The Influence of Maritime Freight Cost Tail Risk on Publically Traded Transport Companies

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Abstract

This study examines the influence of maritime freight cost tail risk events on transportation-related stock market prices. Our findings reveal a significant asymmetry: extreme negative movements in these indices have a disproportionately large adverse impact on stock returns compared to extreme positive movements. As these indices serve as barometers of global economic health, sharp declines signal contractions in global demand, fuelling investor apprehension. These concerns outweigh the potential benefits of lower input costs for most firms. We also uncover substantial heterogeneity amongst stock responses. Notably, owing to their perceived higher risk, smaller firms and those with ESG controversies are more severely impacted by these negative tail-risk events. Further, we also find that strong ESG commitments are sometimes beneficial during negative tail risk events, but not always. We attribute the observed detrimental effects of strong ESG commitments to heightened investor concern about the additional operational costs and regulatory compliance required to meet these commitments during challenging market conditions. Our results suggest companies take proactive steps to address investor concerns about the cost of ESG commitments. By doing so, companies can ensure that their pursuit of sustainability and responsibility does not conflict with their financial objectives and market resilience.

Keywords: ESG; Corporate Resilience; Commodities; Tail risk; Transportation Costs.
JEL Classifications: G14; G32; Q02; Q56; L91.

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1. Introduction

Recent geopolitical crises have highlighted the critical role of shipping costs in shaping global economic dynamics and asset valuations [Drobetz et al., 2021, Nomikos and Tsouknidis, 2023]. The Red Sea crisis, for instance, saw Maersk's share price surge while Tesla and Volvo experienced declines, as component shortages forced the auto-makers to pause production [Notteboom et al., 2024]. These contrasting outcomes underscore the significant influence of shipping costs on corporate performance and investor decision-making. Historically, sharp appreciation of shipping costs has been driven by diverse factors, including geopolitical tensions, fluctuations in commodity demand, variations in ship supply, and changes in oil prices [Di Giovanni et al., 2022, Isaacson and Rubinton, 2023, Carrière-Swallow et al., 2023, Pouliasis and Bentsos, 2024]. Such increases are often categorised into supply shocks, which stem from disruptions to shipping capacity, and demand shocks, which reflect heightened demand for shipping services. This research explores whether stocks of industrial firms within G20 nations act as shock havens during periods of extreme shipping cost volatility. Moreover, it investigates whether shock haven status is universal or contingent on firm characteristics, offering critical insights into the resilience of firm share prices under varying market conditions.

Corporations experience differential impacts from tail risks in shipping costs due to variations in their exposure to global trade dynamics, logistical dependencies, and operational structures. The Baltic Exchange Indices, which track freight rates for various vessel sizes and commodities, serve as a robust indicator of these risks [Gómez-Valle et al., 2021, Padhan et al., 2024]. These indices capture fluctuations in transportation costs driven by factors such as demand for bulk commodities, geopolitical tensions, and energy prices. Companies reliant on bulk materials or those with extensive international supply chains are more vulnerable to sharp increases in shipping costs [Barnes and Oloruntoba, 2005, Waters, 2011], which elevate input expenses and disrupt production timelines. Conversely, firms operating in sectors with low logistical dependencies or strong regional focus may exhibit resilience to these fluctuations.

The differential impact also stems from corporate characteristics, including size, Environmental, Social, and Governance (ESG) preparedness, and geographic reach [Akyildirim et al., 2022, Akyildirim and Corbet, 2024, Hussain et al., 2023, Kyriazis et al., 2024, Conlon et al., 2024, Xu et al., 2024, Goodell et al., 2024]. Larger firms may buffer tail risks through diversified sourcing and economies of scale, while smaller firms often lack such flexibility [Borri, 2019, Chaudhry et al., 2022, Lang et al., 2024, Hu et al., 2024, Xu et al., 2024], making them more susceptible to cost volatility. Similarly, strong ESG performance can provide both a shield, through enhanced investor confidence, and a liability, as firms with stringent sustainability commitments face higher compliance costs during periods of heightened market volatility. By employing the Baltic Exchange Indices as a benchmark, this study provides detailed insights into the sectoral and regional variability of corporate responses to extreme shipping cost shocks. Such work is particularly important when considering that the global shipping industry has faced unprecedented disruptions in recent years, driven by extreme events such as the COVID-19 pandemic [Choquet and Sam-Lefebvre, 2021, Bai et al., 2022, Meng et al., 2023, Chen et al., 2023], geopolitical conflicts [Pangalos, 2023], and escalating protectionist policies. The COVID-19 pandemic triggered severe supply chain bottlenecks, exposing vulnerabilities in global trade logistics and amplifying volatility in transportation costs. Simultaneously, geopolitical tensions, such as terrorist acts and trade disputes, have exacerbated uncertainties, reshaping global shipping patterns and creating contagion effects across industries reliant on stable freight rates. These disruptions underscore the critical role of robust ESG practices in corporate risk management, as firms with strong ESG performance often demonstrate greater resilience to such shocks [Scrimgeour et al., 2024, Meehan and Corbet, 2025]. However, implementing ESG principles is complicated by the differential regulatory standards across regions, as the countries studied in this research represent a diverse array of governance structures, sustainability priorities, and enforcement capabilities. This diversity highlights the pressing need for harmonised international regulations and adopting good corporate ethics, enabling firms to better navigate the challenges posed by extreme market events while contributing to sustainable economic growth.

Specifically, this research aims to investigate the effects of extreme tail risk movements in maritime freight indices, specifically the Baltic Exchange indices, on the stock returns of industrial companies classified under the Thomson Reuters Business Classification (TRBC) sectors of Industrial & Commercial Services, Industrial Goods, and Transportation across G20 nations. By comparing these impacts with similar tail risk shocks stemming from energy and agricultural commodities, representing energy costs and raw material costs, respectively, this research seeks to understand which market volatilities affect corporate performance. Furthermore, this research examines how corporate characteristics such as ESG scores and market capitalisation moderate the influence of extreme transportation and commodity price movements on stock returns. This involves analysing whether strong ESG performance and larger firm size act as defensive mechanisms or preparedness measures that can mitigate the adverse effects of external tail risk events. Ultimately, we aim to determine whether stock returns respond differently across sectors when subjected to extreme price movements in both transportation and commodity markets and to identify the industry-specific factors that shape these responses. Furthermore, the investigation into ESG scores and firm size as moderating variables connects the findings to established theories of corporate resilience and risk management, offering insights into how firm-level characteristics amplify or mitigate exposure to extreme market conditions.[1] By identifying the heightened sensitivity of firms to tail events in commodity prices, the findings highlight the significant role of ESG factors in moderating corporate responses to market volatility, emphasising the need for robust ESG practices to mitigate risks. Understanding that smaller firms are more vulnerable to extreme commodity price movements due to limited resources, amongst a variety of other explanatory factors, underscores the necessity for targeted policies.

The key results of this research demonstrate that industrial corporations are sensitive to extreme price variations in commodity markets, with a pronounced susceptibility to tail events in transportation costs as measured by the Baltic Exchange indices. Specifically, sharp declines in transportation cost indices (negative tail events) exert a more substantial adverse impact on corporate returns than positive tail events, signalling to investors a weakened global trade demand and heightened operational risks. The study further reveals that ESG characteristics critically influence corporate responses to these tail risks. Firms embroiled in ESG controversies experience amplified negative effects during extreme market conditions, indicating that such controversies heighten investor apprehension and perceived risk. High environmental and governance scores are associated with increased vulnerability to commodity price extremes, possibly due to the additional operational costs of upholding ESG commitments. Moreover, corporate size emerges as a vital factor, with smaller firms facing greater financial stress in response to extreme commodity price movements, reflecting their limited resources and capacity to absorb shocks compared to larger firms. Overall, the findings underscore the pivotal role of transportation costs in industrial sectors and highlight how ESG performance and firm size shape corporate resilience to extreme commodity price volatility.

The rest of this paper proceeds as follows: Section 2 provides a concise overview of the key research that provides a foundation for this research's theoretical and empirical focus. Section 3 presents clear oversight of the shipping cost and commodity market data used in this analysis and how it has been aligned with respective stock market data to conduct the methodological processes presented. Section 4 presents the results of the analyses conducted, while Section 5 provides a thorough discussion surrounding this work's policy and regulatory implications, along with several directions for future research. Finally, Section 6 concludes.

[1]This approach aligns with and builds upon prior literature, which emphasises the importance of ESG and operational scale in shaping investor perceptions during periods of uncertainty. The integration of these factors into the analysis not only addresses gaps in understanding the heterogeneity of corporate responses to tail risks but also provides a cohesive framework that links these responses to broader macroeconomic and geopolitical influences, thereby offering a significant theoretical contribution to the field.

2. Previous Literature

The Baltic Exchange products, particularly its indices, have become an important barometer when attempting to understand the dynamics of global trade, economic activity, and financial risk, serving as critical signals of maritime and broader market behaviours. The Baltic Dry Index (BDI) strongly reflects global trade and economic activity, with its volatility in both dry bulk and tanker markets closely tied to macroeconomic shocks and asymmetric effects [Drobetz et al., 2012, Padhan et al., 2024]. The BDI's ability to predict long-term currency movements by reflecting global trade fundamentals further emphasises its significance as a leading indicator [Said and Giouvris, 2019, Han et al., 2020]. The interdependencies among Baltic indices, particularly the Baltic Handysize Index's centrality in transmitting market shocks, challenge traditional diversification strategies, suggesting limited hedging opportunities within maritime freight markets [Pourkermani, 2023]. Similarly, the Baltic Dirty Tanker Index has demonstrated its utility in explaining energy market volatility, showcasing the interconnectedness between maritime freight costs and global energy dynamics [Nikitopoulos et al., 2023]. Forward Freight Agreements (FFAs), priced based on Baltic indices, benefit significantly from innovative modelling approaches; Gómez-Valle et al. [2021] demonstrated that non-parametric techniques improve pricing accuracy by capturing risk-neutral freight rate dynamics, while Sel and Minner [2022] highlighted cost-efficient probabilistic forecasting models that leverage these indices. The COVID-19 pandemic underscored the dynamic relationship between Baltic indices and shipping financial performance, revealing altered correlations and heightened risks in response to global disruptions [Koutoupis et al., 2022]. Furthermore, the BDI's central role in connecting economic activity, policy uncertainty, and commodity price dynamics highlights its integration within broader macroeconomic frameworks [Said and Giouvris, 2019, Padhan et al., 2024]. Collectively, these findings position Baltic Exchange products as pivotal to further our understanding of the complex interplay of global trade, energy markets, financial risks, and economic shocks.

Previous research on tail risk analysis has unveiled significant interconnections across financial markets, demonstrating its critical influence on systemic stability and investment strategies. Wong [2010] critiques the limitations of traditional Value-at-Risk (VaR) models, proposing a saddlepoint approach to better account for extreme losses, while Orlowski [2012] highlights heightened tail risks in European interbank lending during the Global Financial Crisis, underscoring systemic vulnerabilities. Chiu et al. [2015] extend this understanding by showing that tail risk spillovers from financial sectors disproportionately affect highly indebted, low-valuation real economy sectors, particularly in crisis periods. Muteba Mwamba et al. [2017] reveal that Islamic stock markets, with thinner left tails, demonstrate superior resilience and diversification benefits compared to conventional markets during extreme events, while Aboura and Chevallier [2018] add that tail risks significantly shape dynamic feedback and leverage effects in equity markets, particularly through volatility of volatility (VVIX). Gatfaoui [2019] demonstrates the diversification potential of energy commodities by employing regime-dependent tail risk minimisation portfolios, while Gong et al. [2019] identify robust tail dependencies in crude oil futures markets using dynamic copula-GARCH models to enhance hedging efficiency. Zhang et al. [2023] find that weather conditions exacerbate tail risks in U.S. commodity markets, affecting systemic interdependence across energy, agriculture, and metals. Similarly, Gong et al. [2023] show how geopolitical risks amplify tail risk spillovers in energy markets, particularly during crises involving key economies like Russia. In cryptocurrency markets, Nguyen et al. [2020] use LASSO quantile regression to map stronger right tail dependencies, reflecting market euphoria, with Bitcoin and Ethereum driving tail risk during upswings and downturns.

Wong [2010] highlights the need for advanced tail risk measures in financial systems, while Conlon et al. [2024] explore how investor sentiment and unexpected inflation intensify tail risks in Bitcoin basis risk, offering insights into the interplay between cryptocurrencies and traditional markets. Foglia and Angelini [2020] focus on tail risk interconnections in the Eurozone banking system, demonstrating the centrality of shadow banking and its systemic role. Abduraimova [2022] provides evidence of persistent tail risk contagion across global financial networks, while Chen et al. [2022] detail asymmetric tail risk dependencies among energy, metal, and carbon markets, offering strategies for hedging in extreme conditions. Liu et al. [2021] emphasise dynamic tail risk spillovers between oil and stock markets, showing asymmetric effects across exporting and importing economies.

Recent empirical research on the financial implications of ESG disasters provides critical insights into the stock market and corporate financial responses. High ESG-rated firms generally demonstrate resilience against stock price crash risks during geopolitical uncertainties [Fiorillo et al., 2024], while reputational risks significantly erode market longevity and corporate performance, emphasizing the need for robust ESG frameworks [Fafaliou et al., 2022]. Strong ESG practices mitigate managerial misconduct and improve governance quality, particularly under heightened analyst scrutiny [He et al., 2022]. During crises, robust ESG profiles in sectors like aviation and food production buffer negative financial impacts, although smaller firms often face disproportionate and prolonged declines due to limited resources [Zhou et al., 2024, Scrimgeour et al., 2024]. ESG rating agencies play a pivotal role in curbing corporate violations, reducing financial penalties and enhancing investor confidence in compliance practices [Tsang et al., 2024]. However, incidents like greenwashing or regulatory ambiguities, such as those post-Brexit, weaken investor sensitivity to

ESG factors, altering market responses and accountability expectations [Akyildirim et al., 2024, Sun et al., 2024]. In highly visible industries like aviation, reputational damages tied to ESG issues, especially during economic downturns, result in substantial variance in returns and cross-industry contagion [Akyildirim et al., 2023, 2025]. Lastly, discrepancies in ESG scores during scandals highlight that strong ESG profiles attract higher scrutiny, leading to amplified financial repercussions, even as they provide long-term resilience [Sun et al., 2024, Zhou et al., 2024].

The evolving landscape of ESG preparedness underscores its critical role as a multidimensional framework for enhancing resilience, mitigating systemic and geopolitical risks, and driving sustainable growth across corporate and global contexts. Specifically, ESG compliance is shown to mitigate systemic risk and contagion during financial stress, providing stability in volatile markets [Cerqueti et al., 2021, Xu et al., 2023]. Social and environmental risks emerge as critical dimensions of ESG, with significant implications for stock returns, investor confidence, and overall corporate valuation [Cohen, 2023, Xu et al., 2023, Bax et al., 2023]. Meanwhile, ESG ratings enhance portfolio diversification by revealing nuanced dependencies between corporate behaviours and financial stability while simultaneously acting as an "equity vaccine" that fosters stock price resilience during crises such as the COVID-19 pandemic [Xu et al., 2023, Bax et al., 2023]. However, the relationship between ESG performance and firm growth is non-linear, with diminishing returns at higher levels of ESG investment, highlighting the need for strategic optimisation of ESG initiatives [Bagh et al., 2024]. ESG preparedness also demonstrates robust capacity to reduce geopolitical risk impacts and advance climate mitigation efforts, as evidenced by its influence on institutional governance, energy resilience, and carbon emissions reduction [Nguyen et al., 2023, Alam et al., 2024, Feng et al., 2024]. Additionally, governance quality plays a critical role in leveraging ESG to counteract the adverse effects of global uncertainties on achieving Sustainable Development Goals (SDGs), particularly Decent Work and Economic Growth (SDG 8) and Climate Action (SDG 13) [Nguyen et al., 2023, Alam et al., 2024]. ESG practices also bolster export resilience by alleviating financing constraints and enhancing corporate reputation, an effect amplified by digital transformation, underscoring its strategic importance in navigating external shocks [Ma et al., 2024, Bagh et al., 2024]. Collectively, these studies illuminate the multidimensional impact of ESG preparedness, framing it as both a shield against systemic and geopolitical risks and a catalyst for sustainable growth and resilience across corporate and macroeconomic domains.

