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Is ESG Already Priced? Evidence from Cross-Country ESG Factor Pricing

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Abstract

This thesis examines whether environmental, social, and governance (ESG) characteristics are priced in equity markets and whether the strength of ESG pricing differs systematically across countries. Building on equilibrium and transition-dynamics theories of sustainable investing, the analysis distinguishes between persistent expected-return differences (an ESG "premium") and transitory performance driven by episodic repricing as ESG preferences and climate concerns evolve.

Empirically, the study conducts a cross-country asset-pricing test using firm-level data from a set of OECD markets. A firms sustainability is proxied by the Refinitiv ESG Combined Score, and within each country a green-minus-brown return spread is constructed from portfolios of high-ESG and low-ESG firms under a sector-diversification constraint. The methodology follows a two-pass design: rolling time-series regressions estimate firm exposures to both the local market factor and the country-specific ESG spread, and Fama–MacBeth style cross-sectional regressions test whether these exposures are compensated in expected returns. To explain cross-country heterogeneity, the analysis further evaluates whether ESG pricing varies with institutional and policy conditions—capturing macro sentiment, environmental policy intensity, institutional quality, and investor-base composition—and explores whether cultural characteristics help account for average differences in ESG pricing across countries.

Overall, the results provide limited evidence of broad, persistent green outperformance and suggest that systematic ESG pricing is not a uniform feature across markets. Instead, ESG premia appear localized, with clearer pricing signals concentrated in specific countries and with state-dependent patterns in some markets. Moderation tests indicate that policy salience and ownership structure can coincide with stronger or weaker ESG pricing, but the direction and strength of these relationships are country-specific rather than universal. Taken together, the findings are more consistent with localized and episodic ESG premia than with a stable global ESG risk–return relationship.

Abstract

Diese Arbeit untersucht, ob Umwelt-, Sozial- und Governance-(ESG-)Merkmale an Aktienmärkten in Preisen reflektiert werden und ob sich die Stärke der ESG-Bepreisung systematisch zwischen Ländern unterscheidet. Aufbauend auf Gleichgewichts- und Übergangsdynamik-Theorien nachhaltigen Investierens unterscheidet die Analyse zwischen persistenten Unterschieden in erwarteten Renditen (einer ESG-"Prämie") und temporärer Performance, die durch episodische Neubewertungen getrieben wird, wenn sich ESG-Präferenzen und Klimasorgen im Zeitverlauf verändern.

Empirisch führt die Studie einen länderübergreifenden Asset-Pricing-Test auf Basis von Unternehmensdaten aus einer Auswahl von OECD-Märkten durch. Die Nachhaltigkeit eines Unternehmens wird durch den Refinitiv ESG Combined Score angenähert, und innerhalb jedes Landes wird unter einer Sektordiversifikationsrestriktion ein Green-minus-Brown-Renditespread aus Portfolios von High-ESG- und Low-ESG-Unternehmen konstruiert. Methodisch folgt die Untersuchung einem Two-Pass-Design: Rollierende Zeitreihenregressionen schätzen die Unternehmens-Exposures sowohl gegenüber dem lokalen Marktfaktor als auch gegenüber dem länderspezifischen ESG-Spread; Fama–MacBeth-artige querschnittliche Regressionen testen anschließend, ob diese Exposures in Form höherer bzw. niedrigerer erwarteter Renditen kompensiert werden. Zur Erklärung länderspezifischer Heterogenität wird zudem analysiert, ob die ESG-Bepreisung mit institutionellen und politischen Rahmenbedingungen variiert—die Makro-Stimmung, die Intensität umweltpolitischer Maßnahmen, institutionelle Qualität sowie die Zusammensetzung der Investor:innenbasis abbilden—und es wird exploriert, ob kulturelle Charakteristika dazu beitragen, durchschnittliche Unterschiede in der ESG-Bepreisung zwischen Ländern zu erklären.

Insgesamt liefern die Ergebnisse nur begrenzte Evidenz für eine breite, persistente Outperformance "grüner" Titel und deuten darauf hin, dass eine systematische ESG-Bepreisung kein einheitliches Merkmal über Märkte hinweg ist. Stattdessen erscheinen ESG-Prämien eher lokalisiert, mit klareren Preissignalen, die sich auf einzelne Länder konzentrieren, sowie mit zustandsabhängigen Mustern in einigen Märkten. Moderationsanalysen zeigen, dass politische Salienz und Eigentümerstruktur mit stärkerer oder schwächerer ESG-Bepreisung einhergehen können; Richtung und Stärke dieser Zusammenhänge sind jedoch länderspezifisch und nicht universell. Insgesamt sind die Befunde eher mit lokalisierten und episodischen ESG-Prämien vereinbar als mit einer stabilen globalen ESG-Risiko–Rendite-Beziehung.

