Navigating Uncertainty: The Cost of Capital and Environmental Sustainability in European Firms Post Russia-Ukraine Crisis

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Abstract

This study investigates the extent to which the cost of capital influences European firms' commitment to environmental sustainability, particularly in the aftermath of the Russia-Ukraine crisis. The results of fixed-effects regressions, an instrumental variables approach, difference-in-differences analysis, and a multinomial logistic framework show that lower debt costs boost resource efficiency, emissions control, and innovation. In contrast, a higher weighted average cost of capital relates to weaker environmental performance. Firms in conflict-affected industries show declines in emissions and resource use performance but maintain stronger innovation scores. Additionally, firms with higher Environmental Sustainability Indicators (ESI) prefer equity over debt, except when heavily leveraged, suggesting complex financing decisions shaped by environmental commitments.

Keywords: Environmental sustainability; Cost of capital; European firms; Russia-Ukraine crisis

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1 Introduction

The global business environment is undergoing a transformative shift towards environmental sustainability, propelled by increasing awareness of climate change, stringent regulatory frameworks, and evolving consumer preferences (Porter and Kramer, 2011; Delmas and Toffel, 2011). Climate change has emerged as one of the most pressing challenges of the 21st century, with significant implications for economies, societies, and ecosystems worldwide. The scientific consensus on the anthropogenic causes of climate change has galvanized policymakers and stakeholders to advocate for more sustainable business practices (Stern, 2008)[1]. Companies are now more cognizant of the need to integrate sustainable practices into their core strategies to enhance competitiveness and fulfill stakeholder expectations (Eccles et al., 2014; Freeman, 1984).

In response to these pressures, firms are increasingly engaging in transformative innovation, which involves developing novel products, processes, and business models that minimize environmental impact while fostering economic growth (Leach et al., 2012; Raihan et al., 2022). Transformative innovation is seen as a critical pathway to achieving sustainable development goals, enabling firms to address environmental challenges while creating value for shareholders (Porter and van der Linde, 1995; Hart, 1995). The integration of environmental sustainability into corporate strategy is not only a moral imperative but also a source of competitive advantage, as it can lead to improved efficiency, enhanced reputation, and access to new markets (Ren et al., 2019). Nevertheless, there is a cost associated with undertaking environmental sustainability projects. An important factor influencing corporate decisions on sustainability initiatives is the cost of capital—the expenses associated with securing financing for projects (Khan et al., 2016). The cost of capital affects a firm's valuation of potential investments and can significantly impact strategic priorities, especially

[1] According to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2022), the growing ecological problems could lead to dangerous chain of reactions causing ecosystems collapse that would put food supplies, public health, and global stability at serious risk.

in sustainability projects that often require substantial upfront investment with long-term returns (El Ghoul et al., 2011; Hsu et al., 2018). Financing constraints can limit a firm's ability to undertake valuable projects, particularly those with uncertain or delayed payoffs, such as investments in environmental sustainability (López et al., 2007). Therefore, understanding the relationship between the cost of capital and environmental initiatives is crucial for both corporate managers and policymakers.

Prior research has explored the relationship between corporate social responsibility (CSR), environmental, social, and governance (ESG) disclosures, and the cost of capital, generally finding that better sustainability performance is associated with a lower cost of capital (Gianfrate and Peri, 2019; Ghoul et al., 2011). For instance, firms with strong ESG performance may benefit from reduced information asymmetry and perceived lower risk, leading to favorable financing conditions (Dhaliwal et al., 2011; El Ghoul et al., 2011). Moreover, investors are increasingly incorporating ESG criteria into their investment decisions, recognizing that sustainable practices can enhance long-term financial performance and risk management (Friede et al., 2015; Krueger, 2015). This is in line with the theory that green investors can influence polluting firms to adopt cleaner practices through capital allocation (Sharfman and Fernando, 2008; Heinkel et al., 2001)This shift reflects a growing consensus that environmental sustainability is not only compatible with financial objectives but can also contribute to value creation (Clark et al., 2015).

However, recent geopolitical events, notably the Russian invasion of Ukraine, have disrupted global markets, leading to inflation, interest rate hikes, and an energy crisis (Ali et al., 2023). The conflict has exacerbated supply chain disruptions and heightened uncertainty in financial markets, influencing investor sentiment and capital flows (Jagtap et al., 2022). These developments have introduced new complexities into the cost of capital-environmental sustainability relationship, as firms navigate increased financing costs and potential shifts in investment priorities. Unlike environmental disasters previously studied (e.g., Bonetti et al., 2023), the Russia-Ukraine crisis presents a socio-political shock with far-reaching economic implications, offering a unique context to examine how external factors influence firms' sustainability commitments. The energy crisis resulting from the conflict has led to a surge in fossil fuel prices and raised concerns about energy security in Europe (Maneejuk et al., 2024). Some firms and governments have responded by increasing investments in traditional energy sources, potentially at the expense of renewable energy initiatives (Ali et al., 2023). This shift poses questions about the resilience of corporate sustainability efforts in the face of external shocks and the role of financial constraints in shaping strategic decisions.

This study investigates the extent to which the cost of capital drives firms' focus on environmental sustainability in Europe, particularly in the wake of the Russia-Ukraine crisis. Specifically, we seek to understand whether the cost of capital is a significant driver of firms' environmental sustainability initiatives and, if so, which aspects of sustainability—such as emissions reduction, resource use efficiency, and innovation—are most influenced. The analysis finds that higher WACC or CoE do not show a significant link with environmental performance, whereas a lower CoD strongly aligns with improved sustainability performance in our baseline analysis. Sub-component results indicate that cheaper debt increases resource-use efficiency and reduces emissions, highlighting how financing flexibility supports green initiatives. During crisis conditions, firms facing lower cost of external capital maintain comparatively higher environmental performance than heavily exposed peers.

This research contributes to the literature in several ways. While recent studies have explored the impact of the Ukraine war across various dimensions—such as cost of capital, disclosure benefits, and optimal initiatives—these are primarily framed within the ESG context. In contrast, our study focuses specifically on environmental sustainability and its subcomponents. Theoretically, by integrating the impact of geopolitical events into the analysis of the cost of capital and environmental sustainability, the study expands existing theories on how external shocks influence corporate sustainability behavior. It contributes to the discourse on how firms adjust strategic priorities in response to changes in the macroeconomic environment, building on the resource-based view and stakeholder theory (Barney, 1991; Freeman, 1984). Empirically, providing evidence on the relationship between the cost of capital and sustainability focus in the context of the Russia-Ukraine crisis enriches understanding of how firms respond to macroeconomic disruptions. It adds to the body of knowledge on the financial determinants of sustainability investments and the resilience of corporate sustainability efforts during periods of uncertainty (Flammer and Bansal, 2017; Delmas et al., 2015). From practical perspectives, the findings can inform corporate decision-makers on the importance of sustainability indicators in accessing favorable financing conditions. It highlights the potential benefits of enhancing environmental sustainability disclosures to reduce the cost of capital. Firms may leverage sustainability performance to attract green investors and optimize their capital structure, aligning financial and environmental objectives (Ghoul et al., 2011; Cui et al., 2018). From a policy perspective, insights from the study may guide policymakers in designing interventions that encourage sustainable investments, particularly during periods of economic uncertainty. Policymakers concerned about saving the planet could consider incentives for firms maintaining or increasing sustainability investments despite higher financing costs, contributing to broader environmental and economic goals (Stern, 2008).

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature and develops the hypotheses. Section 3 outlines the research methodology, including data collection and econometric models. Section 4 discusses the expected contributions of the study. Finally, Section 5 concludes the paper.

2 Literature Review and Hypothesis Development

2.1 The Cost of Capital and Environmental Sustainability

The cost of capital is a fundamental concept in corporate finance, representing the return required by investors for providing capital to the firm (Brealey et al., 2012). It influences investment decisions by affecting the net present value of projects and can significantly impact strategic priorities. In the context of environmental sustainability, projects often involve significant upfront costs with benefits accruing over the long term (Hsu et al., 2018; López et al., 2007). Therefore, the cost of capital becomes particularly salient for firms considering investments in sustainability initiatives. Empirical studies have consistently found that firms with better CSR or ESG performance tend to have a lower cost of capital. El Ghoul et al. (2011) found that firms with higher CSR scores exhibit lower costs of equity capital, suggesting that investors value sustainable practices due to perceived risk reductions and enhanced long-term viability. Similarly, Dhaliwal et al. (2011) demonstrated that firms initiating voluntary CSR disclosures experienced a subsequent decrease in their cost of equity capital. These findings indicate that the market rewards firms for transparency and commitment to sustainability, which can enhance investor confidence and reduce capital costs.

The theoretical support for this relationship lies in stakeholder theory and risk management perspectives. Stakeholder theory posits that firms addressing the needs and concerns of various stakeholders—including investors, customers, employees, and the broader community—are more likely to achieve sustainable success (Freeman, 1984; Donaldson and Preston, 1995). From a risk management perspective, firms with strong environmental performance are better positioned to mitigate risks associated with regulatory changes, environmental liabilities, and reputational damage (Sharfman and Fernando, 2008; Clarkson et al., 2011). This risk mitigation can translate into lower expected returns demanded by investors, thereby reducing the cost of capital. Moreover, the integration of ESG factors into investment decisions has gained prominence among institutional investors. Studies have shown that ESG considerations can influence portfolio allocation and risk assessment (Dimson et al., 2015; Krueger, 2015). Investors may perceive firms with strong environmental performance as better long-term investments, leading to increased demand for their securities and lower required returns. This dynamic is supported by Friede et al. (2015), who conducted a meta-analysis of over 2,000 empirical studies and found a positive relationship between ESG performance and financial performance.

In addition, firms issuing green bonds—debt instruments earmarked for environmental projects—have been found to benefit from a lower cost of debt compared to conventional bonds (Gianfrate and Peri, 2019; Tang and Zhang, 2020). This ”greenium” reflects investor willingness to accept lower yields for investments that contribute to environmental sustainability. The development of sustainable finance markets and increased demand for green investments have further enhanced the financial incentives for firms to engage in environmental initiatives (Flammer, 2021; Zerbib, 2019). However, some studies have shown that although sustainability initiatives can yield benefits (e.g., reputational gains, operational efficiencies, and risk mitigation), they also frequently involve higher short-term costs for firms (Ambec and Lanoie, 2008; Konar and Cohen, 2001). These additional costs arise both from stricter regulatory compliance (e.g., meeting emission standards, adopting clean technologies) and from voluntarily pursued initiatives (Delmas and Montes-Sancho, 2010). Hence, given the costs/benefits associated with the environmental improvements projects of firms, it becomes and empirical question. Thus, we posit the following hypothesis:

Hypothesis 1 (H1): There is a negative relationship between the cost of capital and firms' environmental sustainability in Europe.