3. Data and Empirical Methodology

3.1. Data

Stock market data is obtained from LSEG Eikon, specifically focusing on G20 nations using an industrially-denoted TRBC classification of Industrial & Commercial Services (including Construction & Engineering, Professional & Commercial Services, and Diversified Industrial Goods Wholesale), Industrial Goods (including Machinery, Tools, Heavy Vehicles etc and Aerospace & Defence) and Transportation (including Freight & Logistics Services, Transport Infrastructure and Passenger Transportation Services). Data is obtained for the period 1 January 2006 through 28 June 2024, with 5,288 companies used for analysis.

Insert Figure 1 about here

To analyse the presented research questions, we separate the selected transport cost and commodity market indices into groups. First, we focus on transportation costs, denoted as Group 1, consisting of the Baltic Exchange indices Dry Index (BADI), Capesize Index (BACI), Panamax Index (BPNI), Handysize Index (BHSI), Dirty Tanker Index (BAID) and Clean Tanker Index (BAIT). Such Baltic Exchange products are compared with selected Energy Commodities Indices, representative of international energy costs, including ICE Brent Crude (LCOc1), RBOB Gasoline (RBc1) and Natural Gas (Henry Hub) (NGc1), and Agricultural Commodities Indices representing international raw material costs including Soybeans (Sc1), Wheat (Wc1) and Corn (Cc1). The respective series of prices are presented in Figure 1. Key characteristics surrounding the analysed Baltic Exchange Indices and comparable energy and raw material markets are presented in Table 1. Specifically, the six Baltic indices, BDI, BCI, BPI, BHSI, BDTI, and BCTI, each provide critical insights into global shipping dynamics and their effects on various industries. The Baltic Dry Index (BDI), a composite measure of global dry bulk shipping, directly impacts sectors like construction and manufacturing by driving up costs through increased freight rates, affecting both imports of raw materials and exports of goods. The Baltic Capesize Index (BCI), which tracks large vessel rates for bulk commodities like iron ore and coal, influences industries such as aerospace and defence, where rising freight costs can disrupt supply chains and production schedules. The Baltic Panamax Index (BPI) reflects freight rates for mid-sized vessels that often carry grains and coal, shaping the profitability and pricing strategies of logistics, manufacturing, and wholesale sectors as firms adjust to fluctuating shipping costs. The Baltic Handysize Index (BHSI) monitors smaller vessel rates, which are essential for regional trade and supply chains and benefits industries like construction and smaller manufacturing, particularly in markets where access to larger ports is restricted. The

Baltic Dirty Tanker Index (BDTI), which tracks the transport costs of crude oil, has a significant effect on petroleum-dependent industries, especially construction and aerospace, by raising fuel and material prices, further straining margins. Finally, the Baltic Clean Tanker Index (BCTI), which tracks the movement of refined petroleum products such as gasoline and jet fuel, directly affects sectors reliant on fuel and energy, with fluctuating costs requiring dynamic pricing strategies and hedging measures to manage operational expenses and protect profitability.[2]

Insert Table 1 about here

Summary statistics surrounding the daily price movements of the selected indices are presented in Table 2. Mean returns for all indices are close to zero, emphasising inherently risk-heavy profiles, reinforced by high percentile extremes that highlight the potential for idiosyncratic tail-risk events rather than consistent returns across all indices, which may hold implications for risk-adjusted return strategies. The Baltic indices' varying skewness and kurtosis indicate differentiated sensitivity across shipping types to geopolitical and commodity price shocks, offering a basis for sector-specific risk hedging. BADI shows moderate skew (0.67) but significant kurtosis (7.49), indicating tail-heavy distributions, while combined with a relatively low estimated mean value, highlights the transportation sector fragility, where moderate volatility conceals the potential for sudden, large shocks in freight costs. Transportation cost indices such as BAID and BAIT present evidence of high kurtosis and negative skew in comparison to analysed energy commodities. Further, the high kurtosis in the BAIT index (72.54) illustrates refined product transport costs' sensitivity to sharp energy price elevation, or more specifically, heavy-tailed risk in clean tanker transportation costs, which may have disproportionate effects on energy-intensive sectors like manufacturing. Percentile analysis shows BPNI and BHSI to have tightly clustered returns, reducing extreme tail risk. Broadly, the other analysed transportation cost indices perform in a similar manner; BACI experiences quite elevated summary statistics in comparison to other products due to its exposure to the negative WTI oil price events.[3] BACI was particularly exposed, as evidenced in the extremely negative skew (-7.54) and high kurtosis (669.38) in comparison to other examined metrics of transportation cost, with evidence of direct exposure to this singular event presented in minimum, maximum and ex-

[2]The time series behaviour of the various indices in this analysis are presented in the associated Online Appendices. In Figure A1, we observe the volatility of the examined indices, with evidence presented of significant phases of exception volatility outside of traditional, long-term trends.

[3]The sharp movement in BACI during the negative WTI oil price event can be attributed to its unique sensitivity to shifts in global commodity demand, particularly for bulk shipping commodities like iron ore and coal. The WTI oil price crash in April 2020, a period of unprecedented demand collapse due to the COVID-19 pandemic, created significant market ripple effects [Huang and Mollick, 2020, Corbet et al., 2020, 2021a,b, Fernandez-Perez et al., 2023].

tremity percentiles, suggesting rare, intense negative shocks. With a particularly negative outlook surrounding global economic growth, as evidenced by reduced demand for steel and construction materials, BACI fell sharply, further exacerbated as freight demand fell sharply due to reduced shipments and postponement.

Insert Table 2 about here

In comparison, agricultural commodities such as corn (Cc1) present evidence of a moderately negative skew (-0.53), indicating mild downside bias. Such a negative skew indicates the existence of asymmetric risk, where a sharp decline might be cushioned by underlying demand, suggesting stable short-term hedging potential. Agricultural assets' moderate skew and kurtosis imply relatively smoother price distributions, perhaps due to stabilising factors in global demand, present themselves as stabilising assets within volatile portfolios. Further, the examined agricultural products exhibit elevated variance and differential skew and kurtosis in comparison to other examined products. Meanwhile, energy commodities demonstrate clustered kurtosis, underscoring the presence of sustained volatility in energy markets. Energy commodities' clustered high kurtosis suggests that these assets could act as systemic volatility amplifiers, potentially exacerbating macroeconomic instability during crises. Natural gas exhibits positive skew (2.55), implying frequent smaller gains and occasional large price elevation, while displaying the highest maximum daily change (0.6142), showing potential for significant outliers. Its high comparative maximum values and positive skew reveal frequent surges, making it valuable for portfolio hedging in volatile periods. RBOB Gasoline (RBc1) shows negative skew (-0.39) and kurtosis (17.29), highlighting the presence of substantial risks across such energy price decline.

3.2. Empirical Methodology

To analyse the response of the analysed industrial corporations to extreme price variation sourced from each of the group of commodities, as separated by Baltic Exchange Indices, energy commodities and agricultural commodities, respectively, we assume a GARCH(1,1) volatility process, where the returns of each stock are assessed as a function of a series of dummy variables representing phases of large downward and upward price movements in the selected transport cost and commodity market indices at both the top and bottom 1%, 2.5%, 5% and 10% levels, respectively:

$$r_{g,t} = \alpha + \beta_0 r_{g,t-n} + \beta_1 r_{c,t} + \delta_1^{1\%} r_{c,t} Q_1 + \delta_2^{2.5\%} r_{c,t} Q_{2.5} + \delta_3^{5\%} r_{c,t} Q_5 + \delta_4^{10\%} r_{c,t} Q_{10} + \delta_5^{90\%} r_{c,t} Q_{90} + \delta_6^{95\%} r_{c,t} Q_{95} + \delta_7^{97.5\%} r_{c,t} Q_{97.5} + \delta_8^{99\%} r_{c,t} Q_{99} + e_t, \quad (1)$$

based on the estimated GARCH process:

$$e_t = \sqrt{h_t}\eta_t, \qquad h_t = \omega + a e_{t-1}^2 + b h_{t-1}, \quad (2)$$

where $r_{g,t}$ are the stock returns of each examined company as identified in the sample of industrial corporations, h_t is the conditional variance equation and $\eta_t \sim i.i.d.(0,1)$. r_c represents the daily movements in the analysed shipping and commodity indices, while Q is a dummy variable that captures quantiles at specific percentiles, facilitating a more robust analysis of their relative performance characteristics [Hu et al., 2024, Conlon et al., 2024, Scrimgeour et al., 2024, Muñiz et al., 2024, Akyildirim et al., 2024, 2025]. The coefficient $r_{g,t-n}$ controls for serial correlation in the dependent variable. $\delta_1^{1\%}$, $\delta_2^{2.5\%}$, $\delta_3^{5\%}$ and $\delta_4^{10\%}$ are the coefficients of interest, capturing the response of each respective corporation to extreme downward moves in the analysed shipping cost and commodity indices. Similarly, $\delta_5^{90\%}$, $\delta_6^{95\%}$ and $\delta_7^{97.5\%}$ capture the response of the variable of interest to extreme returns of the indices in the upper percentiles.[4] If the commodity market returns exceed a certain threshold, they also exceed all smaller thresholds. For example, suppose returns exceed the 99^{th} percentile, then they also exceed the 95^{th} percentile. Throughout the results, we calculate the standard error of the linear combination of coefficients and report the t-statistic of the linear combination. The estimated results are then considered as part of a regression framework that considers both industry and country-fixed effects, therefore presenting an overall estimate of the average interaction effect across all of the industrial stocks considered.

Results are further considered in line with corporate size and ESG performance to specifically investigate whether such preparedness can act as a moderating variable or defensive mechanism against the potential side effects of external tail risk events. Results are separately controlled using three ESG scores. The first is the overall ESG score, along with respective environmental, social and governance scores, which are developed on ten distinct categories inclusive of emissions, resource usage and innovation (environmental), community, human rights, product responsibility,

[4] Individual results for each examined stock and associated Ljung-Box Q statistics based on these methodological structures are omitted for the brevity of presentation but are available from the authors upon request.

workforce (social) and shareholders, CSR strategy and management (corporate governance). We also utilised the ESG controversies score, which was calculated based on 23 ESG controversy topics. The third score is an ESG combined (ESGC) score, which is the Overall ESG score discounted for significant ESG controversies impacting the corporations analysed by LSEG Eikon.[5] Finally, we also consider the log of corporate market capitalisation as a moderating variable to account for recognised bias from which large-cap companies suffer, as they attract more media attention than smaller-cap companies [Corbet et al., 2022, Conlon et al., 2024, Kallis and Corbet, 2024].

4. Empirical Results

Figure 2 presents the GARCH-estimated corporate return differentials due to tail events in the selected indices. Focusing on the Baltic exchange indices, there is a noticeable visual differential between negative and positive tail risks. Corporations exhibit clear evidence of being more adversely affected by negative tail events regarding transportation costs. The Baltic Exchange Dry Index (BADI) is highly sensitive to global trade demand, making it a strong indicator of economic cycles as increased values signal elevated industrial demands. Consistent with this interpretation, stock prices tend to respond negatively to negative tail events concerning this index, whereas stock prices respond positively to movements in the highest percentile: 99 percent. We see a similar dynamic with the Capesize (BACI) and Panamax (BPNI) indices. Whereas, in comparison, BHSI exhibits less of an adverse influence on stock prices. This is theoretically expected given its interlinkage with smaller, less sectorally influential manufacturers.

The sensitivity of BAID, the dirty tanker index, to crude oil transportation costs reflects an additional dimension of risk that is different from other transportation cost measures and serves as a potential indicator of disruptions in the petroleum supply chain, thus significantly influencing corporations. We see that many stocks are adversely affected by extreme positive movements in this index. While BAIT, the Clean Tanker Index, possesses limited interaction at central tail windows, with only sharp, significant influence exhibited at the 1% and 99% tails.

Similar share response differentials exist when considering the tail risk events surrounding agricultural and energy commodities, with Soybeans, oil and natural gas standing out amongst the indices analysed.[6]

[5]Eikon explained this process in detail when considering data during the yearly life of a corporation if a scandal occurs, the company involved is penalised, and this affects the overall ESGC score and grading. The long-term impact of the event may still be seen in the following year if there are new developments related to the same negative event, for example, lawsuits, ongoing legislation disputes or fines. All new media materials are captured as the controversy progresses.

[6]Further intricate dynamics relating to the presented GARCH results are presented in Figures A2, A3 and A4

Insert Figure 2 about here

Such results are further verified in Table 3, which presents the summary statistics of the GARCH-estimated corporate differentials due to shipping cost and commodity-related tail risk. Considering the Baltic Exchange indices, stocks present evidence of a sharp decline in response to lower tail risk in BADI due to the high correlation between shipping costs and global demand. As BADI falls, it indicates to investors that lower industrial demand is expected, or through a secondary threat, that the costs of construction will increase substantially as a result of increased freight rates. At the upper tails for BADI, the stock price response is more moderate, with less pronounced negative outcomes. The BACI presents evidence of risks at lower tails for companies reliant on bulk commodity transportation, with negative responses likely linked to fears surrounding raw material cost movements for sectors reliant on steel production, for example. Broadly, indices such as BPNI, BHSI, BAID and BAIT reflect the health of global trade, and sudden downturns signal not only reduced demand but also potential disruptions in supply chains, impacting stock prices for firms in industries such as construction and heavy manufacturing. Across each market analysed, clear evidence of reduced negative effects at higher tails persists, verified further through the percentiles presented.

Insert Table 3 about here

The impact of energy commodity fluctuations on stock prices is particularly notable in sectors highly sensitive to fuel and oil prices, such as logistics and industrial manufacturing. Sharp declines in Brent Crude and gasoline prices correlate with heightened stock volatility as firms adjust revenue forecasts and operational budgets to account for fluctuating fuel costs. Although investors may perceive energy price spikes as a short-term strain on corporate costs, sectors dependent on refined petroleum products react strongly to these extreme movements, leading to notable stock price volatility. This asymmetric response underscores the operational risks companies face due to global energy dependencies, where costs are often external and sudden shifts can quickly affect profitability. In agricultural commodities, we see that extreme upward price movements, especially in soybeans and wheat, significantly impact stock prices in the food production and biofuel sectors. Supply chain

of the associated Online Appendices, respectively. Specifically, in Figure A2 and Figure A3, we present QQ-plots and histograms relating to the 1% and 99% estimates for comparison. In Figure A4, we present boxplots of the estimated groups analysed as separated by each tail grouping analysed. Such visual representations further verify the differential behaviour of the windows analysed, particularly in the groupings positioned at the tails of each sample analysed.

vulnerabilities, amplified by climate impacts or geopolitical tensions, drive price surges, triggering investor concerns over operational costs and maintaining stable supplies. In contrast, downside tail events in agricultural commodities produce milder stock responses, reflecting steady demand patterns that provide a buffer against price drops. These trends indicate that companies within food and fuel production are not only sensitive to commodity price shocks but may also benefit from strategic stockpiling or diversification efforts that mitigate the effects of adverse price swings.

Insert Table 4 about here

Table 4 presents the results of the entire methodological structure as separated by ESG characteristic.[7] Results indicate that when considering the ESG performance of the analysed corporations, there exist differential responses based on ESG characteristics and TRBC type, with environmental and governance-related influence most prominent. Social influence generates almost no significant effect. Tail risks generated at the lowest levels have the most significant impacts when considering those stemming from BACI, BPNI, BHSI, BAID, and BAIT. Limited observations are identified across almost all of the 99% tails analysed, indicating that the sharpest declines in transportation metrics generate the largest pass-through upon corporations when considering ESG effects. Considering energy and agricultural commodities, limited effects are identified when considering environmental and social influence, and no significant effects stem from upper tails. However, governance-related influence at lower tails generates a prominent negative influence on corporate returns. From a sectoral perspective, such results reflect the heightened sensitivity of sectors to the cost of transportation, particularly under extreme conditions driven by sustainability and regulatory pressures faced by these industries to optimise logistics and reduce emissions, especially during peak volatility. Another contributing factor could be the industries' reliance on just-in-time production and lean inventories, which makes them more vulnerable to abrupt shifts in transportation costs that, in turn, influence environmental scores due to increased emissions from re-routing or expedited shipping. Governance scores respond negatively to extreme transportation cost shifts, likely due to the operational and regulatory risks that arise in high-cost situations. For instance, governance implications can surface when companies need to adjust strategic sourcing or fail to maintain optimal cost management, which can lead to reputational risks or highlight inadequacies in crisis management protocols.[8]

[7] For the brevity of presentation, only the most extreme tail events at the 1% and 99% levels are presented. All other results, including methodological variations, are available from the authors upon request.

