

The table reports the Difference-in-Difference regression results of the cumulative crisis returns on the ESG proxies from January 2021 to February 2023.The model is written as follows:

$$r_{i,t} = \beta_0 + \beta_1 ESG_i C_t + \sum_{k=1}^{5} \gamma_k X_{i,t-1}^{[k]} + \sum_{m=1}^{6} \delta_m F_{i,t-1}^{[m]} + \tau_t + \zeta_i + \epsilon_{i,t} \tag{14}$$

The sample includes non-energy or non-financial companies listed in the U.S. stock market with available return, ESG and control variable data from the LSEG Refinitiv Workspace. $r_{i,t}$is the cumulative stock return of the *i*-th firm at *t*-th post-event month. ESG-related proxies are measured at the month end of January, 2021. *E*, *S* and *G* represents the logarithmic Environmental, Social and Governance Pillar respectively. C_t is the conflict event dummy, which equals 1 from February 2022 to February 2023 and otherwise 0. All the control variables in the model are chosen and processed similarly as in Table 3. Returns are winsorized at the 0.5-th and 99.5th percentile. Significance level is noted as *** p<0.01, ** p<0.05, *p<0.1.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$ESG \times Conflict$	0.0062***	0.0162***						
$E \times Conflict$			0.0017***	0.0074***				
$S \times Conflict$					0.0049***	0.0157***		
$G \times Conflict$							0.0059***	0.0154***
Ln(Cap)	-0.0521***	-0.0630***	-0.0523***	-0.0661***	-0.0518***	-0.0624***	-0.0523***	-0.0635***
Cash	0.0315***	0.0414***	0.0314***	0.0378***	0.0318**	0.0419***	0.0312***	0.0406***
BM	0.0022	0.0042	0.0021	0.0043	0.0023	0.0046	0.0020	0.0035
Leverage	-0.0129	-0.0167	-0.0123	-0.0136	-0.0134	-0.0180	-0.0135	-0.0183
Profitability	0.1983***	0.2171***	0.1977***	0.2152***	0.1984***	0.2167***	0.1999***	0.2213***
FF. Factor Loadings	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Entity Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	Month	Year	Month	Year	Month	Year	Month	Year
Adj. R-Square	25.6%	5.9%	25.6%	5.5%	25.6%	5.8%	25.6%	5.9%

Hereafter, I do a robustness check with the continuous ESG proxies. Unlike the traditional binary variable indicating a treatment group and a control group, I hereby assign the pre-event ESG-related scores ESG_i, which stand for the intensity of receiving treatment, as the independent variable which will interact with C_t in the following DiD regression model: In the analysis, both month dummy and year dummy are applied, with the former one controlling the intra-annual effects and the latter one

leaving more return variations for independent variables to explain. Table 11 presents the results of the Difference-in-Differences (DID) analysis on the ESG score and single pillars. While controlling both time effects, the interaction variable $ESG \times Conflict$ is able to significantly explain the return variation during the Ukraine-Russia conflict, with the coefficients in Column (1) and (2) being 0.62% and 1.62% under the monthly and year fixed effect respectively. This evidence aligns with previous findings, suggesting that the return-ESG relationship shifts before and after the Ukraine war declaration, with this change showing a positive trend. A further pillar decomposition from Column (3) to Column (8) implies that the impacts of E, S and G pillar on the return contribute to this positive movement since February 2022. For example, while controlling the monthly fixed effect, one-unit rise in E-pillar, S-pillar and G-pillar score could result in 0.17%, 0.49% and 0.59% higher return during the conflict. This effect remains consistent even when controlling for annual variations by including year dummies, where a one-unit increase in the E-pillar, S-pillar, and G-pillar scores is associated with a 0.74%, 1.57%, and 1.54% increase in returns, respectively, during the conflict period. This return improvement brought by the ESG outperformance is uniquely observed throughout the studied period.