2.2 Impact of Geopolitical Events on Sustainability Investments

Geopolitical events can significantly affect global financial markets and firms' investment decisions. The Russia-Ukraine crisis has led to economic sanctions, disrupted supply chains, and increased energy prices, contributing to inflation and higher interest rates (Mbah and Wasum, 2022; Liadze et al., 2023). These factors have raised the cost of capital for many firms, potentially impacting their ability to invest in long-term sustainability projects. Previous studies have shown that external shocks can influence corporate behavior regarding environmental initiatives. For instance, Lee et al. (2015) examined the impact of the 2008 financial crisis on environmental performance and found that firms reduced their environmental investments during the downturn. Similarly, Delmas et al. (2015) highlighted that financial constraints during economic crises can lead firms to cut back on CSR activities. However, some firms demonstrate resilience in maintaining sustainability efforts despite adverse conditions. Flammer and Bansal (2017) found that firms with a long-term orientation were more likely to continue investing in environmental initiatives during economic downturns, suggesting that strategic commitment can mitigate the negative effects of external shocks. This resilience may be attributed to the recognition that sustainability investments contribute to long-term competitiveness and risk management (Porter and van der Linde, 1995; Hart, 1995).

The Russia-Ukraine crisis presents unique challenges due to its impact on energy markets. The conflict has heightened concerns about energy security in Europe, leading some governments and firms to increase reliance on traditional fossil fuels (Ali et al., 2023). This shift could potentially divert resources away from renewable energy investments and other sustainability initiatives. The increased cost of capital exacerbates this effect by making long-term, capital-intensive environmental projects less financially attractive. Drawing on the resource-based view of the firm, which emphasizes the allocation of resources towards strategic capabilities (Barney, 1991), an increase in the cost of capital may force firms to prioritize projects with immediate financial returns over long-term sustainability investments. Financial constraints can limit a firm's ability to invest in innovation and environmental initiatives, particularly if access to external financing becomes more expensive or restricted (Hsu et al., 2018).

Therefore, we propose:

Hypothesis 2 (H2): The increased cost of capital following the Russia-Ukraine crisis has negatively impacted European firms' investments in emissions reduction, resource use efficiency, and innovation.

2.3 Environmental Sustainability Indicators and Financing Choices

Environmental sustainability indicators and disclosures play a crucial role in how firms are perceived by investors and creditors. Comprehensive ESG reporting can enhance transparency, reduce information asymmetry, and signal a firm's commitment to sustainable practices (Clarkson et al., 2008b; Dhaliwal et al., 2011). This can lead to favorable financing conditions, as investors are increasingly integrating ESG criteria into their investment decisions (Friede et al., 2015; Dimson et al., 2015). Different sustainability indicators may have varying effects on the cost of capital. For example, firms with high scores in emissions reduction may be viewed favorably by investors concerned about climate change risks (Krueger, 2015; Albuquerque et al., 2019). Such firms may benefit from a lower cost of equity due to reduced risk perceptions. Similarly, innovation in sustainable technologies can signal future growth potential, attracting equity investors seeking long-term value creation (Hansen et al., 2009).

The impact of sustainability indicators on the cost of capital may also influence firms' financing choices. According to the pecking order theory (Myers, 1984), firms prefer internal financing, but when external financing is needed, they choose debt over equity due to lower information asymmetry costs. However, if environmental disclosures lower the cost of equity more than debt, firms may be incentivized to issue equity. This dynamic suggests that specific sustainability indicators can affect not only the overall cost of capital but also the composition of financing sources. Empirical evidence supports this notion. Cui et al. (2018) found that firms with better environmental performance had greater access to equity financing and were more likely to issue equity over debt. Additionally, Ghoul et al. (2011) observed that firms with strong CSR performance experienced a lower cost of equity capital, influencing their capital structure decisions.

Thus, we formulate:

Hypothesis 3 (H3): Different environmental sustainability component (indicator) have differential effects on the overall cost of capital, influencing European firms' choices between equity and debt financing.

3 Research Methodology

3.1 Data and Sample Selection

This study employs a quantitative research design, drawing on financial and sustainability data from the London Stock Exchange Group (LSEG) Workspace, formerly Thomson Reuters/Refinitiv. The LSEG database offers extensive coverage of over 12,500 global companies across 74 countries, with more than 630 ESG metrics dating back to 2002 (Flammer, 2021). The database is recognized for its detailed ESG performance data, making it suitable for analyzing environmental sustainability indicators (Dorfleitner et al., 2015; Berg et al., 2022). Our sample comprises 2,122 publicly listed firm on European exchanges in the LSEG database from 2017 to 2023[2]. This period encompasses significant developments in sustainability reporting and includes the timeframe before and after the Russia-Ukraine crisis, allowing for a longitudinal analysis of trends and changes[3]. In addition, the sample period is robust for analysis since it includes Covid-19 pandemic years. We focus on firms across various industries to capture a comprehensive view of the corporate sustainability landscape in Europe, following methodologies used in similar studies (Ghoul et al., 2011; Ng and Rezaee, 2015). Financial firms are excluded due to their unique financial structures and regulatory environments, as suggested by prior studies (Ng and Rezaee, 2015; El Ghoul et al., 2011). Firms with significant missing data in key variables are also excluded to maintain data integrity.

Additionally, we utilize Caldara and Iacoviello (2022) Geopolitical Risk Index (GPR) in

[2] The inclusion criteria for the sample are firms headquartered in Europe with available data on financial performance, cost of capital metrics, and environmental sustainability indicators for the study period. See the distribution of companies by country and industry in figure 1

[3] The Russia-Ukraine war years are 2022 and 2023 in our sample

our instrumental variable analysis for robustness [4]. This index has been extensively used in the literature to study its impact on financial markets and economic activities, demonstrating its effectiveness as an instrumental variable for isolating exogenous variations in financing costs due to geopolitical risks (Caldara and Iacoviello, 2022; Phan et al., 2022).

3.2 Variables and Measures

3.2.1 Dependent Variables

The primary dependent variable is the environmental sustainability focus of firms, measured using the environmental score of ESG scores related to emissions reduction, resource use efficiency, and innovation. These scores are derived from standardized metrics in the LSEG database, ensuring comparability across firms. Similar measures have been employed in studies examining the impact of environmental performance on financial outcomes (Dhaliwal et al., 2011; Clarkson et al., 2011).

Emissions reduction is assessed through indicators such as greenhouse gas (GHG) emissions intensity and carbon footprint reduction initiatives. Resource use efficiency encompasses metrics on energy consumption efficiency, water usage, and waste reduction efforts. Innovation is captured by investments in R&D for sustainable technologies and the development of green products or services. These variables align with those used by Khan et al. (2016) and Cui et al. (2018) in their analyses of material sustainability issues.

When examining Hypothesis 3, we consider the firm's financing choice as a dependent variable. The financing choice is indicated by the proportion of debt to equity financing in a given year, consistent with methodologies used in capital structure research (Myers, 1984; Flammer, 2020).

[4] The index is considered a robust measure of geopolitical uncertainty because it quantifies risk by analyzing the frequency of newspaper articles related to geopolitical tensions, wars, and terrorist threats, providing a comprehensive and timely indicator of global policy risk.

3.2.2 Independent Variables

The main independent variable is the cost of capital, calculated as the weighted average cost of capital (WACC). This incorporates both the cost of equity and the cost of debt, following standard financial practices (Brealey et al., 2012). The cost of equity is estimated using the Capital Asset Pricing Model (CAPM), as utilized in prior studies examining the relationship between sustainability and financing costs (El Ghoul et al., 2011; Ghoul et al., 2011). The cost of debt is derived from interest expenses and total debt, consistent with methodologies in corporate finance research (Sharfman and Fernando, 2008; Khan et al., 2016).

We include a post-crisis indicator variable to capture the period after the onset of the Russia-Ukraine crisis. This binary variable allows us to examine changes in the relationship between cost of capital and environmental sustainability before and after the crisis, aligning with approaches used in event studies (Bonetti et al., 2023; Flammer, 2013). Environmental sustainability indicators (ESI), constructed from normalised average of firms' emissions, resource use and innovation performance, are included as independent variables when testing Hypothesis 3. These variables have been utilized in prior research to assess the impact of specific sustainability initiatives on financial performance (Clarkson et al., 2011; Dhaliwal et al., 2011).

3.2.3 Control Variables

We include several control variables to account for factors that may influence the dependent variables. Firm size is measured by the natural logarithm of total assets, as larger firms may have more resources to invest in sustainability (Clarkson et al., 2008b; Ghoul et al., 2011). Leverage, calculated as total debt divided by total assets, controls for the firm's capital structure (Myers, 1984). Profitability is measured by return on assets (ROA), reflecting the firm's financial performance (Ghoul et al., 2011). The market-to-book ratio captures growth opportunities, which may influence investment decisions (Dhaliwal et al., 2011).

Further, we control for cash holdings, defined as cash and cash equivalents scaled by total assets, as liquidity can significantly impact a firm's financing strategy. Firms with higher cash holdings may rely less on external financing and have greater flexibility to allocate resources to sustainability initiatives (Ozkan, 2001). Tangibility, measured as the proportion of tangible assets to total assets, captures the firm's asset structure, which can influence its borrowing capacity and financing preferences due to the collateral value of tangible assets (Titman and Wessels, 1988). These controls address potential biases arising from variations in liquidity and asset composition among firms.

In addition to financial and structural controls, we include variables capturing governance characteristics. Board size, measured as the total number of directors on the board, reflects the board's capacity for oversight and strategic decision-making, which can influence sustainability priorities and financing decisions (Yermack, 1996; Coles et al., 2008). Board diversity, defined as the percentage of female directors, serves as a proxy for the inclusivity and diversity of perspectives in corporate governance, which has been linked to more robust decision-making and greater attention to social and environmental issues (Adams and Ferreira, 2009). CEO-chairman duality, a binary variable indicating whether the CEO also serves as the chairman of the board, accounts for the concentration of decision-making power, which can affect governance quality and, by extension, the firm's financing and sustainability strategies (Jensen, 1993). Finally, country, industry, and year dummy variables are included to control for country and industry-specific effects as well as temporal trends, respectively, consistent with methodologies in prior studies (Khan et al., 2016; Ng and Rezaee, 2015).

3.3 Model specification

3.3.1 Fixed Effects Panel Regression

To test Hypothesis 1, we employ fixed-effects panel regression to control for unobserved, time-invariant heterogeneity across firms. This method is appropriate for panel data where individual-specific effects are correlated with independent variables (Wooldridge, 2010). Fixed-effects models have been widely used in studies examining the impact of ESG performance on financial outcomes (Ghoul et al., 2011; Ng and Rezaee, 2015).

The model specification is as follows:

$$\text{ES}_{it} = \alpha_i + \beta_1 \text{CoC}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{ROA}_{it} + \beta_5 \text{MTB}_{it} + \gamma_t + \varepsilon_{it} \tag{1}$$

where ES_{it} is the environmental sustainability focus of firm i at time t, α_i captures firm-specific effects, γ_t represents year effects, and ε_{it} is the error term.

3.3.2 Instrumental Variables Approach

To address potential endogeneity between the cost of capital and environmental sustainability focus, we implement an instrumental variables (IV) strategy. Endogeneity may arise due to reverse causality or omitted variable bias. Similar approaches have been used in prior studies examining the impact of CSR on financial performance (Dhaliwal et al., 2011; Clarkson et al., 2011).