[8] Additionally, firms in these sectors may rely on bulk commodities for production, meaning that governance

Insert Table 5 about here

Table 5 presents evidence of a complex and differentiated response to tail risks across asset classes when accounting for ESG controversies shaped by the particular economic dependencies and market perceptions linked to each index. Specifically, the ESG controversies score considers that if a scandal occurs, the company involved is penalised, and this affects the overall ESGC score and grading; the long-term impact of the event may still be seen in the following year if there are new developments related to the same negative event, for example, lawsuits, ongoing legislation disputes, or fines. For the purpose of explanation, it is prudent to only consider significant cases where there are consistent effects at both lower or upper tails, respectively, as individual results may not be fully representative of broader dynamics. Notably, BACI (-0.168 and -0.089) and BAID (-0.090 and -0.028) show pronounced effects, consistently significant at negative tails. These negative tail responses likely reflect the dependency of sectors on bulk commodities and crude oil, respectively, as a substantial decline in these indices suggests weakened demand for critical industrial inputs, thereby amplifying perceived risks in industries sensitive to these costs, presenting evidence of particular vulnerability when considering ESG controversies, emphasising the importance of such ESG factors in these industries. It appears that firms with ESG controversies experience heightened sensitivity to tail risks, as investors perceive them as riskier during extreme market conditions, leading to more pronounced negative effects on stock performance.

Further tail-specific patterns emerge with the BPNI and BAIT indices, where significant effects appear solely at the 1% negative tail (-0.074 and -0.063, respectively). This tail-bound sensitivity underscores the influence of extreme downward price movements in mid-sized and refined product shipping rates, suggesting that severe declines signal fundamental shifts in demand or supply chain stability, affecting the stock performance of firms tied to grains, coal, or refined product transport. In contrast, only BHSI exhibits significance at the highest tails (+0.088 and +0.226 at the 95% and 99% tails, respectively), implying that elevated rates for smaller vessels, key to regional and niche markets, lead to increased logistics costs, particularly impacting smaller, regionally dependent manufacturing firms, potentially indicating that firms with ESG controversies may benefit from increasing transportation costs in regional markets, possibly due to reduced competition or market inefficiencies that favour controversial firms. Fundamentally, ESG controversies heighten investor apprehensions about a firm's operational stability and future profitability, especially in industries

structures are put under strain when logistics become erratic, causing delays or contractual issues. This environment could spotlight deficiencies in governance practices, such as inadequate risk management strategies to handle severe price spikes in essential inputs like transportation.

sensitive to transportation costs, thereby amplifying negative market responses during tail events. The varying effects observed across different indices highlight how ESG controversies influence investor perceptions uniquely in each sector, affecting stock performance differently during extreme market movements.

Distinct patterns also emerge within the energy and agricultural commodity classes. Among agricultural commodities, only Wheat (Wc1) and Corn (Cc1) show significant positive tail effects at the upper extremes (+0.111 and +0.232 at the 99% tail). This response highlights investor concerns over rising raw material costs for agriculture-dependent sectors, where price surges imply increased operational expenses. Energy commodity indices, such as RBOB Gasoline (RBc1), demonstrate a unique uniformity in response across the tails (-0.152, -0.109, +0.112, and +0.212 across all of the tails examined). The dual negative and positive tail sensitivity reflects the inherent volatility of fuel costs, indicating both relief from lower fuel expenses at the low end and heightened operational costs when prices spike, thus underscoring the impact of fuel cost fluctuations on energy-dependent sectors.

Insert Table 6 about here

When considering how corporate sectors respond to tail risk events when separated by the ESG Controversies Score, results are presented in Table 6, capturing the adverse impact of significant scandals or controversies, which not only influence the immediate ESGC score but may continue affecting it through related legal or regulatory developments in subsequent periods. This separation provides a deeper understanding of sector-specific resilience or vulnerability to extreme market movements in transportation, energy, and agricultural costs. In Group 1 (Baltic Exchange Indices), significant responses are observed in the BADI index across both negative and positive extremes. At the 1% and 5% lower tails, BADI shows strong negative effects (-0.160 and -0.122), suggesting that downward shifts in dry bulk shipping rates signal weakened global trade demand, thus impacting corporations reliant on imported materials. Conversely, the positive tail effects (0.090 and 0.096) reveal investor sensitivity to elevated dry shipping costs, which may raise operational costs for related firms. BACI presents evidence of a similar pattern, with significant responses at both tails, though more pronounced at the positive end (0.139 at 95% and 0.105 at 99%), indicating heightened investor caution around rising bulk commodity transportation costs. BPNI also displays significant effects, with strong negative tail responses (-0.082 and -0.076) that likely reflect reduced demand or disrupted trade routes for medium-sized freight critical to firms dependent on these logistics channels. However, responses are comparatively muted for BHSI and the tanker indices (BAID and

BAIT). BHSI's lack of significant response across the upper tails suggests a limited influence of small-vessel freight costs on corporate valuations, likely due to their niche operational scale. Only BAIT at the 99% tail (0.170) shows a significant positive response, possibly indicating investor perception of heightened operational costs linked to elevated refined product transport costs.

Fundamentally, results indicate companies with higher ESG Controversies Scores may experience heightened sensitivity to extreme commodity price movements due to increased investor scrutiny and perceptions of elevated risk, leading to more pronounced stock price reactions during tail events. Further, firms embroiled in ESG controversies may face reputational damage that erodes investor confidence or additional costs when attempting to mitigate the effects of such issues, causing investors to react more strongly to negative market signals such as extreme drops in commodity prices. Ongoing legal disputes or regulatory investigations related to ESG controversies can compound the financial impact of commodity price shocks, as companies may have fewer resources or flexibility to absorb additional costs. Further, more controversial companies might have constrained access to financial instruments or capital markets needed for hedging against commodity price volatility, making them more vulnerable to extreme price movements, while those with ESG issues may have less robust supply chains, increasing their exposure to disruptions caused by extreme fluctuations in transportation and commodity costs. Elevated operational costs can increase investor sensitivity to such threats to profitability sourced in commodity price volatility. As investors increasingly prioritise ESG factors, companies with poor ESG performance may see amplified market reactions to commodity tail events due to divestment or reduced investment inflows.

Comparatively, in Group 2 (Agricultural Commodities), the responses reveal the substantial impact of agricultural price volatility on corporate sectors. Soybeans (Sc1) show notable positive tail significance at 95% (0.099) and 99% (0.124), highlighting the implications of rising soybean prices on agriculture-dependent industries, where raw material inflation can signal increased production costs. Conversely, wheat (Wc1) and corn (Cc1) exhibit minimal tail significance, indicating relative insensitivity to price volatility for firms reliant on these agricultural commodities, which may reflect stabilising factors in underlying demand or diversified sourcing strategies that mitigate these risks. While in Group 3 (Energy Commodities), Brent Crude (LCOc1) presents significant effects at both the 1% and 5% negative tails (-0.123 and -0.089), suggesting that falling oil prices might initially relieve cost pressures for firms exposed to high energy costs, while extreme positive movements at 99% (0.128) reflect anticipated cost increases in energy-dependent sectors. RBOB Gasoline (RBc1) and Natural Gas (TRNLTTFMc1) do not display significant responses across most tails, suggesting that while these commodities are critical inputs, their price fluctuations do not uniformly impact the studied sectors.

Insert Table 7 about here

The findings in Table 7 further demonstrate the sectoral corporate response differentials across transportation, energy, and agricultural commodities when adjusted for corporate ESG scores, revealing distinct patterns in tail-risk sensitivity. Within the transportation sector, both BADI and BACI exhibit pronounced response differentials across the upper and lower tails. Notably, BADI shows a significant positive response at the 99% upper tail (0.1180), while BACI demonstrates significant negative tail effects at both the 1% (-0.1570) and 5% (-0.1000) lower tails. These results suggest that heightened BADI rates reflect increased demand for dry bulk shipping, likely perceived positively for corporations reliant on raw material imports. Conversely, the negative tail sensitivity of BACI to sharp declines reinforces the reliance of certain sectors on bulk commodity shipments, where reduced demand or disruptions elevate the perceived financial risks. BPNI similarly shows distinct upper-tail effects, with a significant response at the 95% (+0.0907) and 99% (+0.1210) levels, indicating that increases in Panamax shipping costs may have positive implications for related sectors due to the perceived stability in global trade flows. BHSI demonstrates consistent positive tail effects, particularly at the 99% level (0.2230), suggesting that higher costs for smaller vessels reflect constrained regional shipping capacities, which may strain operational costs for companies dependent on these routes. The significant positive responses in the upper tails for indices like BPNI and BHSI indicate that investors may reward companies with strong ESG profiles during times of increasing commodity costs, viewing them as better equipped to handle higher operational expenses. Whereas the pronounced negative tail effects for BACI at the lower tails suggest that companies with lower ESG scores are more susceptible to negative commodity price shocks, possibly due to weaker sustainability practices and less effective risk mitigation strategies. The asymmetry in corporate responses to extreme upper and lower tail events suggests that ESG scores influence investor perceptions differently during periods of market stress, affecting stock performance based on the direction of the commodity price movement. Further, companies with higher ESG scores are potentially perceived as having superior risk management and operational resilience, which may mitigate the negative impacts of commodity price shocks, especially during extreme upward price movements.

Within the agricultural commodities group, Wheat (Wc1) and Corn (Cc1) exhibit notable positive tail effects, particularly at the 99% tail (Wc1 at 0.1254 and Cc1 at 0.1920). These results underscore that rising costs for agricultural commodities signal higher operational expenses for sectors dependent on these raw materials. The upward tail significance of these commodities likely aligns with investor expectations around inflationary pressures and the potential for increased cost pass-through to end consumers, highlighting the sensitivity of agriculture-dependent industries to extreme commodity price volatility. Energy commodity indices display distinct patterns, particularly with Brent Crude (LCOc1) and RBOB Gasoline (RBc1). LCOc1 shows significant negative responses at the 1% and 5% lower tails (-0.0846 and -0.0743), while demonstrating positive significance at the 99% tail (0.1120), reflecting the dual impact of fuel price declines and spikes. In essence, while falling oil prices reduce operating costs for energy-intensive sectors, sharp upward movements can impose increased logistical expenses, underscoring the sector's vulnerability to extreme energy price volatility. Similarly, RBOB Gasoline's significant positive tail effect at the 99% level (0.2030) further supports the notion that sharp gasoline price increases drive up costs, particularly impacting transportation and manufacturing sectors reliant on fuel.

Such findings imply that robust ESG scores may act as a financial buffer against the risks associated with commodity price volatility, particularly benefiting sectors that are heavily dependent on certain commodities. Distinct patterns in the data suggest that strong ESG profiles enhance market confidence and investor sentiment during periods of heightened volatility, potentially stabilising stock performance despite adverse market conditions. The results highlight a strategic imperative for corporations to bolster their ESG practices not only for ethical or regulatory reasons but also to improve financial resilience and attractiveness to investors during extreme market events.

Insert Table 8 about here

Table 8 presents the corporate responses to tail events across environmental score separations, identifying distinct patterns that emphasise the influence of environmental ratings on how firms react to extreme fluctuations in transportation costs, energy, and agricultural commodity prices. Within transportation costs, the Baltic Exchange indices such as BADI, BACI, and BPNI exhibit negative tail effects. Specifically, BADI and BACI show significant negative impacts at the 1% and 5% lower tails (-0.0791 and -0.0700 for BADI, -0.0636 and -0.0528 for BACI), indicating that environmental scrutiny may accentuate corporate sensitivity to severe downturns in shipping rates. Such responses likely stem from investor perceptions that environmentally sensitive companies are more vulnerable to logistical disruptions, impacting their stock performance under adverse trade conditions. BPNI similarly shows lower tail responses with significant negative coefficients at the 1% and 5% levels (-0.0542 and -0.0052, respectively), aligning with the notion that sectors linked to mid-sized bulk shipments are acutely responsive to shifts in trade dynamics. At the highest tails, the BPNI exhibits a notable positive effect (+0.1200 at the 99% tail), suggesting that sharp increases in Panamax costs are linked to positive investor expectations for corporations able to manage heightened transportation costs efficiently, potentially due to perceived environmental or logistical resilience. It appears that firms with higher environmental scores might employ risk management strategies that are not fully equipped to handle extreme commodity price fluctuations, highlighting a gap between environmental commitments and financial hedging practices. There might also exist issues with regard to regulatory compliance pressures, a characteristic associated with elevated environmental scores. Enhanced environmental regulations can increase operational costs for environmentally rated firms, making them more susceptible to commodity price volatility due to tighter profit margins. Fundamentally, elevated expectations from investors regarding sustainability performance can lead to stronger negative stock reactions when commodity price shocks threaten environmental initiatives or financial stability, while environmentally conscious companies often have stricter sourcing requirements, which can reduce supply chain flexibility and increase vulnerability to commodity price spikes or transportation disruptions, while significant investment in sustainability projects may limit available capital to absorb sudden increases in operational costs caused by commodity price extremes.

Distinct behaviour within energy commodities, particularly in the case of wheat (Wc1) and corn (Cc1), is evident with significant upper-tail responses in Cc1 at the 99% level (+0.1810). This positive response underscores the heightened investor caution around operational cost implications for environmentally rated firms facing sharp increases in essential raw material costs. Notably, corn's upper-tail significance suggests that sectors tied to agricultural inputs are particularly affected by environmental concerns, where price surges indicate impending cost pressures. Agricultural commodities such as Brent Crude (LCOc1) and RBOB Gasoline (RBc1) present unique lower-tail and upper-tail patterns. LCOc1 shows strong negative significance at the 1% and 5% lower tails (-0.0720 and -0.0279), likely reflecting that falling oil prices temporarily ease cost pressures for environmentally conscious firms. At the upper tail, RBc1's positive effects (0.1370 at the 99% level) emphasise the operational cost burden that fuel price volatility creates, disproportionately impacting environmentally scored companies reliant on high logistics and transportation costs. Considering this, we must note that firms with high environmental standards may be more globally integrated, exposing them to international commodity market fluctuations and geopolitical risks that exacerbate sensitivity to price extremes, while uncertainties in environmental policies and regulations can compound the effects of commodity price volatility, particularly for firms deeply invested in sustainability compliance. There may be a feedback loop where firms affected by commodity price volatility adjust their environmental strategies, indicating that environmental scores and sensitivity to price shocks influence each other.

Insert Table 9 about here

In Table 9, corporate responses to tail risks demonstrate significant differentiation across asset classes when separated by Social Score. For the Baltic Exchange indices, negative tail impacts are notably present in the BADI and BACI Indices, with BADI showing a significant response at the 1% tail (-0.1470) and BACI displaying effects at both the 1% (-0.2230) and 5% (-0.1140) tails. These results highlight the dependency of firms on bulk shipping, where severe declines suggest reduced demand for essential raw materials. Such negative impacts may reflect market apprehension about broader economic conditions, as diminished shipping rates often correlate with weaker industrial activity. Meanwhile, BPNI shows negative significance at the 1% tail (-0.0920), reinforcing the importance of medium-size bulk trade to sectors reliant on these shipments, such as grains and coal. Conversely, BHSI shows a positive tail effect at the 99% level (0.1830), indicating that surges in small vessel rates may be viewed positively, possibly due to increased demand for regional transport, which affects smaller, regionally focused firms. The significant negative responses to extreme downward movements in the BADI and BACI might be amplified for firms with higher social scores, as investors perceive these companies to be more vulnerable during economic downturns due to their commitments to social initiatives that may strain resources when revenues decline. Firms emphasizing social responsibility often maintain transparent supply chains; this openness can make them more sensitive to disruptions indicated by negative tail events in shipping indices, as stakeholders are promptly aware of any operational challenges. The positive response of the BHSI at the 99% level may suggest that firms with strong social scores are more engaged in regional markets and better positioned to benefit from increased local transport demand, aligning with their social commitments to community development.

Among the agricultural commodities, Soybeans (Sc1) and Wheat (Wc1) show significant positive tail responses at upper levels, with Soybeans at 95% (0.1040) and Wheat at 99% (0.0983). These positive tail reactions imply that rising costs in agricultural commodities are a concern for agriculture-reliant sectors, driving operational expense anticipation. This sensitivity aligns with investor caution around the inflationary impacts of agricultural price volatility. In contrast, Corn (Cc1) presents no significant effects, suggesting that price movements here are less disruptive due to possibly stable demand dynamics or diversified sourcing strategies. In the energy commodities group, Brent Crude (LCOc1) demonstrates a negative response at the 1% tail (-0.1660) and a positive effect at the 99% tail (0.0560), suggesting that severe price declines reduce costs for firms dependent on fuel, whereas extreme increases may signal inflationary pressures on operations. Fundamentally, the absence of significant effects for Corn (Cc1) could reflect that companies with higher social scores have implemented robust risk management and hedging strategies for certain commodities, mitigating the impact of price volatility. Extreme declines in Brent Crude prices, while reducing operational costs, might signal global economic slowdowns; firms with strong social commitments may be particularly impacted as economic contractions can limit their ability to invest in social programs. Positive corporate responses to extreme increases in Brent Crude prices might indicate investor confidence in socially responsible firms' abilities to adapt through innovation or cost management without compromising their social values. Significant positive tail responses in Soybeans and Wheat suggest that firms with higher social scores are proactive in managing social risks associated with rising food prices, such as consumer affordability and food security concerns. The variation in corporate responses indicates that social performance levels can modulate the impact of tail risks, potentially providing resilience due to better stakeholder relationships and reputational capital. Differences across commodities highlight that social considerations are intricately linked to the specific social implications of each commodity's price movements, requiring tailored strategies from firms.

Insert Table 10 about here

The results in Table 10 illustrate corporate response differentials to tail risks, segmented by governance scores, highlighting varied sensitivities across transportation, energy, and agricultural assets. Within transportation indices, BACI and BPNI exhibit pronounced negative tail effects, particularly for BACI at the 1% and 5% tails (-0.0534 and -0.0505) and for BPNI at the 1% tail (-0.0885). These results imply that governance-sensitive firms are adversely impacted by sharp declines in major freight costs, indicating that investors may view unexpected dips in shipping demand as weakening global trade flows, with higher governance scrutiny possibly amplifying perceptions of associated risks. In contrast, positive tail responses in indices like the Baltic Handysize Index (BHSI) at the 95% and 99% tails (+0.0557 and +0.1460) suggest that companies benefit from higher small-vessel rates, potentially because increased regional shipping activity is associated with stable, localised demand, thus providing operational resilience. Such a trend indicates that higher governance-rated firms in specific sectors may be positioned to manage costs more effectively amidst rising logistics expenses, reflecting investor confidence in governance practices when shipping rates signal regional economic strength. Fundamentally, high governance scores may serve as a buffer against tail risks due to superior risk management and compliance practices, enabling firms to better navigate extreme market events. The greater negative responses in governance-sensitive firms during adverse events could reflect heightened investor expectations, leading to more significant penalties when performance falls short amid market downturns. Positive tail responses suggest that firms with strong governance are better positioned to capitalize on favourable market conditions, reinforcing investor confidence in their strategic capabilities during market upswings.

The agricultural commodities, specifically Soybeans (Sc1), display significant effects across tails, with negative impacts at the 1% tail (-0.1800) and positive effects at the 95% tail (+0.1050). This pattern points to heightened sensitivity to extreme price movements in agriculture-related commodities, where companies may face rising costs for essential inputs, impacting investor perceptions of cost management under stringent governance frameworks. Such dynamics likely reflect concerns over supply chain stability and cost control within governance-sensitive sectors as raw material prices escalate. In energy commodities, Brent Crude (LCOc1) and RBOB Gasoline (RBc1) exhibit mixed responses. Brent Crude presents significant effects at the 99% positive tail (+0.1360), signifying heightened operational expenses as oil prices surge, with governance-focused companies viewed as potentially more resilient or proactive in managing these costs. RBOB Gasoline's positive tail significance at the 99% level (+0.2140) reinforces this finding, suggesting that companies with robust governance structures may effectively absorb or hedge against rising fuel costs. Broadly, governance scores may influence investor perceptions of a firm's resilience to extreme market movements, affecting investment decisions during periods of high volatility. Further, strong governance structures might enable firms to adjust more effectively to sudden changes in commodity prices, improving operational flexibility and cost management during extreme events.

Insert Table 11 about here

The results in Table 11 highlight the impact of corporate size, as measured by market capitalisation, on stock performance in response to extreme tail events across asset classes, reflecting distinct sectoral sensitivities linked to transportation, energy, and agricultural costs. Within the transportation sector, BADI and BACI show significant negative responses at the lower tails, specifically -0.6640 at the 1% tail for BADI and -0.2230 at the 1% tail for BACI. These results imply that smaller firms face greater financial stress in response to declining bulk freight rates, possibly due to weaker logistical flexibility or capital reserves to withstand cost fluctuations. The significant 5% tail effects for both indices further support this notion, underscoring the heightened vulnerability of smaller firms to transportation cost reductions tied to global trade slowdowns or supply chain disruptions. Conversely, only BPNI displays notable significance in the upper tails at the 95% level (+0.0395), suggesting that smaller companies benefit from rising rates, likely due to stronger pricing power when demand for medium-sized bulk vessels surges. For BHSI and BAIT, positive tail effects at the 99% level (+0.1830 and +0.0881, respectively) suggest that higher transport costs for smaller vessels or refined products lead to increased costs, disproportionately impacting smaller companies dependent on these niche shipping routes. Additionally, BHSI's consistent positive response across upper tails aligns with its essential role in regional trade, indicating heightened operational costs for smaller, regionally-focused firms during peak demand periods. These results collectively highlight the disproportionate impacts of size-dependent financial resilience across Baltic indices.

In the agricultural commodities group, soybeans (Sc1) and wheat (Wc1) exhibit significant positive effects at the upper tails (99% tail for Sc1 at +0.1318 and Wc1 at +0.0983 at 95%), indicating that agricultural price spikes disproportionately burden smaller firms in agriculture-dependent sectors. Rising raw material costs elevate operating expenses, with smaller firms more susceptible to profitability pressures due to limited cost absorption or pricing power capabilities. In contrast, corn (Cc1) does not show significant effects, indicating stable, size-insensitive demand for this staple commodity, likely reflecting strategic stockpiling by smaller firms as a countermeasure. The response to energy commodities further manifests in the results for Brent Crude (LCOc1), where significant negative tail effects at the 1% and 5% levels (-0.1660 and -0.1240) reflect cost relief for smaller energy-intensive firms during price declines. Positive responses at the 99% tail (+0.1180) reflect investor caution around rising fuel expenses, highlighting cost pressures for smaller firms when fuel costs surge, particularly for logistics and manufacturing sectors reliant on petroleum-based inputs.

Fundamentally, smaller firms operating with higher fixed costs relative to their revenues exhibit heightened sensitivity to input price fluctuations, amplifying the impact of extreme price events on their financial performance. This is evidenced by significant negative responses to declining freight rates in the BADI and BACI indices. Resource constraints often prevent these companies from employing sophisticated risk management or hedging strategies to mitigate commodity price volatility, leaving them more exposed to adverse movements in transportation, energy, and agricultural costs. Additionally, smaller firms may lack the capital necessary for strategic stockpiling of commodities, making them more vulnerable to price spikes. The absence of significant effects for corn (Cc1) suggests that when smaller firms can engage in stockpiling, they mitigate some exposure. Furthermore, smaller companies tend to have concentrated business models focused on specific sectors or commodities, increasing their exposure to sector-specific shocks due to a lack of diversification to offset adverse movements in their primary markets.

During extreme market events, investors may perceive smaller firms as riskier, leading to greater stock price volatility; lower liquidity in small-cap stocks exacerbates these price swings, reflecting heightened sensitivity in their market valuations. Reliance on a limited number of suppliers or logistic routes heightens their vulnerability to disruptions. The significant positive tail effects for BHSI and BAIT at the upper tails indicate that cost increases in niche shipping routes disproportionately impact these companies. With less market power, smaller firms struggle to pass increased commodity costs onto customers without losing competitive advantage, resulting in margin compression when input costs rise—particularly evident in the agricultural commodities sector. Intense competition forces smaller firms to absorb cost increases to maintain market share, intensifying financial strain during periods of extreme commodity price volatility. Conversely, the positive significance of BPNI at the 95% tail suggests that smaller firms may benefit from surging demand due to their ability to respond quickly to market changes, leveraging their leaner operations. However, extreme price events can tighten credit markets, and smaller firms typically have less access to financing, hampering their ability to navigate through periods of increased costs or invest in cost-saving technologies.

5. Associated Discussion and Directions for Future Research

The findings of this research reaffirm the central role that transportation costs play as a barometer for global trade health. Indices such as the Baltic Dry Index not only capture the live dynamics relating to international trade flows but also serve as a leading indicator of industrial demand and economic activity. Fluctuations and uncertainty surrounding these indices influence corporate input expenses and operational decisions. The results highlight that sharp changes in freight rates signal critical inflection points in global trade, reflecting broader economic conditions that directly impact the financial performance of industrial firms. These relationships underscore the indispensable value of transportation costs as an integrated measure of economic resilience and vulnerability. A particularly interesting result surrounds the asymmetrical impact of tail events on transportation costs, with negative events exerting disproportionately greater effects than positive ones. Declines in transportation costs often signify a contraction in industrial demand, sparking investor apprehension about global trade stability and economic health. This asymmetry highlights the heightened sensitivity of markets and operations to downturns, which are interpreted as a broader signal of weakness. Positive tail events, on the other hand, while impactful, are often viewed as transitory cost pressures rather than systemic risks. This nuanced understanding of investor and operational behaviour reveals the need for strategies tailored specifically to manage the outsized impact of adverse events.

The interactions between ESG performance and market volatility are identified as another key example of corporate resilience. While high ESG scores are traditionally observed as indicators of strong governance and robust risk management, the findings suggest a more complex relationship.

Firms with strong ESG commitments often experience heightened vulnerability during periods of extreme market volatility, as sustainability obligations may lead to higher operational costs under adverse conditions. This duality positions ESG preparedness as both a mitigator of reputational risks and a potential operational liability, emphasising the need for companies to integrate agility into their ESG strategies to better navigate crisis scenarios. Adding to this complexity, results indicate that ESG controversies amplify financial risks during volatile periods. Particularly, firms embroiled in ESG-related controversies suffer from heightened investor scepticism, which exacerbates negative stock performance during extreme market events. These controversies not only erode market confidence but also underscore the materiality of ESG compliance in mitigating systemic risks. This reinforces the argument for transparency and ethical governance as cornerstones of financial stability, particularly in an era where market participants increasingly prioritize sustainability metrics.

At the firm level, the results expose a stark heterogeneity in responses to market shocks, with smaller firms identified to be particularly vulnerable. Limited access to capital, constrained operational flexibility, and a lack of diversified risk management strategies leave these firms disproportionately exposed to extreme price movements. This vulnerability highlights the need for targeted policies to support smaller enterprises in building resilience, such as facilitating access to financial instruments or fostering collaborative risk-sharing mechanisms within supply chains. These measures could help bridge the resilience gap and ensure that smaller firms are not disproportionately disadvantaged during periods of volatility.

More broadly, the findings identify the contagion effects of transportation and commodity price volatility on global trade systems. Sharp fluctuations in freight costs not only disrupt corporate profitability but also reshape global trade patterns by influencing sourcing decisions and production strategies. These disruptions align with ongoing policy debates concerning economic resilience in the face of rising geopolitical tensions, protectionist policies, and sustainability mandates. Policymakers must recognise the interconnectedness of these factors, prioritizing coordinated efforts to stabilize trade flows and enhance systemic resilience.

Finally, the study's implications for policy and theory are significant. The need for international coordination to stabilise transportation costs, whether through harmonised shipping regulations or incentives for diversified sourcing practices, cannot be overstated. Simultaneously, the findings advance theoretical frameworks on market volatility and corporate resilience by integrating transportation costs as a critical, yet often overlooked, component of tail risk analysis. This integration provides fresh perspectives on how firm characteristics, such as ESG adherence and operational scale, influence responses to extreme market events, paving the way for more refined and effective risk assessment and mitigation strategies. Together, these insights challenge conventional models of financial risk, demanding a more holistic approach to understanding and managing vulnerabilities in a rapidly evolving global economy.

5.1. Directions for Future Research

Future research should focus on the feedback loop between geopolitical tensions and maritime freight cost volatility. Geopolitical crises, such as conflicts in the South China Sea or disruptions in Arctic trade routes, create cascading effects across global supply chains. Investigating these dynamics can uncover how regional conflicts influence global freight indices and whether certain feedback mechanisms amplify or stabilize these effects in other sectors. Another promising direction is the study of shock haven assets. Identifying whether Baltic indices or other maritime indicators universally act as reliable predictors of resilience across financial, energy, and agricultural markets can provide critical insights. This research could reveal how different crises require unique risk management approaches, depending on the underlying economic drivers. Structural changes in global supply chains, such as decarbonisation efforts and increased automation, warrant further examination regarding their impact on tail risk sensitivity in maritime freight markets. These transformations may alter firms' exposure to extreme shipping cost fluctuations, necessitating research into the evolving nature of these risks and their implications for corporate strategies.

Further work should examine ESG preparedness as both a shield and a potential vulnerability under extreme market conditions. While ESG commitments often enhance resilience, firms with stringent sustainability obligations may face heightened regulatory and operational costs during crises. Understanding this paradox could inform strategies to balance ESG objectives with financial stability amidst volatile commodity prices. Whereas, corporate characteristics such as size, ESG ratings, and geographical reach significantly mediate responses to tail risks. Mapping these factors could enhance understanding how firms scale their resilience strategies and adapt to extreme market conditions. Additionally, comparative analysis between emerging and developed economies could highlight disparities in access to capital and hedging instruments, offering a nuanced perspective on global market vulnerabilities. Finally, research into global policy coordination for maritime freight stabilisation and the interplay between commodity price volatility and ESG investments can provide actionable insights. Policies harmonising international shipping regulations or incentivising resilient practices could mitigate systemic risks. Simultaneously, studying how extreme commodity price movements influence ESG investment trends may reveal thresholds where sustainability goals adapt under financial pressures, shaping future corporate and investor behaviour.

6. Concluding Comments

This study has provided an in-depth analysis of the impact on stock returns of extreme negative and positive movements in selected indices relating to shipping costs and the prices of agricultural and energy commodities. We examine The stock returns of firms operating in the Industrial and Commercial Services, Industrial Goods, and Transportation sectors across the G20 nations. Our findings reveal that extreme negative movements in shipping cost indices typically induce a negative stock reaction. We attribute this to shipping costs' status as a barometer of global economic activity. Consistent with this interpretation, extreme positive movements in shipping cost indices generally elicit a positive reaction in stock prices. We also observe this differential impact on stock returns across negative and positive tail events in the agricultural and energy commodity indices we study. The one exception is oil, where extreme positive movements in oil are detrimental to many stock prices, reflecting oil's importance as an input for many firms.

Significantly, our research highlights that the effects of extreme movements in these indices are not uniform across all firms. Smaller firms and firms with more ESG controversies experience more pronounced declines in stock values during negative tail events, which reflects investors perceiving them as riskier. Our results regarding smaller firms suggest that policy that assists them in building financial resilience is important.

Finally, in some cases, stronger ESG commitments are associated with elevated stock returns during negative tail events, but in other instances, they lead to negative outcomes. The negative outcomes reflect investor concern that ESG obligations involve increased operational costs and regulatory compliance, both of which are felt more acutely in adverse market conditions. Our results suggest that as firms consider integrating ESG commitments into their strategies, they must remain cognisant of these potential drawbacks and proactively address investor apprehensions, ensuring that the pursuit of sustainability and responsibility aligns with their overarching financial and market resilience objectives.