We select instruments that are correlated with the cost of capital but uncorrelated with the error term in the sustainability equation. Potential instruments include macroeconomic indicators such as central bank policy rates and inflation rates, which influence the general cost of capital but are exogenous to individual firms' sustainability efforts (Ng and Rezaee, 2015; Flammer, 2021). Global risk factor-geopolitical risk indices is considered, consistent with methodologies in finance research (Bekaert et al., 2014).

The first-stage regression models the cost of capital as a function of the instrument and control variables:

$$\text{CoC}_{it} = \pi_0 + \pi_1 \text{Instrument}_{it} + \pi_2 \text{Controls}_{it} + u_{it} \tag{2}$$

The second-stage regression examines the impact of the predicted cost of capital on environmental sustainability focus:

$$\text{ES}_{it} = \alpha_i + \beta_1 \widehat{\text{CoC}}_{it} + \beta_2 \text{Controls}_{it} + \varepsilon_{it} \tag{3}$$

3.3.3 Difference-in-Differences Analysis

For Hypothesis 2, we apply a difference-in-differences (DiD) approach to assess the impact of the Russia-Ukraine crisis on the relationship between cost of capital and environmental sustainability. This method compares changes over time between a treatment group and a control group, allowing for causal inference in observational studies (Angrist and Pischke, 2008). DiD analysis has been used in studies examining the impact of policy changes or external shocks on corporate behavior (Flammer, 2013; Bonetti et al., 2023).

We define the treatment group as firms in industries heavily affected by the crisis, such as energy and manufacturing sectors, while the control group comprises firms in less affected industries. The model specification is:

$$\text{ES}_{it} = \alpha_i + \beta_1 \text{Treatment}_i + \beta_2 \text{PostCrisis}_t + \beta_3 (\text{Treatment}_i \times \text{PostCrisis}_t) + \beta_4 \text{Controls}_{it} + \varepsilon_{it} \tag{4}$$

The interaction term ($\text{Treatment}_i \times \text{PostCrisis}_t$) captures the differential effect of the crisis on environmental sustainability focus in the treatment group compared to the control group.

3.3.4 Moderation Analysis

To test Hypothesis 3, we explore how environmental sustainability indicators moderate the relationship between the cost of capital and financing choices. The moderation analysis examines whether the effect of the cost of capital on financing choice varies depending on the level of sustainability indicators. Similar moderation analyses have been conducted in studies examining the interaction between CSR and financial variables (Cui et al., 2018; Khan et al., 2016).

The model specification is:

$$\mathrm{FC}_{it} = \alpha_i + \beta_1 \mathrm{CoC}_{it} + \beta_2 \mathrm{ESI}_{it} + \beta_3 (\mathrm{CoC}_{it} \times \mathrm{ESI}_{it}) + \beta_4 \mathrm{Controls}_{it} + \varepsilon_{it} \tag{5}$$

where FC_{it} is the financing choice of firm i at time t, and β_3 assesses whether environmental sustainability indicators influence the effect of the cost of capital on financing choices.

4 Empirical results

4.1 Descriptive statistics

Table 1 show the descriptive statistics and correlation matrix of variables in our sample. In examining the descriptive statistics, one immediately observes considerable variation among European firms in both the cost of capital measures (Cost of Equity, Cost of Debt, and WACC) and their environmental performance metrics (Env, Emissions, Innovation, and Resource_Use). On average, the cost of equity (CoE) is 8.8% while the cost of debt (CoD) is about 2.3%, underscoring that equity financing is generally more expensive for these firms than debt financing. Meanwhile, the mean values for the environmental metrics hover around 50, suggesting that, on average, firms are moderately engaged in environmental initiatives. Nonetheless, the high standard deviations, particularly for Innovation (32.318) and Resource_Use (30.981) indicates that some firms display little to no engagement in these areas, whereas others invest heavily. Such dispersion emphasizes the heterogeneous approaches European firms take toward sustainability practices.

Insert Table 1 approximately here

The correlation matrix (Panel B) lends further insight into these dynamics. Notably, Env (overall environmental performance) is strongly correlated with Emissions (0.848) and Resource_Use (0.873), indicating that firms with robust environmental management often excel in both emissions reduction and resource efficiency. Interestingly, the correlation between Env and CoE is slightly positive (0.080), implying that higher environmental performance may be linked to a modest increase in the cost of equity, perhaps suggesting that investors perceive these strategies as entailing additional upfront costs or risk. In contrast, CoD shows a weak or even negative correlation with many of the ESG-related metrics, suggesting that debt markets may be less sensitive—or potentially more favorably inclined—toward firms with strong environmental practices. These patterns align with emerging literature that points to complex relationships between sustainability performance, firm risk, and financing costs, highlighting the importance of further research into the specific institutional and investor preferences that shape how European firms are rewarded or penalized for their environmental initiatives. A test of multicollinearity using Variance Inflation Factors (VIFs) shows lower than 10%, signifying no multicollinearity between variables.

4.2 Firms environmental sustainability and cost of capital

The relationship between environmental performance and firm's Weighted Average Cost of Capital (WACC), Cost of Equity (CoE), and Cost of Debt (CoD) is examined in our baseline analysis using fixed-effects models to examine how. Table 2 shows that the coefficient for WACC is positive but not statistically significant, indicating no strong evidence that firms with a higher WACC necessarily achieve better environmental performance. Similarly, CoE is not statistically significant, suggesting no clear link between the cost of equity and environmental commitments in firms.

Insert Table 2 approximately here

By contrast, the negative and highly significant coefficient for CoD implies that firms facing a lower cost of debt tend to exhibit stronger environmental performance. This result aligns with studies showing that favorable borrowing conditions can give firms more flexibility to invest in sustainability initiatives, such as emissions reductions and resource-efficiency projects (Sharfman and Fernando, 2008; El Ghoul et al., 2011). These findings highlight the role of financing constraints in shaping corporate environmental strategies, suggesting that debt costs may be particularly relevant for firms seeking to enhance their environmental performance.

However, firms enviromental efforts can differ in the way they prioritise different aspects due to e.g., industry demands or regulatory requirements. Hence, analyzing the subcomponents of environmental performance provides important insights into how financing costs influence resource efficiency, emissions, and environmental innovation in firms. In Table 3, the negative and statistically significant coefficient on CoD in the Resource_Use indicates that firms paying lower debt costs generally achieve higher resource-use efficiency, likely because they can afford investments in technology and processes that optimize resource utilization. In the case of emissions, a higher WACC is positively and significantly associated with emissions, suggesting that firms with higher total financing costs may be less inclined to prioritize emissions reduction projects. By contrast, the negative, significant association (at the 10% level) between CoD and emissions implies that lower debt costs can facilitate meaningful reductions in emissions—consistent with the view that cheaper financing allows firms to allocate funds toward cleaner technologies (Goss and Roberts, 2011; Chava, 2014).

Insert Table 3 approximately here

Turning to environmental innovation, the results show negative and statistically significant coefficients for all financing cost measures (WACC, CoE, and CoD), indicating that cheaper financing is linked to stronger innovation performance. This aligns with Porter and van der Linde (1995), who argue that sufficient financial resources are crucial for developing and adopting environmentally friendly technologies. The results also concur with Dhaliwal et al. (2011), who demonstrate that firms initiating CSR reporting often benefit from a reduced cost of equity, suggesting that better environmental practices can create a positive feedback loop i.e., lower financing costs support more innovation, which in turn can further enhance a firm's environmental profile and potentially lower future capital costs.

4.3 Environmental performance of firms during uncertainty

The difference-in-differences (DiD) estimates in Table 4 & 5 illustrate how the Russia-Ukraine war has affected firms' environmental performance. By contrasting companies that were significantly exposed to the conflict (treatment group) against those that were less exposed (control group), this method accounts for both time-invariant differences and broader time trends, following the standard DiD framework (Angrist and Pischke, 2008)[5]. The postcrisis period starting in 2022 serves as the main point of comparison to capture shifts in performance that emerge as the conflict escalates[6]. Many industries—particularly Energy Equipment & Services, Independent Power and Renewable Electricity Producers, and Oil, Gas & Consumable Fuels—face increased operational and financial pressure, prompting managers to revise or postpone sustainability projects [7]. In some cases, companies have introduced new emissions controls or improved resource management to cope with unstable supply chains, echoing earlier findings that crises can spark innovation (Porter and van der Linde, 1995). However, the negative coefficient on the $Treatment \times PostCrisis$ interaction term suggests that, compared to the control group, heavily exposed firms show a larger drop in environmental performance after the conflict began. This pattern matches studies indicating that crisis conditions often reduce a firm's capacity or inclination to maintain environmental

[5] Highly affected industries classification is based on The International Monetary Fund (IMF) and European Bank for Reconstruction and Development (EBRD) Regional Economic Outlook, 2022.

[6] See figures 2 and 3 for parralel trend analysis between control and treatment groups.

[7] Other highly affected industries include Manufacturing, Multi-Utilities, Marine Transportation, Chemicals, Gas Utilities, Textiles, Apparel & Luxury Goods, Water Utilities, Paper & Forest Products, Electric Utilities, Metals & Mining, Transportation Infrastructure, Ground Transportation

investments (Clarkson et al., 2008b).

Insert Table 4 approximately here

To capture how the cost of equity or debt for heavily exposed ("treated") firms shifts differently during the crisis, affecting their overall environmental performance and its sub-components (Innovation, Emissions, and ResourceUse), the $Treatment \times PostCrisis \times CoE$ and $Treatment \times PostCrisis \times CoD$ interaction terms are considered. For cost of equity, the negative coefficients for treated firms during the crisis appear all sub-components of environmental sustainability but is statistically significant only for Resource_Use. This implies that conflict-exposed firms with lower equity financing costs (as reflected by a negative interaction) tend to exhibit better resource-use efficiency. One possible explanation is that firms facing heightened geopolitical risks can still pursue efficiency-improving investments if their equity financing conditions remain relatively favorable. By contrast, the insignificant negative effects for overall environmental performance, innovation, and emissions suggest that any cost-of-equity advantage in these areas is either more modest or varies significantly across firms.

Insert Table 5 approximately here

The cost of debt likewise shows negative and significant coefficients for Env, Innovation, and Emissions among treated firms during the crisis. This indicates that lower debt costs can be particularly advantageous for high-exposure companies seeking to maintain or improve environmental initiatives. For example, the negative coefficient on Env implies that firms facing cheaper debt financing during this period are able to bolster their environmental performance relative to the control group. These results align with the idea that, in times of crisis, reduced borrowing costs free up resources for capital-intensive projects—such as emissions-reduction strategies or innovative clean technologies—allowing firms to make meaningful progress on sustainability despite external disruptions.

Overall, the war's impact extends across diverse sectors, including Marine Transportation, Chemicals, and Metals & Mining, where energy and resource demands are typically high. In such industries, geopolitical pressures can lead to cost-cutting measures that derail emissions reduction targets or resource efficiency projects. Nevertheless, some firms adopt a proactive stance during crises—seeking reputational benefits and, over the longer term, potentially lowering financing costs as part of an adaptive sustainability strategy (Eccles et al., 2014). The negative and significant triple-interaction terms Show that firms hit hardest by the war (those in the treatment group) experience a distinct financing tweak, which in turn hinders their environmental efforts during the crisis. Firms under acute geopolitical and economic pressure may reduce or delay sustainability investments if the additional cost of external capital (equity or debt) is prohibitive. Consequently, the revealing a critical interaction between rising financing costs and environmental performance when geopolitical shocks escalate. This finding supports earlier literature suggesting that crisis events magnify financial constraints, prompting firms to prioritize short-term survival over long-term sustainable innovation (Dhaliwal et al., 2011).

4.4 Environmental sustainability indicators and firms' financing choices

The multinomial logistic regression presented in Table 6 results highlight the significant role of environmental sustainability and financial structure in shaping firms' financing choices. The dependent variable, Financing_Method, categorizes firms into "Debt," "Equity," or "Mix" based on thresholds for debt and equity ratios, with "Mix" serving as the reference category. This classification is informed by key financial metrics: the debt ratio (total debt divided by total assets), the equity ratio (shareholder equity divided by total assets), and the debt-to-equity ratio (total debt divided by shareholder equity). Firms with a debt ratio exceeding 0.6 are classified as debt-financed, while those with an equity ratio exceeding 0.6 are categorized as equity-financed. Firms that do not meet either threshold fall into the mixed financing category.

The findings highlight the influence of environmental sustainability, as measured by the Environmental Sustainability Indicator (ESI), on financing decisions. The ESI is constructed by normalizing three components of environmental performance—emissions, innovation, and resource use—and calculating their equal-weighted average. Specifically, normalized emissions, innovation, and resource use scores are derived by scaling each variable between 0 and 1, ensuring comparability. Firms with higher ESI scores are significantly less likely to rely on debt financing, suggesting that environmentally sustainable firms may avoid heavy debt burdens to align with stakeholder expectations and reduce financial risks. Conversely, higher ESI scores are associated with a greater likelihood of equity financing, aligning with research showing that sustainability-oriented firms attract equity investors who prioritize environmental responsibility.

Insert Table 6 approximately here

The interaction between ESI and debt ratio reveals additional nuances. For firms with high debt ratios, stronger environmental sustainability performance increases the likelihood of debt financing. This may indicate that environmentally responsible firms leverage their sustainability credentials to secure favorable debt terms, as suggested by prior studies (Chava, 2014). However, the opposite effect is observed for equity financing; high-debt firms with strong environmental sustainability are significantly less likely to pursue equity financing, possibly reflecting constraints in accessing equity markets or investor concerns about overleverage (Goss and Roberts, 2011). These results demonstrate the multifaceted relationship between environmental sustainability, financial structure, and capital structure decisions. Firms that emphasize environmental performance are more inclined toward equity financing while avoiding excessive reliance on debt. The framework used to construct ESI and classify financing methods provides a robust basis for analyzing these relationships. By combining normalized environmental performance metrics and key financial ratios, the study highlights the dynamic relationship between sustainability and financing strategies, offering valuable insights for corporate managers and policymakers.

4.5 Additional considerations and Robustness tests

Our baseline result showing the relationship between cost of capital and environmental performance may be subject to potential endogeneity issues such as reverse causality and omitted variable bias may affect the validity of the results. For instance, firms with better environmental performance might be perceived as less risky by investors, leading to a lower cost of capital—a case of reverse causality (Clark et al., 2015). Additionally, unobserved factors like managerial quality or corporate culture could influence both environmental performance and financing costs, resulting in omitted variable bias (Waddock and Graves, 1997). To address these concerns, implementing an instrumental variable (IV) regression is necessary [8]. This study use the Global Policy Risk Index (GPR) as an instrument to isolate the exogenous variation in financing costs that is uncorrelated with the error term in the environmental performance equation. GPR affects firms' cost of capital through policy uncertainty but is unlikely to be directly related to individual firms' environmental performance [9]. This method enhances the credibility of the findings by providing unbiased and consistent estimates of the causal impact of financing costs on environmental performance.

Insert Table 7 approximately here

[8] The Wu-Hausman tests for endogeneity indicate significant endogeneity in the cost models for both the overall environmental performance and its components, justifying the use of IV estimation in order to obtain unbiased and consistent estimates (Hausman, 1978).

[9] The first-stage regression results confirm the relevance of the Global Policy Risk Index (GPR) as an instrument for the endogenous variables. GPR has a positive and highly significant coefficient ($p < 0.001$) across the three cost measures, indicating a strong correlation with the endogenous regressors satisfying the instrument relevance condition necessary for valid instrumental variable (IV) estimation (Wooldridge, 2010).

In the two-stage least squares (2SLS) regression results presented in Table 7, the negative and statistically significant coefficients for WACC, CoE, and CoD show that as the costs of capital decrease, the firm's environmental performance improves. These results suggest that firms with lower financing costs have greater financial flexibility to invest in sustainability initiatives, which is consistent with prior research on the importance of financial resources for environmental innovation and performance (Eccles et al., 2014). Thus, the role of financial flexibility in corporate environmental strategies is reflected with how lower overall financing cost (WACC) postively increase environmental performance of firms, showing that the less constrained a firm is financially, the more it can allocate resources to sustainability projects. This is further evidenced with the negative relationships between both CoE, CoD and environmental performance of firms. Firms with reduced equity costs benefits from improved investor confidence and reduced risk perceptions, enabling them to channel resources into environmental initiatives (Clarkson et al., 2008a). Similarly, access to affordable debt financing enables investments in resource-efficient technologies and emissions reduction initiatives as evidence suggests creditors increasingly assess environmental performance when determining loan terms, as environmentally responsible firms are perceived as lower-risk borrowers (Goss and Roberts, 2011; Chava, 2014). This result is consistent across the environmental sustainability components—resource use efficiency, emissions reduction, and environmental innovation[10]. Thereby showing that the use of IV regression addresses potential endogeneity issues, strengthening the validity of our findings.

Another test that requires careful interpretation is the financing decision, especially since firms' activities may require prioritizing different aspects of environmental sustainability. This may be due to industry standards or regulatory requirements (Delmas and Toffel, 2008). Thus, we assign different weights across the components. The multinomial logistic regression results reveal how varying the weightings of the Environmental Sustainability Indicator (ESI) affects firms' financing choices, highlighting the importance of strategic prioritization within

[10] Result is available on request.

sustainability frameworks. The first analysis with equal weighting for emissions, innovation, and resource use provided a baseline, demonstrating that higher ESI scores reduced reliance on debt financing and increased the likelihood of equity financing. Subsequent analyses adjusted these weightings to reflect different strategic emphases, offering robust insights into how prioritizing specific sustainability components—emissions, innovation, or resource use—can influence financing decisions. This iterative approach serves as a robustness check for the initial findings and emphasizes the dynamic nature of sustainability and capital structure interactions.

Insert Table 8 approximately here

When emissions are given the highest weight (40%) relative to innovation and resource use (30% each), the results indicate a stronger aversion to debt financing for firms with high ESI scores, while the inclination toward equity financing becomes more pronounced. This aligns with the notion that firms prioritizing emissions reduction may avoid debt due to its fixed obligations, which can hinder their ability to invest in long-term environmental initiatives (Chava, 2014). Conversely, equity investors appear to reward firms emphasizing emissions reduction, perceiving them as aligning with societal pressures for climate action and regulatory compliance (Flammer, 2021). However, the interaction between ESI and debt ratio reveals that firms with high debt ratios and strong emissions-focused sustainability are more likely to secure debt financing, leveraging their environmental credentials to negotiate favorable terms.

In contrast, when innovation is emphasized (40% weighting) or resource use (40% weighting), the patterns remain consistent but reflect slight variations. For innovation-heavy firms, equity financing remains the preferred option, underscoring the appeal of forward-looking, technology-driven strategies to investors. Resource use prioritization shows a comparable preference for equity financing, reflecting stakeholders' increasing focus on efficient resource management. Across all weightings, the interaction between ESI and debt ratio consistently highlights the trade-offs firms face: high-debt firms with strong sustainability metrics are less likely to attract equity investors, potentially due to concerns about over-leverage (Goss and Roberts, 2011). These findings emphasize that depending on which aspect of sustainability a firm prioritizes, its financing preferences and access to capital will differ, offering critical insights for managers balancing sustainability goals with financial constraints.

5 Conclusion

This study useful insights into the pivotal role of the cost of capital in shaping firms' environmental sustainability initiatives, particularly in Europe and during periods of geopolitical and economic turbulence like the Russia-Ukraine crisis. The findings highlight that lower financing costs, particularly cheaper debt, facilitate enhanced environmental performance, with specific improvements in resource use efficiency, emissions reduction, and environmental innovation. These results highlight the importance of financial flexibility in helping firms achieve sustainability goals while managing external challenges. The study adds to the academic understanding of the link between finance and sustainability and provides useful insights for corporate managers and policymakers.

However, this study has number of limitations. First, this analysis focuses on publicly listed European firms, which may limit its generalization to firms outside Europe. Different regions could show unique relationships between financing costs and sustainability efforts because of differences in regulations, cultural attitudes, and investor preferences. Second, while the study addresses endogeneity concerns using instrumental variable (IV) techniques, it relies on proxies like the Global Policy Risk Index, which may not fully capture firm-specific factors influencing financing decisions and sustainability performance. Third, the weighting of sustainability components in constructing the Environmental Sustainability Indicator (ESI) provides useful robustness checks but remains a simplification. Firms may adopt unique internal weightings based on proprietary goals, which could further refine the relationship between sustainability priorities and financing choices.

Hence, future research could address these limitations by expanding the sample to include non-European markets to evaluate regional and structural differences in sustainability-finance interactions. Additionally, employing alternative methodologies, such as case studies or surveys, could provide richer qualitative insights into how firms prioritize sustainability components internally. Exploring sector-specific dynamics, particularly in industries with high environmental impacts, could yield more targeted findings. Finally, investigating the role of emerging financial instruments, such as green bonds and sustainability-linked loans, in reducing financing constraints and promoting environmental initiatives would further enhance the understanding of the evolving relationship between capital markets and sustainability objectives. These areas of inquiry would deepen the academic and practical implications of how firms balance financial and environmental imperatives in an increasingly complex global landscape.

References

Adams, R. B. and Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, 94(2):291–309.

Albuquerque, R., Koskinen, Y., and Zhang, C. (2019). Corporate social responsibility and firm risk: Theory and empirical evidence. *Management Science*, 65(10):4451–4469.

Ali, M., Basu, S., and Sharma, S. (2023). The russia-ukraine crisis and its impact on global energy markets. *Energy Economics*, 105:105798.

Ambec, S. and Lanoie, P. (2008). Does it pay to be green? a systematic overview. *The Academy of Management Perspectives*, pages 45–62.

Angrist, J. D. and Pischke, J.-S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1):99–120.