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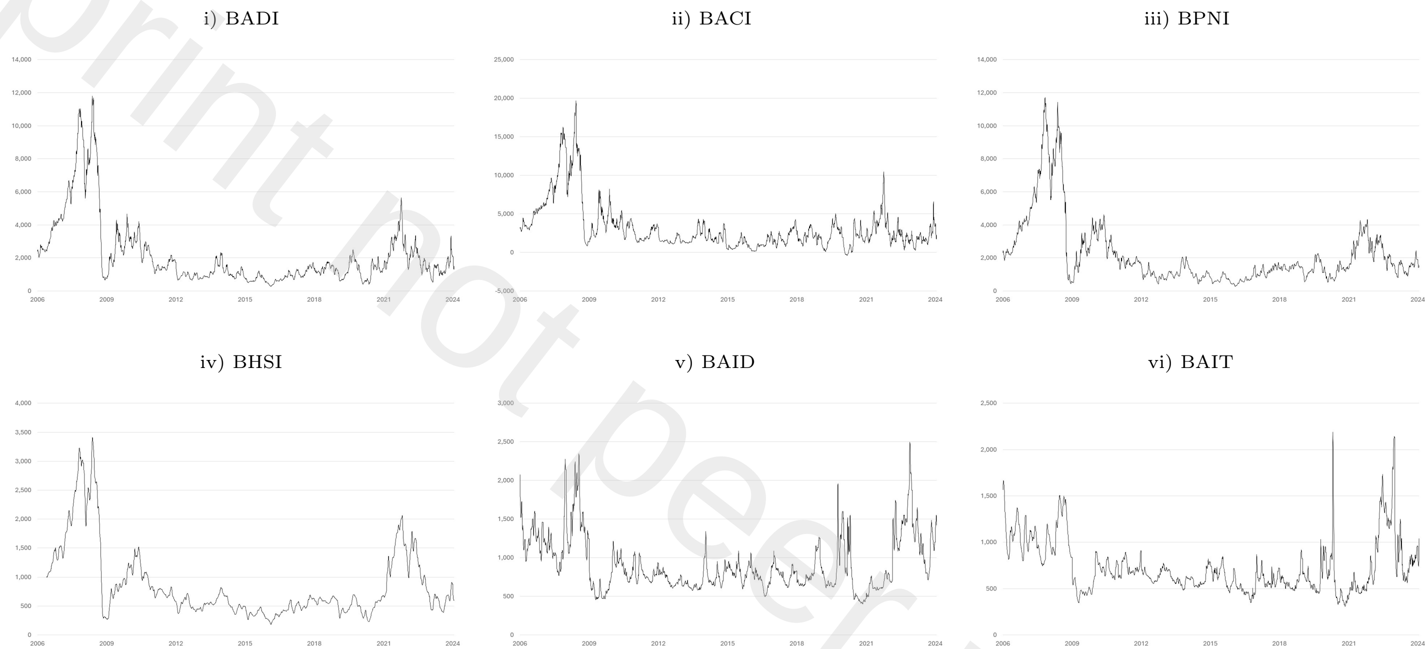
Figure 1: Price Returns of Examined Indices

Group 1: Baltic Exchange Indices (Transportation Costs)



Note: To analyse the presented research questions, we focus on transportation costs, denoted as Group 1, consisting of the Baltic Exchange indices Dry Index (BADI), Capesize Index (BACI), Panamax Index (BPNI), Handysize Index (BHSI), Dirty Tanker Index (BAID) and Clean Tanker Index (BAIT). Such Baltic Exchange products are compared with selected Energy Commodities Indices, representative of international energy costs, including ICE Brent Crude (LCOc1), RBOB Gasoline (RBc1) and Natural Gas (Henry Hub) (NGc1), and Agricultural Commodities Indices representing international raw material costs including Soybeans (Sc1), Wheat (Wc1) and Corn (Cc1). Data is obtained for the period 1 January 2006 and 28 June 2024.

Figure 1: Price Returns of Examined Indices (continued)

Group 2: Agricultural Commodities Indices (Raw Material Costs)

vii) Sc1 viii) Wc1 ix) Cc1

Group 3: Energy Commodities Indices (Energy Costs)

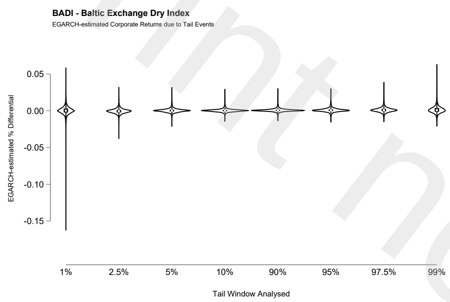
x) LCOc1 xi) RBc1 xii) TRNLTT

Note: To analyse the presented research questions, we focus on transportation costs, denoted as Group 1, consisting of the Baltic Exchange indices Dry Index (BADI), Capesize Index (BACI), Panamax Index (BPNI), Handysize Index (BHSI), Dirty Tanker Index (BAID) and Clean Tanker Index (BAIT). Such Baltic Exchange products are compared with selected Energy Commodities Indices, representative of international energy costs, including ICE Brent Crude (LCOc1), RBOB Gasoline (RBc1) and Natural Gas (Henry Hub) (NGc1), and Agricultural Commodities Indices representing international raw material costs including Soybeans (Sc1), Wheat (Wc1) and Corn (Cc1). Data is obtained for the period 1 January 2006 and 28 June 2024.

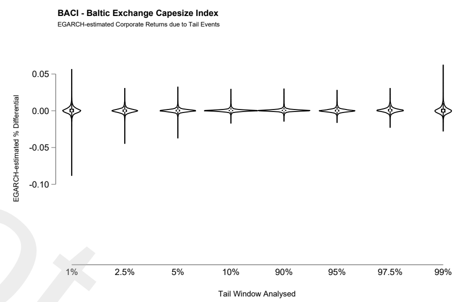
Figure 2: Violin Plots of GARCH-Estimated Corporate Return Differentials due to Commodity Market Tail Events

Group 1: Baltic Exchange Indices (Transportation Costs)

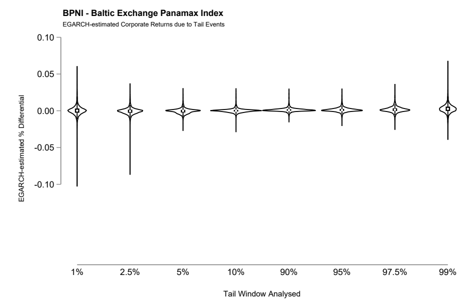
i) BADI



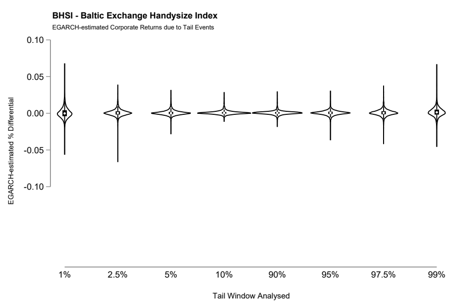
ii) BACI



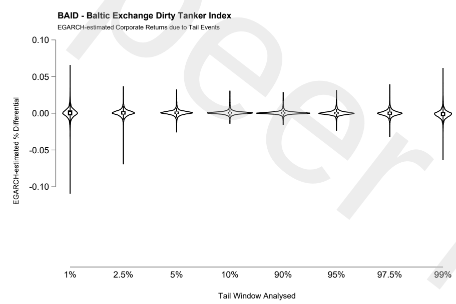
iii) BPNI



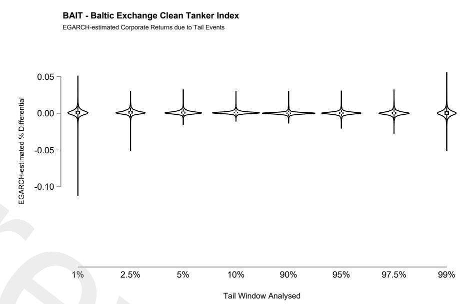
iv) BHSI



v) BAID



vi) BAIT

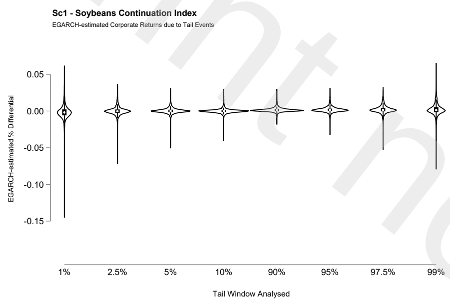


Note: To analyse the response of the analysed industrial corporations to extreme price variation sourced from each of the group of commodities, as separated by Baltic Exchange Indices, Energy Commodities and Agricultural Commodities, respectively, we assume a GARCH(1,1) volatility process, where the returns of each of each stock are assessed as a function of a series of dummy variables representing phases of large downward and upward price movements in the selected energy commodity markets at both the top and bottom 1%, 2.5%, 5% and 10% levels, respectively. For brevity of presentation, further results pertaining to alternative methodological specifications and goodness-of-fit testing are omitted but are available from the authors upon request.

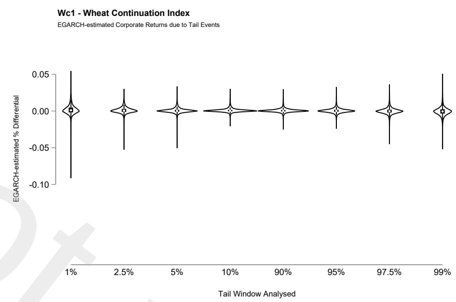
Figure 2: Violin Plots of GARCH-Estimated Corporate Return Differentials due to Commodity Market Tail Events (continued)

Group 2: Agricultural Commodities Indices (Raw Material Costs)

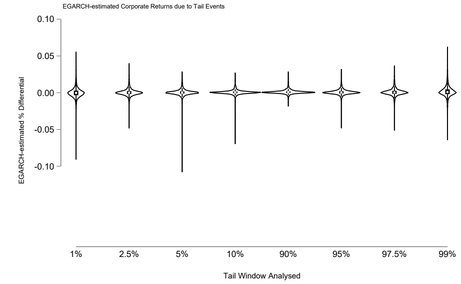
vii) Sc1



viii) Wc1

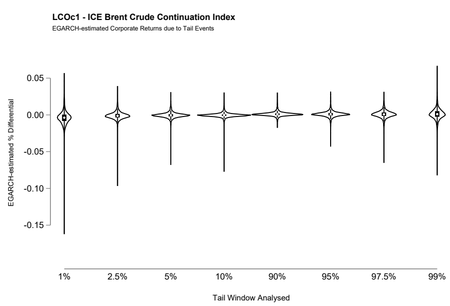


ix) Cc1

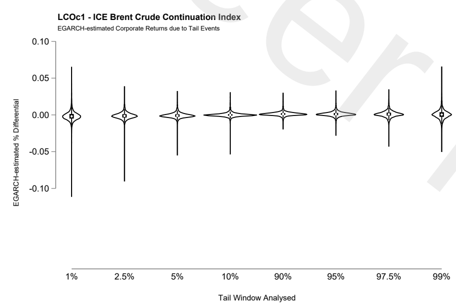


Group 3: Energy Commodities Indices (Energy Costs)

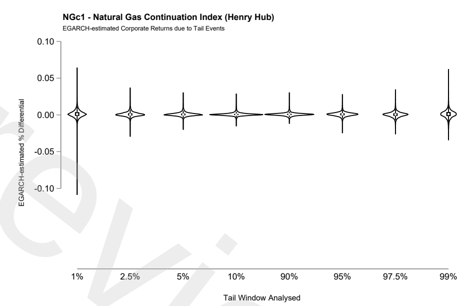
x) LCOc1



xi) RBc1



xii) TRNLTT



Note: To analyse the response of the analysed industrial corporations to extreme price variation sourced from each of the group of commodities, as separated by Baltic Exchange Indices, Energy Commodities and Agricultural Commodities, respectively, we assume a GARCH(1,1) volatility process, where the returns of each of each stock are assessed as a function of a series of dummy variables representing phases of large downward and upward price movements in the selected energy commodity markets at both the top and bottom 1%, 2.5%, 5% and 10% levels, respectively. For brevity of presentation, further results pertaining to alternative methodological specifications and goodness-of-fit testing are omitted but are available from the authors upon request.

Table 1: Selected Analysed Baltic Exchanges

Index	Key Characteristics	Influence on Selected Industrials	Mechanisms of Influence
1. BDI - Baltic Dry Index	The Baltic Dry Index is a composite index that tracks freight rates for shipping dry bulk commodities such as iron ore, coal, and grains across 23 shipping routes worldwide. It is a weighted average of the Capesize, Panamax, and Supramax timecharter averages and reflects global demand and supply for shipping capacity. Considered a leading economic indicator due to its sensitivity to global trade and industrial activity, the BDI is influenced by seasonal patterns, geopolitical events, and commodity demand fluctuations.	The BDI significantly affects the industrial goods sector, including machinery, tools, and heavy vehicles. Increased shipping costs impact both the importing of raw materials and the exporting of finished goods, raising production costs and squeezing profit margins. The construction and engineering industries face higher costs for importing essential materials such as steel and cement, which can affect project budgets and timelines. Freight and logistics services also see direct correlations between the BDI and their revenue and operating costs, influencing demand for shipping services and fleet utilisation.	The influence of the BDI is seen in increased transportation costs, which elevate the landed cost of imports. Companies in affected sectors may adjust pricing strategies to offset increased costs, thus affecting competitiveness. The index's volatility necessitates robust logistics planning to avoid delays and cost overruns. Persistent high rates may prompt firms to invest in alternative transport methods or localised production.
2. BCI - Baltic Capesize Index	The Baltic Capesize Index measures freight rates for Capesize vessels, typically over 150,000 DWT, which are used for transporting bulk commodities like iron ore and coal. Capesize vessels are too large for the Panama and Suez Canals and must navigate around capes, making them highly responsive to demand from major importers such as China and steel production inputs.	In the aerospace and defence sector, changes in freight rates affect the cost of bulk raw materials essential for manufacturing processes. This can lead to production delays if logistical bottlenecks arise due to high demand. The industrial goods manufacturing sector also experiences changes in the cost structure for heavy machinery production. Additionally, transport infrastructure sectors, such as ports handling Capesize vessels, may face congestion or require upgrades to accommodate changes in shipping demands.	Input cost variability from fluctuating freight rates directly influences the cost of raw materials, which can impact overall profitability. Firms may mitigate these costs through strategic sourcing, diversifying suppliers, or finding alternative materials. Operational flexibility is required to adapt to rate fluctuations, and logistical bottlenecks can strain port capacities and cause delays.
3. BPI - Baltic Panamax Index	The Baltic Panamax Index tracks freight rates for Panamax vessels (60,000–80,000 DWT), which can transit the Panama Canal. These vessels often carry grains, coal, and minor bulk commodities and can serve a wider range of ports than larger vessels, making them crucial for global commodity distribution.	The Panamax Index impacts the machinery and tools manufacturing sector by affecting import/export costs for intermediate goods and machinery. Diversified industrial goods wholesalers face changing pricing strategies due to fluctuating logistics costs. Freight and logistics services experience alterations in fleet deployment and route planning, directly influencing profitability based on the demand for Panamax vessels.	Firms must manage costs in response to fluctuating shipping rates, particularly when it comes to inventory strategies. For instance, firms may adjust inventory levels to optimise costs in response to rate changes. Shipping costs can also influence decisions around market expansion or retraction, determining the feasibility of entering new markets. Long-term contract negotiations may include rate adjustment clauses tied to the BPI to manage these fluctuations.

Note: To analyse the presented research questions, we separate the selected commodity markets. First, we focus on transportation costs, denoted as Group 1, consisting of the Baltic Exchange indices Dry Index (BADI), Capesize Index (BACI), Panamax Index (BPNI), Handysize Index (BHSI), Dirty Tanker Index (BAID) and Clean Tanker Index (BAIT). Such Baltic Exchange products are compared with selected Energy Commodities Indices, representative of international energy costs, including ICE Brent Crude (LCOc1), RBOB Gasoline (RBc1) and Natural Gas (Henry Hub) (NGc1), and Agricultural Commodities Indices representing international raw material costs including Soybeans (Sc1), Wheat (Wc1) and Corn (Cc1).