Bekaert, G., Hoerova, M., and Lo Duca, M. (2014). Risk, uncertainty and monetary policy. *Journal of Monetary Economics*, 68:1–15.

Berg, F., Kölbel, J. F., and Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *The Review of Finance*, 26(6):1315–1344.

Bonetti, P., Cho, C. H., and Michelon, G. (2023). Environmental disasters and corporate environmental disclosure: Evidence from the fukushima nuclear accident. *Journal of Accounting and Public Policy*, 42(2):106872.

Brealey, R. A., Myers, S. C., and Allen, F. (2012). *Principles of Corporate Finance*. McGraw-Hill.

Caldara, D. and Iacoviello, M. (2022). Measuring geopolitical risk. *American Economic Review*, 112(4):1194–1225.

Chava, S. (2014). Environmental externalities and cost of capital. *Management Science*, 60(9):2223–2247.

Clark, G. L., Feiner, A., and Viehs, M. (2015). From the stockholder to the stakeholder: How sustainability can drive financial outperformance. *Available at SSRN 2508281*.

Clarkson, P. M., Li, Y., Richardson, G. D., and Vasvari, F. P. (2008a). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations and Society*, 33(4-5):303–327.

Clarkson, P. M., Li, Y., Richardson, G. D., and Vasvari, F. P. (2011). Does it really pay to be green? determinants and consequences of proactive environmental strategies. *Journal of Accounting and Public Policy*, 30(2):122–144.

Clarkson, P. M., Overell, M. B., and Chapple, L. (2008b). Environmental reporting and its relation to corporate environmental performance. *Abacus*, 44(4):538–568.

Coles, J. L., Daniel, N. D., and Naveen, L. (2008). Boards: Does one size fit all? *Journal of Financial Economics*, 87(2):329–356.

Cui, J., Jo, H., and Na, H. (2018). Does corporate social responsibility affect information asymmetry? *Journal of Business Ethics*, 148(3):549–572.

Delmas, M. A. and Montes-Sancho, M. J. (2010). Voluntary agreements to improve environmental quality: Symbolic and substantive cooperation. *Strategic Management Journal*, 31(6):575–601.

Delmas, M. A., Nairn-Birch, N., and Lim, J. (2015). Dynamics of environmental and financial performance: The case of greenhouse gas emissions. *Organization & Environment*, 28(4):374–393.

Delmas, M. A. and Toffel, M. W. (2008). Organizational responses to environmental demands: Opening the black box. *Strategic Management Journal*, 29(10):1027–1055.

Delmas, M. A. and Toffel, M. W. (2011). Institutional pressures and organizational characteristics: Implications for environmental strategy. *Business Strategy and the Environment*, 20(6):365–382.

Dhaliwal, D. S., Li, O. Z., Tsang, A., and Yang, Y. G. (2011). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *The Accounting Review*, 86(1):59–100.

Dimson, E., Karakaş, O., and Li, X. (2015). Active ownership. *The Review of Financial Studies*, 28(12):3225–3268.

Donaldson, T. and Preston, L. E. (1995). The stakeholder theory of the corporation: Concepts, evidence, and implications. *Academy of Management Review*, 20(1):65–91.

Dorfleitner, G., Halbritter, G., and Nguyen, M. (2015). Measuring the level and risk of corporate responsibility–an empirical comparison of different esg rating approaches. *Journal of Asset Management*, 16(7):450–466.

Eccles, R. G., Ioannou, I., and Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, 60(11):2835–2857.

El Ghoul, S., Guedhami, O., Kwok, C. C., and Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 35(9):2388–2406.

Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, 56(3):758–781.

Flammer, C. (2020). Green bonds: Effectiveness and implications for public policy. *Environmental and Energy Policy and the Economy*, 1(1):95–128.

Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2):499–516.

Flammer, C. and Bansal, P. (2017). Does a long-term orientation create value? evidence from a regression discontinuity. *Strategic Management Journal*, 38(9):1827–1847.

Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*. Pitman.

Friede, G., Busch, T., and Bassen, A. (2015). Esg and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4):210–233.

Ghoul, S. E., Guedhami, O., Kwok, C. C., and Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 35(9):2388–2406.

Gianfrate, G. and Peri, M. (2019). The green advantage: Exploring the convenience of issuing green bonds. *Journal of Cleaner Production*, 219:127–135.

Goss, A. and Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance*, 35(7):1794–1810.

Hansen, E. G., Grosse-Dunker, F., and Reichwald, R. (2009). Sustainability innovation cube—a framework to evaluate sustainability-oriented innovations. *International Journal of Innovation Management*, 13(04):683–713.

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review*, 20(4):986–1014.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of the Econometric Society*, pages 1251–1271.

Heinkel, R., Kraus, A., and Zechner, J. (2001). The effect of green investment on corporate behavior. *Journal of Financial and Quantitative Analysis*, 36(4):431–449.

Hsu, F. J., Wang, T. S., and Hsu, Y. C. (2018). Does corporate social responsibility influence cost of capital in china? *Asia Pacific Management Review*, 23(4):229–240.

Jagtap, S., Trollman, H., Trollman, F., Garcia-Garcia, G., Parra-López, C., Duong, L., Martindale, W., Munekata, P. E., Lorenzo, J. M., Hdaifeh, A., et al. (2022). The Russia-Ukraine conflict: Its implications for the global food supply chains. *Foods*, 11(14):2098.

Jensen, M. C. (1993). The modern industrial revolution, exit, and the failure of internal control systems. *the Journal of Finance*, 48(3):831–880.

Khan, M., Serafeim, G., and Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review*, 91(6):1697–1724.

Konar, S. and Cohen, M. A. (2001). Does the market value environmental performance? *Review of Economics and Statistics*, 83(2):281–289.

Krueger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics*, 115(2):304–329.

Leach, M., Rockström, J., Raskin, P., Scoones, I., Stirling, A., Smith, A., and Olsson, P. (2012). Transforming innovation for sustainability. *Ecology and Society*, 17(2):11.

Lee, K. H., Cin, B. C., and Lee, E. Y. (2015). Environmental responsibility and firm performance: The application of an environmental, social and governance model. *Business Strategy and the Environment*, 25(1):40–53.

Liadze, I., Macchiarelli, C., Mortimer-Lee, P., and Sanchez Juanino, P. (2023). Economic costs of the russia-ukraine war. *The World Economy*, 46(4):874–886.

López, M. V., Garcia, A., and Rodriguez, L. (2007). Sustainable development and corporate performance: A study based on the dow jones sustainability index. *Journal of Business Ethics*, 75:285–300.

Maneejuk, P., Kaewtathip, N., and Yamaka, W. (2024). The influence of the ukraine-russia conflict on renewable and fossil energy price cycles. *Energy Economics*, 129:107218.

Mbah, R. E. and Wasum, D. F. (2022). Russian-ukraine 2022 war: A review of the economic impact of russian-ukraine crisis on the usa, uk, canada, and europe. *Advances in Social Sciences Research Journal*, 9(3):144–153.

Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance*, 39(3):574–592.

Ng, A. C. and Rezaee, Z. (2015). Business sustainability performance and cost of equity capital. *Journal of Corporate Finance*, 34:128–149.

Ozkan, A. (2001). Determinants of capital structure and adjustment to long run target: evidence from uk company panel data. *Journal of Business Finance & Accounting*, 28(1-2):175–198.

Phan, D. H. B., Tran, V. T., and Iyke, B. N. (2022). Geopolitical risk and bank stability. *Finance Research Letters*, 46:102453.

Porter, M. E. and Kramer, M. R. (2011). Creating shared value. *Harvard Business Review*, 89(1/2):62–77.

Porter, M. E. and van der Linde, C. (1995). Green and competitive: Ending the stalemate. *Harvard Business Review*, 73(5):120–134.

Raihan, A., Liu, W., and Zhang, Q. (2022). The role of transformative innovation in achieving sustainability. *Sustainable Development*, 30(1):123–134.

Ren, S., Tang, G., and Jackson, S. E. (2019). Green human resource management research in emergence: A review and future directions. *Asia Pacific Journal of Management*, 35(3):769–803.

Sharfman, M. P. and Fernando, C. S. (2008). Environmental risk management and the cost of capital. *Strategic Management Journal*, 29(6):569–592.

Stern, N. (2008). The economics of climate change. *American Economic Review*, 98(2):1–37.

Tang, D. Y. and Zhang, Y. (2020). Do shareholders benefit from green bonds? *Journal of Corporate Finance*, 61:101427.

Titman, S. and Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, 43(1):1–19.

Waddock, S. A. and Graves, S. B. (1997). The corporate social performance–financial performance link. *Strategic Management Journal*, 18(4):303–319.

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT Press.

Yermack, D. (1996). Higher market valuation of companies with a small board of directors. *Journal of Financial Economics*, 40(2):185–211.

Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking & Finance*, 98:39–60.

Table 1: Descriptive Statistics and Correlation Matrix

This table provides descriptive statistics (Panel A) and a correlation matrix (Panel B) for the variables analyzed. Panel A presents the number of observations (N), mean, standard deviation (SD), minimum (Min), median, maximum (Max), and the 25th and 75th percentiles (P25 and P75) for each variable. Panel B shows Pearson correlation coefficients between variables. CoE = Cost of Equity; CoD = Cost of Debt; WACC = Weighted Average Cost of Capital; Env = Environmental score; Emissions, Innovation, Resource_Use are the enviromental score components showing how firms performance in different aspects of environmental sustainability; ROA = Return on Assets; Firm_Size = Log of Total Assets; Tangibility = ratio of tangible assets to total assets; Leverage = Debt-to-Equity Ratio; CashHolding = Cash/Short-term Investment ratio to total assets; MtoB = Market-to-Book ratio; Board_Diversity = Percentage of women to men on the firm's board in a year; Board_Size = Number of directors; CEO_Chair_Duality = Binary indicator for CEO/Chairman role overlap. Significance levels are denoted by *** (1%), ** (5%), and * (10%).