Table 1: Selected Analysed Baltic Exchanges (continued)

Index	Key Characteristics	Influence on Selected Industrials	Mechanisms of Influence
4. BHSI - Baltic Handysize Index	The Baltic Handysize Index measures freight rates for Handysize vessels (15,000–35,000 DWT), which are versatile ships suited for smaller cargo volumes and ports. These vessels carry goods such as grains, steel products, and logs, and their ability to access ports with size or draft restrictions makes them essential for regional trade.	In the professional and commercial services sector, demand for services such as port management, shipping agency, and maritime consulting fluctuates with Handysize activity. The construction and engineering sectors benefit from Handysize vessels by facilitating the delivery of materials to remote or developing areas. Industrial and commercial services, including smaller manufacturers, rely on these vessels for their import/export needs.	The Handysize Index influences regional supply chains, where changes in rates affect local economies and the availability of goods. Firms may optimise costs by using Handysize vessels for shipping to certain destinations. This creates opportunities to exploit niche markets where larger ships cannot operate. Flexibility and responsiveness are key advantages, allowing companies to adapt quickly to changing market demands.
5. BDTI - Baltic Dirty Tanker Index	The Baltic Dirty Tanker Index tracks freight rates for tankers transporting unrefined petroleum products, including crude oil. This index is driven by global oil production levels, geopolitical tensions, OPEC policies, and demand from refineries. Major shipping routes include the Middle East to Asia/Europe and West Africa to the Americas.	The industrial and commercial services sectors, including construction and engineering, are heavily impacted by rising crude transport costs, which lead to higher fuel prices. The aerospace and defence industries face higher input costs for oil-derived products, such as lubricants and composites. Freight and logistics services also experience shifts in operational expenses due to fluctuating bunker fuel prices.	Rising crude transport costs inflate operating costs across industries, particularly in construction, where oil-based materials are critical. Companies may face profit margin pressures as increased expenses are not always fully passed on to customers. Geopolitical events that disrupt crude oil transport can introduce significant supply chain risks. Some companies may respond by investing in energy efficiency or alternative fuels to mitigate these risks.
6. BCTI - Baltic Clean Tanker Index	The Baltic Clean Tanker Index measures freight rates for tankers carrying refined petroleum products such as gasoline, diesel, and jet fuel. This index is influenced by refinery outputs, seasonal consumption patterns, and overall economic growth. Major routes include the Middle East to Asia, Europe to the Americas, and intra-regional trade.	In the transportation sector, including freight and logistics services, fluctuating fuel costs directly impact operating budgets. Similarly, industrial goods manufacturing faces higher costs due to energy and petroleum-based inputs, such as plastics and chemicals. Construction and engineering projects also see higher operational expenses when fuel and material costs rise. The aerospace and defence industries, which rely heavily on jet fuel, are particularly vulnerable to rising costs.	The BCTI necessitates dynamic budgeting and cost management as fuel price fluctuations affect operational expenses. Firms may need to adjust service or product prices in response to changing fuel costs. Some companies hedge against fuel price risks or engage in bulk purchasing to stabilize fuel costs. Higher fuel prices can also reduce demand for transportation services, impacting overall profitability.

Note: To analyse the presented research questions, we separate the selected commodity markets. First, we focus on transportation costs, denoted as Group 1, consisting of the Baltic Exchange indices Dry Index (BADI), Capesize Index (BACI), Panamax Index (BPNI), Handysize Index (BHSI), Dirty Tanker Index (BAID) and Clean Tanker Index (BAIT). Such Baltic Exchange products are compared with selected Energy Commodities Indices, representative of international energy costs, including ICE Brent Crude (LCOc1), RBOB Gasoline (RBc1) and Natural Gas (Henry Hub) (NGc1), and Agricultural Commodities Indices representing international raw material costs including Soybeans (Sc1), Wheat (Wc1) and Corn (Cc1).

Table 2: Summary Statistics of Selected Variables Analysed

							Percentile									
Asset	Mean	Var	Skew	Kurt	Min	Max	1%	3%	5%	10%	25%	75%	90%	95%	98%	99%
Group 1: *Baltic Exchange Indices (Transportation Costs)*																
.BADI	0.0003	0.0006	0.6700	7.4889	-0.1749	0.2255	-0.0643	-0.0471	-0.0357	-0.0254	-0.0106	0.0099	0.0257	0.0388	0.0513	0.0752
.BACI	0.0012	0.0087	-7.5429	669.3752	-3.9565	2.6154	-0.1410	-0.1001	-0.0716	-0.0478	-0.0173	0.0149	0.0487	0.0801	0.1164	0.1941
.BPNI	0.0003	0.0006	0.4413	6.0896	-0.1945	0.2292	-0.0574	-0.0458	-0.0360	-0.0263	-0.0123	0.0115	0.0274	0.0393	0.0507	0.0747
.BHSI	0.0000	0.0002	-0.6668	9.0987	-0.1286	0.1031	-0.0356	-0.0246	-0.0195	-0.0137	-0.0059	0.0064	0.0131	0.0187	0.0246	0.0330
.BAID	0.0003	0.0005	1.0301	33.0596	-0.3170	0.2688	-0.0525	-0.0374	-0.0272	-0.0185	-0.0087	0.0079	0.0207	0.0303	0.0440	0.0613
.BAIT	0.0003	0.0005	1.0846	72.5381	-0.4356	0.3394	-0.0472	-0.0316	-0.0227	-0.0150	-0.0074	0.0059	0.0175	0.0279	0.0402	0.0644
Group 2: *Agricultural Commodities Indices (Raw Material Costs)*																
Sc1	0.0003	0.0002	-0.5147	16.0779	-0.2087	0.2253	-0.0448	-0.0315	-0.0229	-0.0163	-0.0074	0.0083	0.0171	0.0240	0.0305	0.0392
Wc1	0.0003	0.0004	0.4485	4.1095	-0.1068	0.2178	-0.0490	-0.0375	-0.0294	-0.0217	-0.0116	0.0112	0.0241	0.0336	0.0432	0.0573
Cc1	0.0003	0.0003	-0.5313	10.4737	-0.2356	0.1361	-0.0476	-0.0344	-0.0256	-0.0189	-0.0089	0.0093	0.0196	0.0286	0.0381	0.0488
Group 3: *Energy Commodities Indices (Energy Costs)*																
LCOc1	0.0005	0.0005	-0.2316	8.4559	-0.2440	0.2102	-0.0613	-0.0468	-0.0357	-0.0248	-0.0109	0.0119	0.0251	0.0347	0.0445	0.0609
RBc1	0.0004	0.0007	-0.3913	17.2910	-0.3198	0.2510	-0.0709	-0.0480	-0.0384	-0.0267	-0.0114	0.0133	0.0260	0.0356	0.0458	0.0658
TRNLTTFMc1	0.0010	0.0017	2.5470	30.8666	-0.3199	0.6142	-0.1018	-0.0691	-0.0522	-0.0343	-0.0130	0.0120	0.0330	0.0543	0.0825	0.1399

Note: To analyse the presented research questions, we separate the selected commodity markets. First, we focus on transportation costs, denoted as Group 1, consisting of the Baltic Exchange indices Dry Index (BADI), Capesize Index (BACI), Panamax Index (BPNI), Handysize Index (BHSI), Dirty Tanker Index (BAID) and Clean Tanker Index (BAIT). Such Baltic Exchange products are compared with selected Energy Commodities Indices, representative of international energy costs, including ICE Brent Crude (LCOc1), RBOB Gasoline (RBc1) and Natural Gas (Henry Hub) (NGc1), and Agricultural Commodities Indices representing international raw material costs including Soybeans (Sc1), Wheat (Wc1) and Corn (Cc1).

Table 3: Summary Statistics of GARCH-estimated Corporate Return Differentials due to Baltic Exchange and Commodity Market Tail Risk

								Percentile									
Asset	Tail	Ave	Var	Skew	Kurt	Min	Max	1%	3%	5%	10%	25%	75%	90%	95%	98%	99%
							Group 1: *Baltic Exchange Indices (Transportation Costs)*										
.BADI	1%	0.0004	0.0001	-4.1210	101.5859	-0.1630	0.0570	-0.0174	-0.0115	-0.0080	-0.0054	-0.0023	0.0030	0.0064	0.0096	0.0145	0.0236
	99%	0.0012	0.0000	3.9446	49.5726	-0.0666	0.0590	-0.0061	-0.0042	-0.0028	-0.0017	-0.0004	0.0019	0.0037	0.0057	0.0097	0.0194
.BACI	1%	0.0007	0.0000	-4.3723	129.7105	-0.1780	0.0554	-0.0138	-0.0089	-0.0068	-0.0043	-0.0020	0.0028	0.0062	0.0094	0.0141	0.0232
	99%	0.0005	0.0000	-3.4671	173.9417	-0.1210	0.0550	-0.0061	-0.0044	-0.0033	-0.0024	-0.0011	0.0014	0.0031	0.0051	0.0085	0.0162
.BPNI	1%	0.0005	0.0001	-1.5308	46.7223	-0.1680	0.0587	-0.0202	-0.0129	-0.0096	-0.0063	-0.0027	0.0031	0.0073	0.0120	0.0192	0.0286
	99%	0.0015	0.0000	3.5560	29.0272	-0.0300	0.0467	-0.0069	-0.0044	-0.0028	-0.0017	-0.0002	0.0025	0.0045	0.0066	0.0103	0.0198
.BHSI	1%	0.0003	0.0001	-1.4949	45.6530	-0.1880	0.0650	-0.0203	-0.0138	-0.0109	-0.0079	-0.0040	0.0041	0.0095	0.0141	0.0191	0.0265
	99%	0.0008	0.0000	-5.7822	223.9251	-0.1630	0.0560	-0.0094	-0.0064	-0.0045	-0.0030	-0.0010	0.0022	0.0042	0.0059	0.0082	0.0182
.BAID	1%	0.0005	0.0001	-2.4176	53.7469	-0.1840	0.0633	-0.0260	-0.0163	-0.0111	-0.0071	-0.0029	0.0040	0.0082	0.0127	0.0188	0.0294
	99%	0.0006	0.0000	-0.5027	86.1100	-0.1140	0.0610	-0.0088	-0.0059	-0.0040	-0.0027	-0.0012	0.0017	0.0041	0.0067	0.0103	0.0183
.BAIT	1%	0.0013	0.0000	-3.5809	98.1394	-0.1480	0.0496	-0.0150	-0.0091	-0.0058	-0.0036	-0.0012	0.0033	0.0067	0.0102	0.0155	0.0245
	99%	0.0005	0.0000	0.6361	97.6130	-0.1020	0.0523	-0.0074	-0.0051	-0.0036	-0.0023	-0.0009	0.0014	0.0031	0.0047	0.0076	0.0173
							Group 2: *Agricultural Commodities Indices (Raw Material Costs)*										
Sc1	1%	-0.0014	0.0001	-1.2483	24.5220	-0.1480	0.0587	-0.0273	-0.0193	-0.0139	-0.0101	-0.0060	0.0023	0.0084	0.0142	0.0215	0.0316
	99%	0.0020	0.0000	-5.9728	191.1228	-0.1790	0.0607	-0.0087	-0.0053	-0.0031	-0.0017	0.0000	0.0033	0.0061	0.0089	0.0133	0.0217
Wc1	1%	0.0018	0.0001	-1.2209	32.5357	-0.1470	0.0523	-0.0183	-0.0105	-0.0070	-0.0048	-0.0019	0.0047	0.0100	0.0149	0.0202	0.0281
	99%	0.0005	0.0000	-8.4394	276.9894	-0.1720	0.0633	-0.0084	-0.0057	-0.0042	-0.0028	-0.0011	0.0018	0.0039	0.0058	0.0090	0.0179
Cc1	1%	0.0002	0.0001	0.4125	15.7121	-0.0891	0.0533	-0.0190	-0.0132	-0.0092	-0.0068	-0.0035	0.0029	0.0074	0.0125	0.0189	0.0301
	99%	0.0010	0.0000	-2.8575	126.0931	-0.1490	0.0623	-0.0090	-0.0062	-0.0042	-0.0026	-0.0009	0.0021	0.0047	0.0076	0.0122	0.0232
							Group 3: *Energy Commodities Indices (Energy Costs)*										
LCOc1	1%	-0.0036	0.0001	-1.8420	34.8596	-0.1660	0.0537	-0.0281	-0.0206	-0.0174	-0.0139	-0.0083	0.0005	0.0060	0.0125	0.0210	0.0315
	99%	0.0011	0.0000	-5.8781	194.4210	-0.1680	0.0610	-0.0107	-0.0070	-0.0048	-0.0028	-0.0007	0.0026	0.0049	0.0073	0.0108	0.0208
RBc1	1%	-0.0015	0.0001	-0.4922	30.1440	-0.1220	0.0630	-0.0180	-0.0133	-0.0106	-0.0081	-0.0050	0.0013	0.0053	0.0094	0.0143	0.0239
	99%	0.0013	0.0000	-0.4200	102.7896	-0.1080	0.0643	-0.0075	-0.0050	-0.0035	-0.0021	-0.0004	0.0026	0.0047	0.0066	0.0094	0.0154
TRNLTTFMc1	1%	0.0015	0.0000	-1.7131	60.0110	-0.1320	0.0627	-0.0118	-0.0083	-0.0063	-0.0040	-0.0014	0.0037	0.0073	0.0102	0.0141	0.0225
	99%	0.0011	0.0000	-0.8593	106.1458	-0.0961	0.0540	-0.0066	-0.0047	-0.0035	-0.0022	-0.0006	0.0023	0.0038	0.0052	0.0081	0.0183

Note: To analyse the response of the analysed industrial corporations to extreme price variation sourced from each of the group of commodities, as separated by Baltic Exchange Indices, Energy Commodities and Agricultural Commodities, respectively, we assume a GARCH(1,1) volatility process, where the returns of each of each stock are assessed as a function of a series of dummy variables representing phases of large downward and upward price movements in the selected energy commodity markets at both the top and bottom 1%, 2.5%, 5% and 10% levels, respectively: $r_{g,t} = \alpha + \beta_0 r_{g,t-n} + \beta_1 r_{c,t} + \delta_1^{1\%} r_{c,t} Q_1 + \delta_2^{2.5\%} r_{c,t} Q_{2.5} + \delta_3^{5\%} r_{c,t} Q_5 + \delta_4^{10\%} r_{c,t} Q_{10} + \delta_5^{90\%} r_{c,t} Q_{90} + \delta_6^{95\%} r_{c,t} Q_{95} + \delta_7^{97.5\%} r_{c,t} Q_{97.5} + \delta_8^{99\%} r_{c,t} Q_{99} + e_t$, based on the estimated GARCH process: $e_t = \sqrt{h_t}\eta_t, h_t = \omega + a e_{t-1}^2 + b h_{t-1}$. $\delta_1^{1\%}$, $\delta_2^{2.5\%}$, $\delta_3^{5\%}$ and $\delta_4^{10\%}$ are the coefficients of interest, capturing the response of each respective corporation to extreme downward moves in the analysed commodity markets. Similarly, $\delta_5^{90\%}$, $\delta_6^{95\%}$ and $\delta_7^{97.5\%}$ capture the response of the variable of interest to extreme returns of the analysed commodity markets in the upper percentiles.

Table 4: ESG-Separated Sectoral Corporate Response Differentials

	Environmental			Social			Government		
	I&C	Ind.G	Trans	I&C	Ind.G	Trans	I&C	Ind.G	Trans
	Group 1: *Baltic Exchange Indices (Transportation Costs)*								
BADI 1%	-0.0139	-0.0116	-0.0069	-0.0142	-0.0452	-0.0133	-0.0053	-0.0795	-0.0076
	(0.65)	(0.19)	(0.74)	(0.57)	(0.61)	(1.23)	(0.23)	(1.08)	(0.74)
BADI 99%	0.0470	0.0458	0.0073	0.0135	0.0573	0.0039	0.0184	0.0260	0.0099
	(2.22)	(1.31)	(1.04)	(0.54)	(1.35)	(0.48)	(0.81)	(0.60)	(1.27)
BACI 1%	-0.0228	-0.0234	-0.0025***	0.0188	0.0042	-0.0034	-0.0187***	-0.0772***	-0.0233**
	(0.94)	(0.54)	(4.03)	(0.68)	(0.08)	(0.40)	(3.73)	(4.49)	(2.91)
BACI 99%	0.0434*	0.0275	0.0108	0.0122	0.0435	0.0150*	0.0003	0.0194	0.0061
	(2.34)	(0.53)	(1.65)	(0.56)	(0.70)	(1.98)	(0.01)	(0.31)	(0.85)
BPNI 1%	-0.0075	-0.0455	-0.0600***	-0.0219	-0.0116	-0.0009	-0.0057	-0.0126***	-0.0361***
	(0.21)	(1.79)	(4.75)	(0.52)	(0.36)	(0.09)	(0.15)	(3.39)	(3.41)
BPNI 99%	0.0418	0.0633	0.0124	0.0002	0.0167	0.0031	0.0375	0.0120	0.0027
	(1.62)	(1.56)	(1.62)	(0.01)	(0.33)	(0.35)	(1.37)	(0.24)	(0.32)
BHSI 1%	-0.0283	-0.0066	-0.0186*	0.0110	-0.0378	-0.0097	-0.0073	-0.0565***	-0.0097
	(1.03)	(0.12)	(2.21)	(0.35)	(0.56)	(0.99)	(0.25)	(5.83)	(1.04)
BHSI 99%	0.0089	0.0075	0.0054	0.0297	0.0308	0.0096	0.0004	0.0199	0.0148
	(0.36)	(0.19)	(0.61)	(1.06)	(0.65)	(0.94)	(0.01)	(0.42)	(1.52)
BAID 1%	-0.0204	-0.0153	-0.0272**	0.0112	-0.0134	-0.0002	-0.0083	-0.0223***	-0.0392***
	(0.69)	(0.36)	(2.76)	(0.33)	(0.26)	(0.02)	(0.27)	(3.43)	(3.60)
BAID 99%	0.0380	0.0962	0.0143	0.0281	0.0024	0.0090	0.0133	0.0143	0.0004
	(1.39)	(1.80)	(1.69)	(0.89)	(0.03)	(0.92)	(0.46)	(0.21)	(0.04)
BAIT 1%	0.0163	-0.0137	-0.0285***	0.0071	-0.0172	-0.0075	-0.0055	-0.0206***	-0.0119**
	(0.85)	(1.33)	(4.36)	(0.32)	(0.50)	(0.83)	(0.27)	(3.60)	(2.78)
BAIT 99%	0.0148	0.0223	0.0032	0.0094	0.0349	0.0046	0.0289	0.0198	0.0064
	(0.61)	(1.03)	(0.42)	(0.34)	(1.34)	(0.52)	(1.14)	(0.74)	(0.77)

Note: To analyse the response of the analysed industrial corporations to extreme price variation sourced from each of the group of commodities, as separated by Baltic Exchange Indices, Energy Commodities and Agricultural Commodities, respectively, we assume a GARCH(1,1) volatility process, where the returns of each of each stock are assessed as a function of a series of dummy variables representing phases of large downward and upward price movements in the selected energy commodity markets at both the top and bottom 1%, 2.5%, 5% and 10% levels, respectively: $r_{g,t} = \alpha+\beta_0 r_{g,t-n}+\beta_1 r_{c,t}+\delta_1^{1\%} r_{c,t}Q_1+\delta_2^{2.5\%} r_{c,t}Q_{2.5}+\delta_3^{5\%} r_{c,t}Q_5+\delta_4^{10\%} r_{c,t}Q_{10}+\delta_5^{90\%} r_{c,t}Q_{90}+\delta_6^{95\%} r_{c,t}Q_{95}+\delta_7^{97.5\%} r_{c,t}Q_{97.5}+\delta_8^{99\%} r_{c,t}Q_{99}+e_t$, based on the estimated GARCH process: $e_t=\sqrt{h_t}\eta_t, h_t=\omega+ae_{t-1}^2+bh_{t-1}$. $\delta_1^{1\%}$, $\delta_2^{2.5\%}$, $\delta_3^{5\%}$ and $\delta_4^{10\%}$ are the coefficients of interest, capturing the response of each respective corporation to extreme downward moves in the analysed commodity markets. Similarly, $\delta_5^{90\%}$, $\delta_6^{95\%}$ and $\delta_7^{97.5\%}$ capture the response of the variable of interest to extreme returns of the analysed commodity markets in the upper percentiles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 4: ESG-Separated Sectoral Corporate Response Differentials (continued)

	Environmental			Social			Government		
	I&C	Ind.G	Trans	I&C	Ind.G	Trans	I&C	Ind.G	Trans
	Group 2: *Energy Commodities Indices (Energy Costs)*								
LCOc1 1%	-0.0242	-0.0173	-0.0129	-0.0166	-0.0630	-0.0182	-0.0324	-0.0899	-0.0094
	(0.71)	(1.71)	(1.43)	(0.42)	(1.20)	(1.75)	(0.90)	(4.74)	(0.95)
LCOc1 99%	0.0027	0.0152	0.0159	0.0197	0.0224	0.0147	0.0226	0.0038	0.0179
	(0.09)	(0.48)	(1.63)	(0.57)	(0.58)	(1.31)	(0.72)	(0.10)	(1.66)
RBc1 1%	-0.0257*	-0.0183	-0.0102	-0.0448	-0.0782	-0.0090	-0.0090	-0.0266***	-0.0073***
	(1.99)	(1.71)	(1.15)	(1.35)	(1.31)	(0.87)	(0.29)	(3.44)	(4.01)
RBc1 99%	0.0090	0.0092	0.0008	0.0095	0.0318	0.0004	0.0127	0.0136	0.0051
	(0.34)	(0.35)	(0.10)	(0.31)	(1.01)	(0.05)	(0.45)	(0.43)	(0.56)
NGc1 1%	-0.0010	-0.0158	-0.0008	-0.0197	-0.0904	-0.0023	0.0043	-0.0100***	-0.0086***
	(0.04)	(1.42)	(0.09)	(0.75)	(1.84)	(0.23)	(0.18)	(4.02)	(4.09)
NGc1 99%	0.0248	0.0531	0.0023	0.0078	0.0463	0.0014	0.0433	0.0008	0.0051
	(0.72)	(1.28)	(0.24)	(0.20)	(0.91)	(0.12)	(1.19)	(0.02)	(0.48)
	Group 3: *Agricultural Commodities Indices (Raw Material Costs)*								
Sc1 1%	-0.0072	0.0175	-0.0005	0.0208	-0.0130	0.0165	-0.0695***	-0.0441***	-0.0324**
	(0.20)	(0.32)	(0.05)	(0.51)	(0.19)	(1.42)	(3.87)	(4.66)	(2.93)
Sc1 99%	0.0235	0.0076	0.0143	0.0180	0.0244	0.0090	0.0238	0.0659	0.0193
	(0.87)	(0.18)	(1.43)	(0.58)	(0.47)	(0.78)	(0.84)	(1.29)	(1.74)
Wc1 1%	0.0029	0.0366	-0.0105	-0.0073	-0.0469	0.0081	-0.0427	-0.0754***	-0.0349***
	(0.10)	(0.77)	(1.28)	(0.22)	(0.81)	(0.85)	(1.38)	(3.32)	(4.04)
Wc1 99%	0.0195	0.0185	0.0067	0.0062	0.0520	0.0169	0.0105	0.0349	0.0165
	(0.62)	(0.27)	(0.77)	(0.17)	(1.87)	(1.67)	(0.32)	(0.41)	(1.71)
Cc1 1%	0.0004	0.0266	-0.0116	0.0189	0.0139	-0.0106	-0.0081	-0.0025	-0.0075
	(0.02)	(1.16)	(1.50)	(0.72)	(0.49)	(1.18)	(0.33)	(0.09)	(0.87)
Cc1 99%	0.0285	0.0063	0.0060	0.0069	0.0294	0.0024	0.0072	0.0200	0.0164*
	(1.06)	(0.19)	(0.89)	(0.22)	(0.72)	(0.31)	(0.25)	(0.49)	(2.20)

Note: To analyse the response of the analysed industrial corporations to extreme price variation sourced from each of the group of commodities, as separated by Baltic Exchange Indices, Energy Commodities and Agricultural Commodities, respectively, we assume a GARCH(1,1) volatility process, where the returns of each of each stock are assessed as a function of a series of dummy variables representing phases of large downward and upward price movements in the selected energy commodity markets at both the top and bottom 1%, 2.5%, 5% and 10% levels, respectively: $r_{g,t} = \alpha+\beta_0 r_{g,t-n}+\beta_1 r_{c,t}+\delta_1^{1\%} r_{c,t}Q_1+\delta_2^{2.5\%} r_{c,t}Q_{2.5}+\delta_3^{5\%} r_{c,t}Q_5+\delta_4^{10\%} r_{c,t}Q_{10}+\delta_5^{90\%} r_{c,t}Q_{90}+\delta_6^{95\%} r_{c,t}Q_{95}+\delta_7^{97.5\%} r_{c,t}Q_{97.5}+\delta_8^{99\%} r_{c,t}Q_{99}+e_t$, based on the estimated GARCH process: $e_t = \sqrt{h_t}\eta_t, h_t = \omega + ae_{t-1}^2 + bh_{t-1}$. $\delta_1^{1\%}$, $\delta_2^{2.5\%}$, $\delta_3^{5\%}$ and $\delta_4^{10\%}$ are the coefficients of interest, capturing the response of each respective corporation to extreme downward moves in the analysed commodity markets. Similarly, $\delta_5^{90\%}$, $\delta_6^{95\%}$ and $\delta_7^{97.5\%}$ capture the response of the variable of interest to extreme returns of the analysed commodity markets in the upper percentiles. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 5: Sectoral Corporate Response Differentials as Separated by Combined Score

Asset	Tail				Tail				Tail			
	1%	5%	95%	99%	1%	5%	95%	99%	1%	5%	95%	99%
Group 1: *Baltic Exchange Indices (Transportation Costs)*												
Asset	BADI				BACI				BPNI			
Coeff.	-0.0211	-0.0732**	0.0669	0.0641	-0.1680**	-0.0887**	0.0081	0.0360	-0.0736**	-0.0308	0.0122	0.0515
	(0.0800)	(0.0275)	(0.0826)	(0.0690)	(0.0781)	(0.0335)	(0.0397)	(0.0495)	(0.0324)	(0.0636)	(0.0306)	(0.0468)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,377	1,374	1,377	1,376	1,374	1,375	1,377	1,375	1,375	1,377
R^2	0.052	0.123	0.103	0.14	0.077	0.111	0.103	0.089	0.065	0.125	0.105	0.06
Asset	BHSI				BAID				BAIT			
Coeff.	0.0715	0.0610	0.0884*	0.2260***	-0.0901***	-0.0278***	0.0476	0.1210	-0.0627***	-0.0171	0.0439	0.1710***
	(0.1790)	(0.0856)	(0.0478)	(0.0762)	(0.0160)	(0.0036)	(0.0318)	(0.0997)	(0.0052)	(0.0503)	(0.0367)	(0.0460)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,374	1,376	1,376	1,375	1,375	1,377	1,376	1,375	1,375
R^2	0.106	0.073	0.076	0.083	0.114	0.09	0.065	0.066	0.049	0.081	0.081	0.087
Group 2: *Agricultural Commodities Indices (Raw Material Costs)*												
Asset	Sc1				Wc1				Cc1			
Coeff.	-0.0951	-0.0868	0.0223	0.1220	-0.0047	0.0032	0.1090	0.1110*	0.0718	0.0197	0.0551	0.2320**
	(0.1400)	(0.0640)	(0.0706)	(0.0846)	(0.0996)	(0.0518)	(0.0752)	(0.0591)	(0.1160)	(0.0712)	(0.0513)	(0.0857)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,376	1,377	1,372	1,375	1,377	1,376	1,374	1,375	1,374
R^2	0.076	0.06	0.085	0.086	0.087	0.059	0.149	0.101	0.075	0.102	0.086	0.084
Group 3: *Energy Commodities Indices (Energy Costs)*												
Asset	LCOc1				RBc1				TRNLTTFMc1			
Coeff.	0.0614	0.0632	-0.0259	0.0828	-0.1520***	-0.1090***	0.1120*	0.2120*	-0.0142	0.0095	0.0895	0.0827
	(0.1140)	(0.0656)	(0.0611)	(0.0685)	(0.0171)	(0.0126)	(0.0558)	(0.1090)	(0.0710)	(0.0329)	(0.0800)	(0.0772)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,375	1,375	1,375	1,376	1,375	1,376	1,377	1,377	1,375	1,376	1,377
R^2	0.087	0.063	0.100	0.090	0.079	0.083	0.128	0.112	0.083	0.085	0.160	0.088

Note: For brevity of presentation, only those results pertaining to the top and bottom 1% and 5% of tail risk price movements are included in the above tables. Further results, alternative methodological specifications, and related goodness-of-fit testing procedures are available from the authors upon request. Results are further considered in line with the ESG combined (ESGC) score, discounted for significant ESG controversies impacting the corporations analysed by LSEG Eikon. Further, we utilise the ESG controversies score, calculated based on 23 ESG controversy topics. Eikon explained this process in detail when considering data during the yearly life of a corporation; if a scandal occurs, the company involved is penalised, and this affects the overall ESGC score and grading. The long-term impact of the event may still be seen in the following year if there are new developments related to the same negative event, for example, lawsuits, ongoing legislation disputes or fines. All new media materials are captured as the controversy progresses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 6: Sectoral Corporate Response Differentials as Separated by Controversies Score

Asset	Tail				Tail				Tail			
	1%	5%	95%	99%	1%	5%	95%	99%	1%	5%	95%	99%
Group 1: *Baltic Exchange Indices (Transportation Costs)*												
Asset	BADI				BACI				BPNI			
Coeff.	-0.1600*	-0.1220**	0.0900**	0.0961	-0.1010**	-0.0640***	0.1390**	0.1050*	-0.0828***	-0.0768***	0.0500	0.1920*
	(0.0814)	(0.0467)	(0.0432)	(0.0822)	(0.0433)	(0.0223)	(0.0514)	(0.0595)	(0.0221)	(0.0246)	(0.0311)	(0.0966)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,377	1,374	1,377	1,376	1,374	1,375	1,377	1,375	1,375	1,377
R^2	0.053	0.125	0.104	0.141	0.077	0.111	0.107	0.09	0.065	0.126	0.105	0.063
Asset	BHSI				BAID				BAIT			
Coeff.	-0.0845	-0.1130	-0.0527	-0.0255	-0.0132	0.0049	0.0038	0.0436	-0.1200	-0.0088	0.0036	0.1700*
	(0.0938)	(0.0700)	(0.0392)	(0.0388)	(0.0483)	(0.0280)	(0.0827)	(0.0652)	(0.0728)	(0.0294)	(0.0318)	(0.0952)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,374	1,376	1,376	1,375	1,375	1,377	1,376	1,375	1,375
R^2	0.106	0.074	0.075	0.081	0.114	0.09	0.065	0.066	0.05	0.081	0.081	0.087
Group 2: *Agricultural Commodities Indices (Raw Material Costs)*												
Asset	Sc1				Wc1				Cc1			
Coeff.	0.0256	0.0106**	0.0992*	0.1240**	-0.0338	-0.0296	0.0301	0.0220	-0.0694	-0.0185	0.0968	0.0549
	(0.0494)	(0.0038)	(0.0510)	(0.0465)	(0.1000)	(0.0368)	(0.0659)	(0.1330)	(0.0643)	(0.0269)	(0.0580)	(0.0973)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,376	1,377	1,372	1,375	1,377	1,376	1,374	1,375	1,374
R^2	0.076	0.061	0.087	0.086	0.088	0.059	0.148	0.101	0.075	0.102	0.087	0.082
Group 3: *Energy Commodities Indices (Energy Costs)*												
Asset	LCOc1				RBc1				TRNLTTFMc1			
Coeff.	-0.1230**	-0.0896***	0.0322	0.1280*	-0.0497	-0.0425	0.0170	0.0222	-0.0222	-0.0349	0.0307	0.0221
	(0.0540)	(0.0301)	(0.0490)	(0.0744)	(0.0783)	(0.0441)	(0.0470)	(0.0333)	(0.0490)	(0.0247)	(0.0395)	(0.0680)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,375	1,375	1,375	1,376	1,375	1,376	1,377	1,377	1,375	1,376	1,377
R^2	0.088	0.063	0.1	0.091	0.078	0.082	0.127	0.11	0.083	0.083	0.159	0.088

Note: For brevity of presentation, only those results pertaining to the top and bottom 1% and 5% of tail risk price movements are included in the above tables. Further results, alternative methodological specifications, and related goodness-of-fit testing procedures are available from the authors upon request. The above table is separated based on the ESG Controversies Score, defined by LSEG Eikon as: "*The ESG controversies score is calculated based on 23 ESG controversy topics. During the year, if a scandal occurs, the company involved is penalised, and this affects their overall ESG Controversies score and grading. The event's impact may still be seen in the following year if there are new developments related to the negative event, for example, lawsuits, ongoing legislation disputes or fines. All new media materials are captured as the controversy progresses. The controversies score also addresses the market cap bias from which large-cap companies suffer, as they attract more media attention than smaller-cap companies.*" ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 7: Sectoral Corporate Response Differentials as Separated by ESG Score