Panel A: Descriptive Statistics

	N	Mean	SD	Min	Median	Max	P25	P75
CoE	10,626	0.088	0.046	-0.130	0.080	0.550	0.060	0.110
CoD	10,642	0.023	0.086	0	0.020	8.590	0.010	0.030
WACC	10,642	0.070	0.090	-0.100	0.070	8.550	0.050	0.090
Env	10,642	50.051	25.559	0.050	49.815	99.140	29.062	71.490
Emissions	10,642	55.831	28.881	0	58.665	99.910	33.763	80.800
Innovation	10,642	33.337	32.318	0	28.240	99.880	0	57.630
Resource_Use	10,642	53.554	30.981	0	55.955	99.930	28.472	81.005
ROA	10,462	0.055	0.099	-0.830	0.040	2.440	0.020	0.080
Firm_Size	10,621	21.375	2.280	7.251	21.317	28.645	19.938	22.802
Tangibility	10,218	0.214	0.209	0	0.150	0.990	0.040	0.330
Leverage	10,620	19.653	357.947	0.003	1.742	28,335.450	1.378	2.386
CashHolding	10,347	0.130	0.140	0	0.089	1	0.040	0.170
MtoB	10,408	3.563	15.427	0	1.770	892.710	1	3.470
Board_Diversity	10,638	30.706	14.180	0	33.330	80	20	40
Board_Size	10,638	8.992	3.625	2	8	34	6	11
CEO_Chair_Duality	10,642	0.198	0.398	0	0	1	0	0

Panel B: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)CoE																
(2)CoD	0.102															
(3)WACC	0.397	0.902														
(4)Env	0.080	-0.020	-0.030													
(5)Emissions	0.099	-0.012	-0.011	0.848												
(6)Innovation	0.020	-0.028	-0.035	0.707	0.404											
(7)ResourceUse	0.082	-0.012	-0.015	0.873	0.760	0.461										
(8)ROA	-0.048	-0.141	0.069	-0.040	0.020	-0.042	0.005									
(9)Firm_Size	0.141	-0.006	-0.028	0.586	0.492	0.404	0.496	-0.123								
(10)Tangibility	0.044	0.035	0.014	0.039	0.041	-0.033	0.066	0.004	0.012							
(11)Leverage	-0.025	-0.014	-0.003	-0.052	-0.057	-0.004	-0.072	0.008	-0.010	-0.016						
(12)CashHolding	-0.014	-0.017	0.050	-0.211	-0.183	-0.143	-0.175	0.024	-0.337	-0.161	-0.025					
(13)MtoB	-0.003	-0.021	0.038	-0.043	-0.014	-0.041	-0.025	0.274	-0.089	-0.021	-0.010	0.073				
(14)Board_Diversity	0.071	-0.003	0.006	0.291	0.303	0.183	0.268	0.021	0.212	-0.090	-0.011	-0.076	-0.001			
(15)Board_Size	0.011	-0.034	-0.062	0.531	0.483	0.317	0.500	-0.084	0.521	0.057	-0.043	-0.126	-0.043	0.211		
(16)CEO_Chair_Duality	-0.062	0.007	-0.009	0.077	0.090	0.041	0.089	0.039	0.030	0.034	-0.0002	0.039	-0.0001	0.026	0.112	

Table 2: Cost of capital and environmental sustainability of firms

This table shows the result of the analysis on relationship between cost of capital and environmental sustainability performance of firms. The dependent variable is the Environmental score of firm i at time t. CoE is the cost of equity for firm i at time t; CoD is cost of debt for firm i at time t; WACC is the weighted average cost of capital for firm i at time t; Firm_Size = Log of Total Assets; ROA = Return on Assets; Tangibility = ratio of tangible assets to total assets; CashHolding = Cash/Short-term Investment ratio to total assets; Leverage = Debt-to-Equity Ratio; MtoB = Market-to-Book ratio; Board_Diversity = Percentage of women to men on the firm's board in a year; Board_Size = Number of directors; CEO_Chair_Duality = Binary indicator for CEO/Chairman role overlap. Significance levels are denoted by *** (1%), ** (5%), and * (10%).

	Environmental performance		
	(1)	(2)	(3)
WACC	0.045		
	(0.065)		
CoE		0.004	
		(0.050)	
CoD			−0.478***
			(0.128)
Firm_Size	0.053***	0.053***	0.053***
	(0.002)	(0.002)	(0.002)
ROA	0.159***	0.165***	0.148***
	(0.033)	(0.033)	(0.033)
Tangibility	0.061***	0.060***	0.064***
	(0.014)	(0.014)	(0.014)
CashHolding	0.006	0.006	−0.002
	(0.018)	(0.018)	(0.018)
Leverage	−0.00001***	−0.00001***	−0.00002***
	(0.00001)	(0.00001)	(0.00001)
MtoB	0.0001	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)
Board_Size	0.017***	0.017***	0.017***
	(0.001)	(0.001)	(0.001)
Board_Diversity	0.003***	0.003***	0.003***
	(0.0002)	(0.0002)	(0.0002)
CEO_Chair_Duality	0.008	0.007	0.006
	(0.005)	(0.005)	(0.005)
Industry and Year FE	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes
Observations	9,627	9,613	9,627
Adjusted R^2	0.479	0.479	0.480

Table 3: Regression Results for Environmental Metrics

This table shows the result of the analysis on relationship between cost of capital and environmentalsustainability performance of firms. The dependent variable is the component scores of the environmental score of firms i.e. Resource_Use is the resource efficiency score of firm i at time t, Emissions is the emission management performance score of i at time t , Innovation is innovative performance score of firm i at time t. CoE is the cost of equity for firm i at time t; CoD is cost of debt for firm i at time t; WACC is the weighted average cost of capital for firm i at time t; Firm_Size = Log of Total Assets; ROA = Return on Assets; Tangibility = ratio of tangible assets to total assets; CashHolding = Cash/Short-term Investment ratio to total assets; Leverage = Debt-to-Equity Ratio; MtoB = Market-to-Book ratio; Board_Diversity = Percentage of women to men on the firm's board in a year; Board_Size = Number of directors; CEO_Chair_Duality = Binary indicator for CEO/Chairman role overlap. Significance levels are denoted by *** (1%), ** (5%), and * (10%).

	Resource_Use			**Emissions**			**Innovation**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
WACC	0.042 (0.078)			0.214*** (0.079)			−0.146* (0.083)		
CoE		0.020 (0.062)			0.080 (0.061)			−0.171** (0.067)	
CoD			−0.642*** (0.170)			−0.342** (0.158)			−0.622*** (0.163)
Firm_Size	0.060*** (0.002)	0.060*** (0.002)	0.060*** (0.002)	0.056*** (0.002)	0.055*** (0.002)	0.056*** (0.002)	0.042*** (0.002)	0.043*** (0.002)	0.042*** (0.002)
ROA	0.162*** (0.037)	0.172*** (0.037)	0.158*** (0.037)	0.177*** (0.038)	0.182*** (0.039)	0.171*** (0.039)	0.096** (0.038)	0.094** (0.038)	0.072* (0.038)
Tangibility	0.068*** (0.017)	0.067*** (0.017)	0.071*** (0.017)	0.036** (0.016)	0.033** (0.016)	0.037** (0.016)	−0.048*** (0.017)	−0.047*** (0.017)	−0.044** (0.017)
CashHolding	−0.001 (0.021)	0.0004 (0.021)	−0.011 (0.021)	−0.015 (0.022)	−0.013 (0.022)	−0.017 (0.022)	0.034 (0.021)	0.032 (0.021)	0.022 (0.021)
Leverage	−0.0001*** (0.0001)	−0.0001*** (0.0001)	−0.0001*** (0.0001)	−0.0002*** (0.0001)	−0.0002*** (0.0001)	−0.0002*** (0.0001)	−0.0002*** (0.0001)	−0.0002*** (0.0001)	−0.0002*** (0.0001)
MtoB	0.0001 (0.0002)	0.0001 (0.0002)	0.0001 (0.0002)	0.0003* (0.0002)	0.0003* (0.0002)	0.0003* (0.0002)	0.00001 (0.0002)	0.00000 (0.0002)	0.00001 (0.0002)
Board_Size	0.021*** (0.001)	0.021*** (0.001)	0.021*** (0.001)	0.020*** (0.001)	0.020*** (0.001)	0.019*** (0.001)	0.010*** (0.001)	0.010*** (0.001)	0.010*** (0.001)
Board_Diversity	0.003*** (0.0002)	0.003*** (0.0002)	0.003*** (0.0002)	0.004*** (0.0002)	0.004*** (0.0002)	0.004*** (0.0002)	0.002*** (0.0002)	0.002*** (0.0002)	0.002*** (0.0002)
CEO_Chair_Duality	0.005 (0.006)	0.005 (0.006)	0.004 (0.006)	0.015** (0.006)	0.014** (0.006)	0.013** (0.006)	0.004 (0.007)	0.004 (0.007)	0.004 (0.007)
Industry and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,627	9,613	9,627	9,627	9,613	9,627	9,627	9,613	9,627
Adjusted R^2	0.419	0.419	0.421	0.416	0.416	0.416	0.300	0.300	0.301

Table 4: Cost of Equity and Firms' Environmental Performance during crisis

This table shows the result of difference-in-difference analysis on relationship between cost of equity and environmental performance of firms in the aftermath of Russia-Ukraine war. The dependent variable is the environmental score of firm i at time t and component scores i.e. Resource_Use is the resource efficiency score of firm i at time t, Emissions is the emission management performance score of i at time t , Innovation is innovative performance score of firm i at time t. Treatment is the firms that are in the mostly affected firms since the war began and PostCrisis is year 2022 and 2023 capturing the years since the war started. CoE is the cost of equity for firm i at time t; Firm_Size = Log of Total Assets; ROA = Return on Assets; Tangibility = ratio of tangible assets to total assets; CashHolding = Cash/Short-term Investment ratio to total assets; Leverage = Debt-to-Equity Ratio; MtoB = Market-to-Book ratio; Board_Diversity = Percentage of women to men on the firm's board in a year; Board_Size = Number of directors; CEO_Chair_Duality = Binary indicator for CEO/Chairman role overlap. Significance levels are denoted by *** (1%), ** (5%), and * (10%).

	Env	Innovation	Emissions	ResourceUse
	(1)	(2)	(3)	(4)
$Treatment \times PostCrisis \times CoE$	−0.107	−0.012	−0.020	−0.268*
	(0.108)	(0.148)	(0.153)	(0.145)
$PostCrisis \times CoE$	−0.085	−0.079	−0.077	−0.059
	(0.055)	(0.075)	(0.078)	(0.074)
$Treatment \times CoE$	−0.085	−0.166	−0.119	−0.081
	(0.090)	(0.123)	(0.127)	(0.120)
$Treatment \times PostCrisis$	−0.010	0.010	−0.040**	−0.006
	(0.013)	(0.018)	(0.018)	(0.017)
Treatment	−0.456***	−0.175	−0.645***	−0.533***
	(0.104)	(0.143)	(0.148)	(0.140)
PostCrisis	0.054***	0.038***	0.066***	0.057***
	(0.006)	(0.008)	(0.009)	(0.008)
CoE	0.185***	0.212***	0.180***	0.252***
	(0.046)	(0.063)	(0.066)	(0.062)
Firm_Size	0.061***	0.038***	0.081***	0.066***
	(0.004)	(0.005)	(0.005)	(0.005)
ROA	0.019	−0.004	−0.013	0.042
	(0.024)	(0.035)	(0.032)	(0.032)
Tangibility	0.142***	0.099***	0.162***	0.156***
	(0.022)	(0.031)	(0.032)	(0.030)
MtoB	−0.0002***	−0.0003***	−0.0002	−0.0002**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Leverage	−0.00000	−0.00000	−0.00000	−0.00000
	(0.00000)	(0.00001)	(0.00001)	(0.00001)
CashHolding	0.059***	0.061***	0.080***	0.032
	(0.016)	(0.022)	(0.023)	(0.022)
BoardSize	0.002*	0.002*	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
BoardDiversity	0.001***	0.001***	0.002***	0.002***
	(0.0001)	(0.0002)	(0.0002)	(0.0002)
CEO_Chair_Duality	0.011**	0.017**	0.013	0.003
	(0.006)	(0.008)	(0.008)	(0.008)
Firm and Year FE	Yes	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes	Yes
Observations	9,613	9,613	9,613	9,613
Adjusted R^2	0.033	0.190	0.063	0.090

Table 5: Cost of Debt and Firms' Environmental Performance during crisis

This table shows the result of difference-in-difference analysis on relationship between cost of debt and environmental sustainability performance of firms in the aftermath of Russia-Ukraine war. The dependent variable is the environmental score of firm i at time t and component scores i.e. Resource_Use is the resource efficiency score of firm i at time t, Emissions is the emission management performance score of i at time t , Innovation is innovative performance score of firm i at time t. Treatment is the firms that are in the mostly affected firms since the war began and PostCrisis is year 2022 and 2023 capturing the years since the war started. CoD is cost of debt for firm i at time t; Firm_Size = Log of Total Assets; ROA = Return on Assets; Tangibility = ratio of tangible assets to total assets; CashHolding = Cash/Short-term Investment ratio to total assets; Leverage = Debt-to-Equity Ratio; MtoB = Market-to-Book ratio; Board_Diversity = Percentage of women to men on the firm's board in a year; Board_Size = Number of directors; CEO_Chair_Duality = Binary indicator for CEO/Chairman role overlap. Significance levels are denoted by *** (1%), ** (5%), and * (10%).

	Env	Innovation	Emissions	ResourceUse
	(1)	(2)	(3)	(4)
$Treatment \times PostCrisis \times CoD$	−0.722**	−0.763*	−0.938**	−0.572
	(0.308)	(0.422)	(0.436)	(0.414)
$PostCrisis \times CoD$	0.763***	0.538***	1.144***	0.717***
	(0.145)	(0.199)	(0.206)	(0.195)
$Treatment \times CoD$	0.550***	0.454*	0.824***	0.478*
	(0.194)	(0.266)	(0.275)	(0.261)
$Treatment \times PostCrisis$	−0.010	0.022	−0.030*	−0.028*
	(0.012)	(0.017)	(0.017)	(0.016)
Treatment	−0.494***	−0.210	−0.699***	−0.561***
	(0.104)	(0.143)	(0.148)	(0.140)
PostCrisis	0.031***	0.020***	0.038***	0.039***
	(0.005)	(0.007)	(0.008)	(0.007)
CoD	−0.423***	−0.203	−0.779***	−0.363**
	(0.115)	(0.157)	(0.163)	(0.154)
Firm_Size	0.064***	0.039***	0.083***	0.068***
	(0.004)	(0.005)	(0.005)	(0.005)
ROA	0.016	−0.005	−0.017	0.042
	(0.024)	(0.035)	(0.032)	(0.032)
Tangibility	0.138***	0.097***	0.158***	0.151***
	(0.022)	(0.031)	(0.032)	(0.030)
MtoB	−0.0002***	−0.0003***	−0.0001	−0.0002*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Leverage	−0.00000	−0.00000	−0.00000	−0.00000
	(0.00000)	(0.00001)	(0.00001)	(0.00001)
CashHolding	0.057***	0.059***	0.074***	0.033
	(0.016)	(0.022)	(0.023)	(0.022)
BoardSize	0.002*	0.003*	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
BoardDiversity	0.001***	0.001***	0.002***	0.002***
	(0.0001)	(0.0002)	(0.0002)	(0.0002)
CEO_Chair_Duality	0.011*	0.016**	0.012	0.002
	(0.006)	(0.008)	(0.008)	(0.008)
Firm and Year FE	Yes	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes	Yes
Observations	9,627	9,627	9,627	9,627
Adjusted R^2	0.032	0.190	0.059	0.092

Table 6: Firms' enviromental sustainability and financing choices

This table presents the multinomial logistic regression results on the relationship between firms' environmental sustainability indicators and their financing choices. The dependent variables are Debt - Column (1) and Equity - Column (2), respectively. The interaction terms include $ESI \times WACC$ (Environmental Sustainability Indicator and Weighted Average Cost of Capital) and $ESI \times Debt\_Ratio$ (Environmental Sustainability Indicator and Debt Ratio). Key variables include ESI (Environmental Sustainability Indicator), WACC (Weighted Average Cost of Capital), Debt_Ratio, and Equity_Ratio. Control variables include Firm_Size (Log of Total Assets), ROA (Return on Assets), Leverage (Debt-to-Equity Ratio), CashHolding (Cash/Short-term Investment ratio to total assets), Tangibility (ratio of tangible assets to total assets), MtoB (Market-to-Book ratio), Board_Diversity (Percentage of women to men on the firm's board), Board_Size (Number of directors), and CEO_Chair_Duality (Binary indicator for CEO/Chairman role overlap). Significance levels are denoted by *** (1%), ** (5%), and * (10%). The table also reports the Akaike Information Criterion (AIC), indicating model fit.

	Debt	Equity
	(1)	(2)
Constant	−43.842***	−95.476***
	(2.960)	(11.310)
$ESI \times WACC$	−10.993	−10.781
	(5.860)	(14.438)
$ESI \times Debt\_Ratio$	54.445***	−70.329***
	(0.925)	(13.100)
ESI	−27.672***	29.028***
	(1.286)	(5.318)
WACC	−12.363	1.231
	(10.444)	(8.028)
Debt_Ratio	678.434***	35.441*
	(3.494)	(14.730)
Equity_Ratio	106.311***	134.239***
	(4.799)	(5.155)
Firm_Size	1.593***	0.017
	(0.288)	(0.109)
ROA	4.164	1.715
	(40.661)	(15.203)
Leverage	−264.477***	0.061
	(3.284)	(1.988)
CashHolding	6.369*	−0.619
	(3.093)	(1.104)
Tangibility	1.338	0.161
	(1.479)	(0.650)
MtoB	−0.103	0.003
	(0.122)	(0.038)
Board_Size	−0.094	0.014
	(0.127)	(0.048)
Board_Diversity	0.003	0.002
	(0.024)	(0.010)
CEO_Chair_Duality	0.495	−0.466
	(0.899)	(0.310)
Number of Observations	9006	9006
Akaike Inf. Crit.	450.345	450.345

Table 7: Instrumental Variable Regression Results

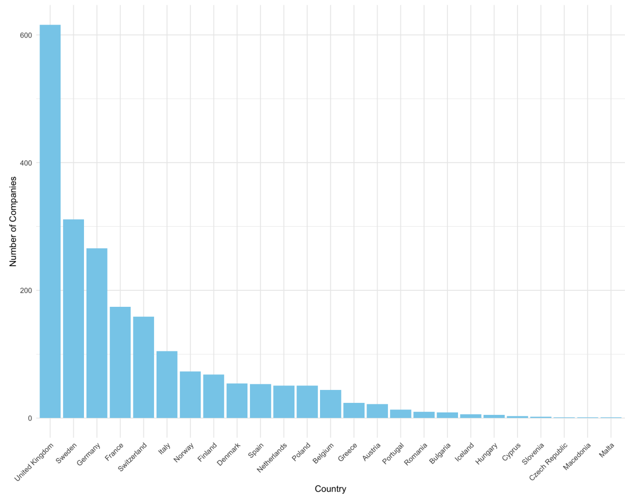
This table shows the result of the second-stage estimates of the two-stage least square instrumental variable analysis on relationship between cost of capital and environmental sustainability performance of firms. The dependent variable is the Environmental score of firm i at time t. WACC is the weighted average cost of capital for firm i at time t; CoE is the cost of equity for firm i at time t; CoD is cost of debt for firm i at time t; Firm_Size = Log of Total Assets; ROA = Return on Assets; Tangibility = ratio of tangible assets to total assets; CashHolding = Cash/Short-term Investment ratio to total assets; Leverage = Debt-to-Equity Ratio; MtoB = Market-to-Book ratio; Board_Diversity = Percentage of women to men on the firm's board in a year; Board_Size = Number of directors; CEO_Chair_Duality = Binary indicator for CEO/Chairman role overlap. Significance levels are denoted by *** (1%), ** (5%), and * (10%).

	Env		
	(1)	(2)	(3)
WACC	−0.711***		
	(0.234)		
CoE		−0.555***	
		(0.180)	
CoD			−1.281***
			(0.416)
Firm_Size	0.068***	0.069***	0.068***
	(0.002)	(0.002)	(0.002)
ROA	0.158***	0.135***	0.107***
	(0.034)	(0.033)	(0.033)
Tangibility	0.076***	0.079***	0.081***
	(0.013)	(0.013)	(0.013)
MtoB	−0.0001	−0.0001	−0.0001
	(0.0003)	(0.0002)	(0.0002)
Leverage	−0.00005***	−0.00005***	−0.00005***
	(0.00001)	(0.00001)	(0.00001)
CashHolding	−0.017	−0.027	−0.053**
	(0.026)	(0.025)	(0.025)
Board_Size	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)
Board_Diversity	0.003***	0.003***	0.003***
	(0.0002)	(0.0002)	(0.0002)
CEO_Chair_Duality	0.033***	0.033***	0.034***
	(0.006)	(0.006)	(0.006)
Constant	−1.078***	−1.109***	−1.103***
	(0.043)	(0.039)	(0.040)
Industry and Year FE	Yes	Yes	Yes
Country dummy	Yes	Yes	Yes
Observations	9,627	9,613	9,627
Adjusted R^2	0.396	0.399	0.408

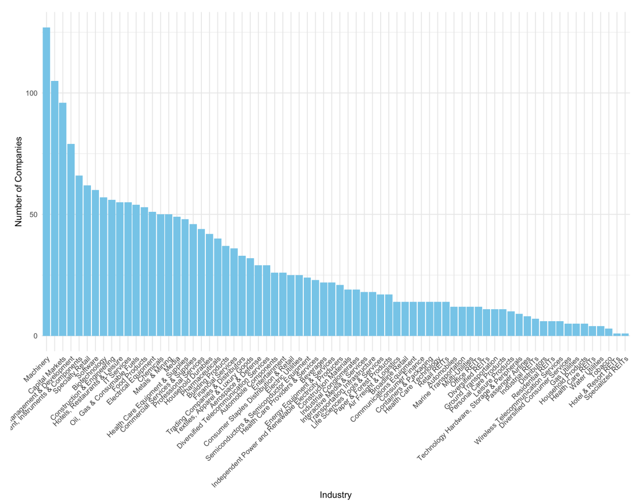
Table 8: Firms' environmental sustainability priorities and financing choices

This table presents the multinomial logistic regression results on the relationship between firms' environmental sustainability indicators (ESIs) and their financing choices with different weighting across the ESIs. The other variables are as defined in Table 6. Significance levels are denoted by *** (1%), ** (5%), and * (10%). The table also reports the Akaike Information Criterion (AIC), indicating model fit.