Asset	Tail				Tail				Tail			
	1%	5%	95%	99%	1%	5%	95%	99%	1%	5%	95%	99%
	Group 1: *Baltic Exchange Indices (Transportation Costs)*											
Asset	BADI				BACI				BPNI			
Coeff.	-0.0398	-0.0370	0.0782	0.1180**	-0.1570***	-0.1000***	0.0774	0.1160*	-0.0405	-0.0125	0.0907***	0.1210*
	(0.0803)	(0.0561)	(0.0811)	(0.0486)	(0.0523)	(0.0358)	(0.0775)	(0.0628)	(0.0862)	(0.0580)	(0.0311)	(0.0598)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,377	1,374	1,377	1,376	1,374	1,375	1,377	1,375	1,375	1,377
R^2	0.052	0.124	0.102	0.14	0.076	0.111	0.103	0.089	0.065	0.125	0.105	0.062
Asset	BHSI				BAID				BAIT			
Coeff.	-0.1080	-0.1080	0.0953	0.2230**	-0.0736*	-0.0843	0.0267	0.0656	-0.1180**	-0.0212	0.0337**	0.1210***
	(0.1500)	(0.1140)	(0.0578)	(0.0917)	(0.0372)	(0.0600)	(0.0397)	(0.1020)	(0.0529)	(0.0362)	(0.0140)	(0.0428)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,374	1,376	1,376	1,375	1,375	1,377	1,376	1,375	1,375
R^2	0.107	0.074	0.076	0.083	0.115	0.09	0.065	0.066	0.049	0.081	0.082	0.086
	Group 2: *Agricultural Commodities Indices (Raw Material Costs)*											
Asset	Sc1				Wc1				Cc1			
Coeff.	-0.0786	-0.0933	0.0341	0.0612	0.0129	0.0119	0.0780	0.1254	0.0762	0.0237	0.0805*	0.1920**
	(0.1470)	(0.0629)	(0.0944)	(0.0834)	(0.1200)	(0.0541)	(0.0506)	(0.1090)	(0.1060)	(0.0623)	(0.0436)	(0.0860)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,376	1,377	1,372	1,375	1,377	1,376	1,374	1,375	1,374
R^2	0.076	0.06	0.085	0.085	0.087	0.059	0.148	0.101	0.076	0.102	0.086	0.084
	Group 3: *Energy Commodities Indices (Energy Costs)*											
Asset	LCOc1				RBc1				TRNLTTFMc1			
Coeff.	-0.0846***	-0.0743***	0.0527	0.1120*	-0.1480	-0.0731	0.1010	0.2030*	-0.0176	0.0114	0.0989	0.0888
	(0.1010)	(0.0066)	(0.0500)	(0.0579)	(0.1860)	(0.1090)	(0.0612)	(0.1160)	(0.0643)	(0.0097)	(0.0934)	(0.0976)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,375	1,375	1,375	1,376	1,375	1,376	1,377	1,377	1,375	1,376	1,377
R^2	0.087	0.063	0.1	0.09	0.079	0.082	0.128	0.111	0.083	0.086	0.162	0.089

Note: For brevity of presentation, only those results pertaining to the top and bottom 1% and 5% of tail risk price movements are included in the above tables. Further results, alternative methodological specifications, and related goodness-of-fit testing procedures are available from the authors upon request. In the above Table, we further focus on the overall ESG score, along with respective environmental, social and governance scores, which are developed on ten distinct categories inclusive of emissions, resource usage and innovation (environmental), community, human rights, product responsibility, workforce (social) and shareholders, CSR strategy and management (corporate governance). ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 8: Sectoral Corporate Response Differentials as Separated by Environmental Score

Asset	Tail				Tail				Tail			
	1%	5%	95%	99%	1%	5%	95%	99%	1%	5%	95%	99%
Group 1: *Baltic Exchange Indices (Transportation Costs)*												
Asset	BADI				BACI				BPNI			
Coeff.	-0.0791**	-0.0700*	0.0227	0.0391	-0.0636**	-0.0528*	0.0237	0.0744	-0.0542***	-0.0052	0.0441*	0.1200**
	(0.0314)	(0.0378)	(0.0368)	(0.0888)	(0.0265)	(0.0259)	(0.0222)	(0.0607)	(0.0081)	(0.0357)	(0.0245)	(0.0528)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,377	1,374	1,377	1,376	1,374	1,375	1,377	1,375	1,375	1,377
R^2	0.052	0.124	0.102	0.14	0.077	0.112	0.103	0.089	0.065	0.125	0.105	0.061
Asset	BHSI				BAID				BAIT			
Coeff.	-0.1310	-0.0885	0.0437**	0.1510*	-0.1600***	-0.0650**	0.0203	0.0305	-0.0305***	-0.0095	0.0601*	0.1010**
	(0.1540)	(0.0832)	(0.0203)	(0.0739)	(0.0535)	(0.0306)	(0.0386)	(0.0773)	(0.0047)	(0.0225)	(0.0317)	(0.0377)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,374	1,376	1,376	1,375	1,375	1,377	1,376	1,375	1,375
R^2	0.106	0.074	0.076	0.083	0.114	0.09	0.065	0.066	0.05	0.081	0.081	0.086
Group 2: *Agricultural Commodities Indices (Raw Material Costs)*												
Asset	Sc1				Wc1				Cc1			
Coeff.	0.0761	-0.0170	-0.0116	-0.0128	0.0157	0.0079	0.0606	-0.0240	0.1200	0.0092	0.0242	0.1810***
	(0.1320)	(0.0456)	(0.0592)	(0.0674)	(0.1240)	(0.0443)	(0.0445)	(0.0691)	(0.1110)	(0.0468)	(0.0304)	(0.0617)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,376	1,377	1,372	1,375	1,377	1,376	1,374	1,375	1,374
R^2	0.076	0.061	0.085	0.085	0.087	0.059	0.148	0.101	0.075	0.102	0.086	0.084
Group 3: *Energy Commodities Indices (Energy Costs)*												
Asset	LCOc1				RBc1				TRNLTTFMc1			
Coeff.	-0.0720***	-0.0279***	-0.0218	0.0315	-0.0981***	0.0199	0.0901*	0.1370*	-0.0356***	0.0889	0.0997	0.0992
	(0.0088)	(0.0074)	(0.0487)	(0.0730)	(0.0129)	(0.0774)	(0.0496)	(0.0771)	(0.0036)	(0.0675)	(0.0755)	(0.0877)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,375	1,375	1,375	1,376	1,375	1,376	1,377	1,377	1,375	1,376	1,377
R^2	0.087	0.063	0.1	0.091	0.079	0.082	0.128	0.112	0.083	0.086	0.161	0.089

Note: For brevity of presentation, only those results pertaining to the top and bottom 1% and 5% of tail risk price movements are included in the above tables. Further results, alternative methodological specifications, and related goodness-of-fit testing procedures are available from the authors upon request. In the above table, we further focus on the environmental categories, including emissions, resource usage, and innovation. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 9: Sectoral Corporate Response Differentials as Separated by Social Score

Asset		Tail				Tail				Tail		
	1%	5%	95%	99%	1%	5%	95%	99%	1%	5%	95%	99%
Group 1: *Baltic Exchange Indices (Transportation Costs)*												
Asset		BADI				BACI				BPNI		
Coeff.	-0.1470**	-0.0918	0.0291	0.0128	-0.2230*	-0.1140*	0.0527	0.0227	-0.0920***	0.0350	0.0395	0.1130
	(0.0685)	(0.0565)	(0.0470)	(0.0526)	(0.1140)	(0.0587)	(0.0382)	(0.0597)	(0.0220)	(0.0770)	(0.0460)	(0.0836)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,377	1,374	1,377	1,376	1,374	1,375	1,377	1,375	1,375	1,377
R^2	0.052	0.127	0.102	0.140	0.080	0.113	0.103	0.089	0.065	0.125	0.105	0.061
Asset		BHSI				BAID				BAIT		
Coeff.	-0.0698	-0.0846	0.0841	0.1830*	-0.0266	-0.0104	0.0593	0.1490	-0.1650*	-0.0383*	0.0379	0.0881*
	(0.1130)	(0.1030)	(0.0686)	(0.0958)	(0.0865)	(0.0320)	(0.0354)	(0.1020)	(0.0927)	(0.0217)	(0.0365)	(0.0490)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,374	1,376	1,376	1,375	1,375	1,377	1,376	1,375	1,375
R^2	0.106	0.074	0.076	0.083	0.114	0.090	0.066	0.067	0.051	0.081	0.081	0.086
Group 2: *Agricultural Commodities Indices (Raw Material Costs)*												
Asset		Sc1				Wc1				Cc1		
Coeff.	-0.0622	-0.0909	0.0171	0.0632	0.0774*	0.0661	0.1040	0.0983**	-0.1040	-0.0539	0.0177	0.0890
	(0.1030)	(0.0559)	(0.0907)	(0.1010)	(0.0417)	(0.0524)	(0.0665)	(0.0447)	(0.0941)	(0.0668)	(0.0777)	(0.0919)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,376	1,377	1,372	1,375	1,377	1,376	1,374	1,375	1,374
R^2	0.076	0.061	0.085	0.085	0.088	0.060	0.149	0.101	0.075	0.102	0.086	0.082
Group 3: *Energy Commodities Indices (Energy Costs)*												
Asset		LCOc1				RBc1				TRNLTTFMc1		
Coeff.	-0.1660**	-0.1240**	0.0286	0.0560	-0.1990	-0.1430	0.0418	0.0914	-0.1270*	-0.0290	0.0345	0.0799
	(0.0808)	(0.0476)	(0.0749)	(0.1050)	(0.1730)	(0.1070)	(0.0598)	(0.1200)	(0.0728)	(0.0355)	(0.0206)	(0.0758)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,375	1,375	1,375	1,376	1,375	1,376	1,377	1,377	1,375	1,376	1,377
R^2	0.088	0.064	0.100	0.090	0.080	0.084	0.127	0.111	0.083	0.087	0.161	0.088

Note: For brevity of presentation, only those results pertaining to the top and bottom 1% and 5% of tail risk price movements are included in the above tables. Further results, alternative methodological specifications, and related goodness-of-fit testing procedures are available from the authors upon request. In the above table, we further focus on social categories, including community, human rights, product responsibility, and workforce. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 10: Sectoral Corporate Response Differentials as Separated by Governance Score

Asset	Tail				Tail				Tail			
	1%	5%	95%	99%	1%	5%	95%	99%	1%	5%	95%	99%
					Group 1: *Baltic Exchange Indices (Transportation Costs)*							
Asset	BADI				BACI				BPNI			
Coeff.	-0.0327	-0.0260	0.0308	0.0308	-0.0534**	-0.0505**	0.0163	0.0869	-0.0885***	-0.0117	-0.0254	0.0230
	(0.0542)	(0.0236)	(0.0540)	(0.0584)	(0.0253)	(0.0206)	(0.0410)	(0.0555)	(0.0221)	(0.0509)	(0.0257)	(0.0689)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,377	1,374	1,377	1,376	1,374	1,375	1,377	1,375	1,375	1,377
R^2	0.052	0.122	0.102	0.14	0.076	0.111	0.103	0.089	0.065	0.125	0.105	0.06
Asset	BHSI				BAID				BAIT			
Coeff.	-0.0491	-0.0352	0.0557**	0.1460***	-0.0398*	-0.0578	0.0115	0.0159	-0.0478	-0.0342	0.0241	0.0532
	(0.0675)	(0.0426)	(0.0259)	(0.0487)	(0.0215)	(0.0382)	(0.0320)	(0.0759)	(0.0502)	(0.0345)	(0.0367)	(0.0344)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,374	1,376	1,376	1,375	1,375	1,377	1,376	1,375	1,375
R^2	0.106	0.073	0.075	0.082	0.114	0.09	0.065	0.066	0.049	0.081	0.081	0.085
					Group 2: *Agricultural Commodities Indices (Raw Material Costs)*							
Asset	Sc1				Wc1				Cc1			
Coeff.	-0.1800*	-0.0869*	-0.0037	0.0773	-0.0902*	-0.0451*	-0.0036	0.0061	-0.0642	-0.0113	0.1050***	0.1370
	(0.0952)	(0.0465)	(0.0343)	(0.0488)	(0.0483)	(0.0258)	(0.0443)	(0.0822)	(0.0559)	(0.0415)	(0.0312)	(0.0906)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,376	1,377	1,372	1,375	1,377	1,376	1,374	1,375	1,374
R^2	0.077	0.061	0.085	0.085	0.088	0.06	0.147	0.101	0.075	0.102	0.086	0.083
					Group 3: *Energy Commodities Indices (Energy Costs)*							
Asset	LCOc1				RBc1				TRNLTTFMc1			
Coeff.	-0.0307	-0.0387	0.0157	0.1360	-0.0139	-0.0025	0.0971*	0.2140**	-0.0158	-0.0197	0.0244	0.0734
	(0.0749)	(0.0394)	(0.0421)	(0.0867)	(0.1210)	(0.0665)	(0.0543)	(0.0865)	(0.0921)	(0.0327)	(0.0509)	(0.0743)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,375	1,375	1,375	1,376	1,375	1,376	1,377	1,377	1,375	1,376	1,377
R^2	0.087	0.063	0.1	0.091	0.078	0.082	0.128	0.113	0.083	0.083	0.159	0.088

Note: For brevity of presentation, only those results pertaining to the top and bottom 1% and 5% of tail risk price movements are included in the above tables. Further results, alternative methodological specifications, and related goodness-of-fit testing procedures are available from the authors upon request. In the above Table, we further focus on the corporate governance categories, including shareholders, CSR strategy and management. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 11: Sectoral Corporate Response Differentials as Separated by Corporate Size (Market Capitalisation, log)

Asset	Tail				Tail				Tail			
	1%	5%	95%	99%	1%	5%	95%	99%	1%	5%	95%	99%
Group 1: *Baltic Exchange Indices (Transportation Costs)*												
Asset	BADI				BACI				BPNI			
Coeff.	-0.6640***	-0.1470**	0.0291	0.0128	-0.2230*	-0.1140*	-0.0527	0.0227	-0.0920***	-0.0350	0.0395	0.1130
	(0.0795)	(0.0685)	(0.0470)	(0.0526)	(0.1140)	(0.0587)	(0.0382)	(0.0597)	(0.0220)	(0.0770)	(0.0460)	(0.0836)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,377	1,374	1,377	1,376	1,374	1,375	1,377	1,375	1,375	1,377
R^2	0.052	0.127	0.102	0.140	0.080	0.113	0.103	0.089	0.065	0.125	0.105	0.061
Asset	BHSI				BAID				BAIT			
Coeff.	-0.0698	-0.0846	0.0841	0.1830*	-0.0266	-0.0104	0.0593	0.1490	-0.1650*	-0.0383*	0.0379	0.0881*
	(0.1130)	(0.1030)	(0.0686)	(0.0958)	(0.0865)	(0.0320)	(0.0354)	(0.1020)	(0.0927)	(0.0217)	(0.0365)	(0.0490)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,374	1,376	1,376	1,375	1,375	1,377	1,376	1,375	1,375
R^2	0.106	0.074	0.076	0.083	0.114	0.090	0.066	0.067	0.051	0.081	0.081	0.086
Group 2: *Agricultural Commodities Indices (Raw Material Costs)*												
Asset	Sc1				Wc1				Cc1			
Coeff.	-0.0622	-0.0909	0.0171	0.0632	0.0916	0.0774*	0.0983**	0.1318	0.1040	0.0539	0.0177	0.0890
	(0.1030)	(0.0559)	(0.0907)	(0.1010)	(0.1050)	(0.0417)	(0.0447)	(0.1030)	(0.0941)	(0.0668)	(0.0777)	(0.0919)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,376	1,374	1,376	1,377	1,372	1,375	1,377	1,376	1,374	1,375	1,374
R^2	0.076	0.061	0.085	0.085	0.088	0.060	0.149	0.101	0.075	0.102	0.086	0.082
Group 3: *Energy Commodities Indices (Energy Costs)*												
Asset	LCOc1				RBc1				TRNLTTFMc1			
Coeff.	-0.1660**	-0.1240**	0.0560	0.1180**	-0.1990	-0.1430	0.0418	0.0914	0.1270*	0.0290	0.0345	0.0799
	(0.0808)	(0.0476)	(0.1050)	(0.0525)	(0.1730)	(0.1070)	(0.0598)	(0.1200)	(0.0728)	(0.0355)	(0.0206)	(0.0758)
Ind. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Count. F-E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,376	1,375	1,375	1,375	1,376	1,375	1,376	1,377	1,377	1,375	1,376	1,377
R^2	0.088	0.064	0.100	0.090	0.080	0.084	0.127	0.111	0.083	0.087	0.161	0.088

Note: For brevity of presentation, only those results pertaining to the top and bottom 1% and 5% of tail risk price movements are included in the above tables. Further results, alternative methodological specifications, and related goodness-of-fit testing procedures are available from the authors upon request. In this specification, we consider the log of corporate market capitalisation as a moderating variable to account for recognised bias from which large-cap companies suffer, as they attract more media attention than smaller-cap companies. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.