	30% Emi, 40% Inn, 30% Res		*40% Emi, 30% Inn, 30% Res*		*30% Emi, 30% Inn, 40% Res*	
	Debt	Equity	Debt	Equity	Debt	Equity
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	−138.235***	−57.134***	−23.037***	−99.365***	−14.293***	−101.503***
	(1.870)	(7.636)	(3.162)	(12.315)	(3.107)	(12.363)
$ESI \times WACC$	−6.339	5.173	−9.460	−16.027	−9.971	−13.889
	(4.341)	(11.716)	(6.109)	(14.743)	(6.220)	(14.634)
$ESI \times Debt\_Ratio$	6.630***	−33.786**	58.939***	−85.856***	56.131***	−82.102***
	(0.673)	(10.413)	(1.047)	(13.052)	(1.058)	(13.294)
ESI	−5.078***	12.777**	−31.272***	34.693***	−31.788***	33.423***
	(1.099)	(4.226)	(1.343)	(5.322)	(1.442)	(5.381)
WACC	−0.814	0.290	−10.099	3.556	−9.651	6.737
	(8.443)	(6.573)	(10.599)	(7.972)	(10.968)	(7.856)
Debt_Ratio	585.364***	8.828	697.526***	42.978**	704.423***	43.368**
	(1.756)	(9.821)	(3.971)	(15.743)	(3.919)	(15.930)
Equity_Ratio	72.417***	91.756***	108.347***	138.079***	112.448***	141.981***
	(3.493)	(3.750)	(4.896)	(5.288)	(4.995)	(5.405)
Firm_Size	0.639**	−0.067	1.689***	−0.082	1.851***	−0.123
	(0.231)	(0.093)	(0.284)	(0.110)	(0.279)	(0.111)
Leverage	−152.538***	−0.0004	−285.665***	0.456	−294.389***	0.442
	(2.330)	(1.168)	(3.484)	(2.226)	(3.452)	(2.217)
CashHolding	7.240**	−1.074	8.334**	−0.856	10.301***	−1.226
	(2.757)	(0.930)	(3.202)	(1.136)	(3.119)	(1.137)
Tangibility	1.897	0.174	2.266	0.067	2.426	0.050
	(1.285)	(0.556)	(1.529)	(0.666)	(1.468)	(0.665)
MtoB	−0.108	0.030	0.131	0.020	−0.005	0.020
	(0.097)	(0.032)	(0.102)	(0.039)	(0.111)	(0.039)
Board_Size	−0.075	0.029	−0.187	0.019	−0.405**	0.038
	(0.104)	(0.042)	(0.129)	(0.049)	(0.123)	(0.049)
Board_Diversity	−0.023	−0.003	0.008	0.0002	−0.009	0.0004
	(0.020)	(0.008)	(0.023)	(0.010)	(0.023)	(0.010)
CEO_Chair_Duality	0.466	−0.294	0.635	−0.543	1.474	−0.435
	(0.736)	(0.268)	(0.966)	(0.317)	(0.921)	(0.315)
Number of Observations	9006	9006	9006	9006	9006	9006
Akaike Inf. Crit.	498.417	498.417	453.540	453.540	445.532	445.532

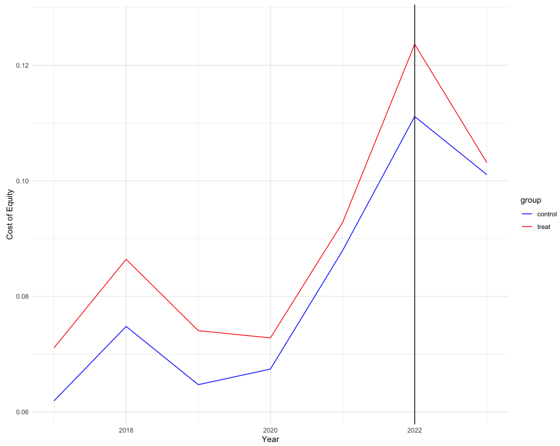


(a) Number of companies by country

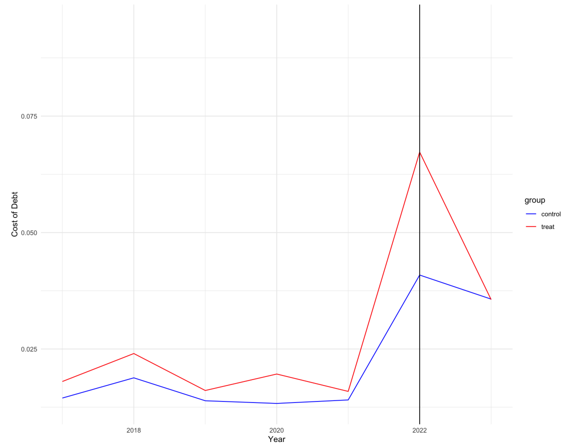


(b) Number of companies by Industry

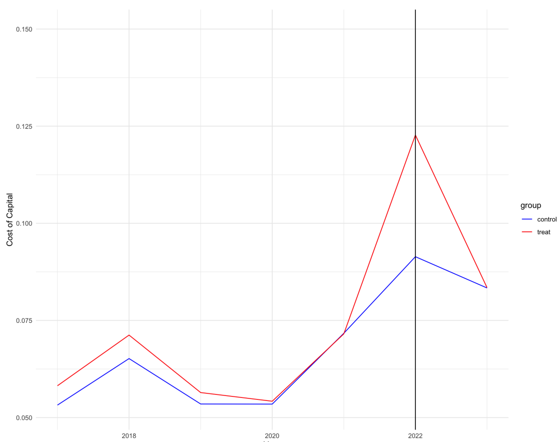
Figure 1: Number of Companies by Country and Industry



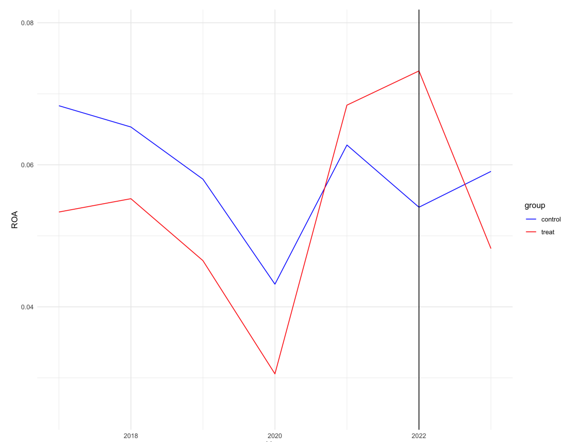
(a) Cost of Equity Over Time



(b) Cost of Debt Over Time

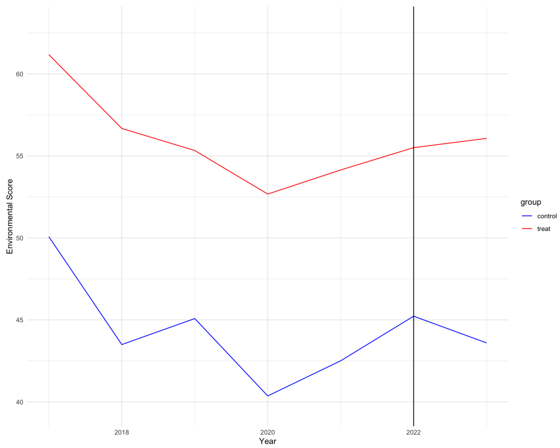


(c) Cost of Capital Over Time

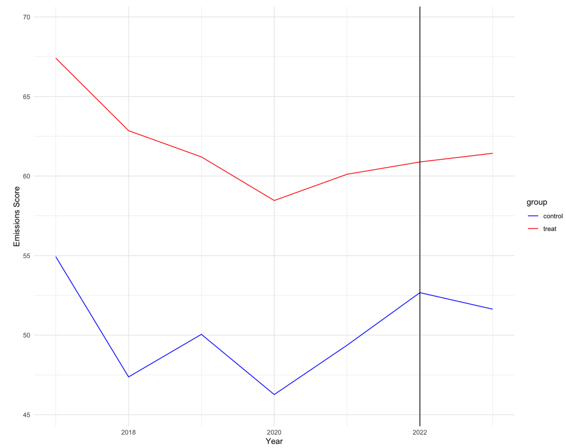


(d) ROA Over Time

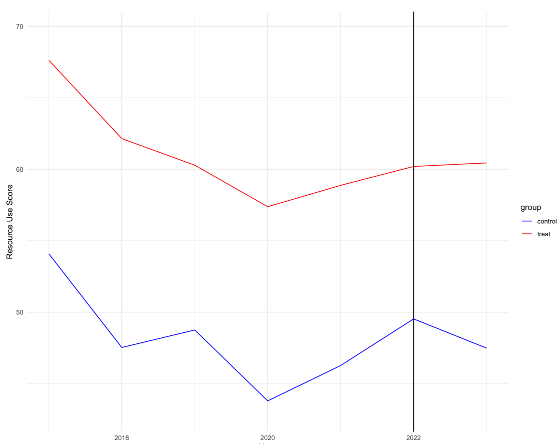
Figure 2: Treated and control group parralel trend of financial metrics over time



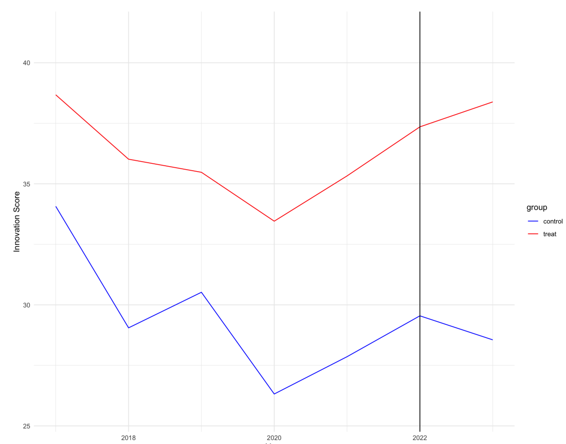
(a) Environmental score over time



(b) Emissions score over time



(c) Resource_Use score over time



(d) Innovation score over time

Figure 3: Treated and control group parralel trend of Environmental and components score over time

Cost of Capital (CoC): Calculated as the weighted average cost of capital (WACC), incorporating both the cost of equity and the cost of debt.

- **Cost of Equity (CoE):** Estimated using the Capital Asset Pricing Model (CAPM):

$$\mathrm{CoE}_i = R_f + \beta_i (R_m - R_f) \tag{6}$$

  Where:

  - R_f = Risk-free rate (e.g., yield on government bonds).
  - β_i = Beta coefficient of firm i.
  - R_m = Expected market return.

- **Cost of Debt (CoD):** Derived from interest expenses and total debt:

$$\mathrm{CoD}_i = \frac{\text{Interest Expense}_i}{\text{Total Debt}_i} \tag{7}$$

- **WACC:**

$$\mathrm{WACC}_i = \left(\frac{E_i}{E_i + D_i} \times \mathrm{CoE}_i \right) + \left(\frac{D_i}{E_i + D_i} \times \mathrm{CoD}_i \times (1 - T_i) \right) \tag{8}$$

  Where:

  - E_i = Market value of equity for firm i.
  - D_i = Market value of debt for firm i.
  - T_i = Corporate tax rate for firm i.