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1 History and Development of ESG

The modern ESG agenda has its intellectual roots in earlier forms of socially responsible investment (SRI) that emerged in the 1960s and 1970s, when church investors, foundations, and later university endowments began to exclude "sin stocks" and firms linked to the Vietnam War or apartheid. Academic surveys describe SRI as an investment discipline that adds social and environmental objectives to the traditional risk–return calculus and trace its gradual expansion from small ethical funds to a recognizable market segment in the 1980s and 1990s (Renneboog, L., Ter Horst, J. & Zhang, C., 2008). By the early 2000s, SRI had evolved into a "global revolution", with institutional investors in Europe and North America increasingly adopting sustainability-themed mandates and engagement strategies (Sparkes, R., 2003).

The specific ESG label gained prominence in 2004, when the UN Global Compact convened leading financial institutions for the report *Who Cares Wins – Connecting Financial Markets to a Changing World*. This report argued that environmental, social, and governance issues are financially material and should be integrated into mainstream security analysis and valuation, effectively coining ESG as a unified analytical category (UN Global Compact, 2004). In the same year, the UNEP Finance Initiative published its CEO briefing on *The Materiality of Social, Environmental and Corporate Governance Issues to Equity Pricing*, documenting how brokerage analysts were already identifying ESG-related factors as relevant to competitiveness and stock prices across multiple industries (UNEP Finance Initiative Asset Management Working Group, 2004).

1.1 Integration of ESG

A decisive step toward mainstream adoption was the launch of the UN Principles for Responsible Investment (PRI) in 2006, which provided a voluntary but influential framework for institutional investors to integrate ESG considerations into investment processes and ownership practices. By 2024, more than 5,300 signatories, representing roughly USD 128 trillion in assets under management, had committed to the PRI, indicating that ESG considerations are now embedded in global asset management (Volhard, P., Young, J., Scott, A. & Smith, U., 2025). The *Global Sustainable Investment Review 2022* estimates that around USD 30 trillion in assets are managed under sustainable investment strategies worldwide, underlining the scale of ESG's diffusion (Global Sustainable Investment Alliance, 2022).

In portfolio management, ESG metrics are used to tilt portfolios toward firms with stronger environmental, social, and governance profiles, to define exclusion lists, and to guide engagement strategies. Meta-analytical evidence from more than 2,000 studies finds that the relationship between ESG and corporate financial performance is predominantly non-negative and frequently positive, which has helped justify ESG integration within a traditional risk–return framework rather than as a purely ethical add-on (Friede, G., Busch, T. & Bassen, A., 2015). Large asset owners and, increasingly, central banks incorporate ESG criteria in their own portfolios, using strategies such as negative screening, best-in-class selection, and green bonds (Network for Greening the Financial System, 2020). This has contributed to the view of ESG as an additional dimension of systematic risk and opportunity in asset allocation.

In risk management, ESG—especially climate-related factors—is now treated as a material source of financial risk. The Task Force on Climate-related Financial Disclosures (TCFD) provides a widely adopted framework that requires firms to disclose how climate risks affect governance, strategy, risk management, and metrics and targets, enabling investors and lenders to incorporate these exposures into their risk analyses (Task Force on Climate-related Financial Disclosures, 2017). Central banks and supervisors use NGFS climate scenarios to assess macro-financial vulnerabilities, and climate stress tests have shown that both physical and transition risks can have measurable impacts on banks' risk profiles and loss distributions (Network for Greening the Financial System, 2022).

In banking, ESG considerations shape credit policies and supervisory expectations. High-emitting or environmentally sensitive exposures are increasingly scrutinised as potential stranded assets, and climate risk stress tests—such as those conducted by the ECB—indicate that climate risks can materially affect banks' portfolios under adverse scenarios (European Central Bank, 2022).

Conceptually, this motivates two complementary interpretations of ESG in finance. First, ESG functions as an information system, expanding the set of priced risk factors beyond traditional financial metrics. Second, ESG operates as a preference system, where heterogeneous investor tastes for sustainability directly influence asset demand, prices, and expected returns (Pastor, L., Stambaugh, R. F. & Taylor, L. A., 2020).

1.2 ESG Data and Rating Construction

ESG rating providers such as Refinitiv/LSEG, MSCI, and Sustainalytics transform heterogeneous non-financial information into standardized assessments of firms' sustainability performance or risk. Across major frameworks, the process typically follows a similar sequence:

1. collection of input data from company reports, regulatory filings, and alternative sources;
2. mapping these data to a structured indicator framework;
3. scoring firms on individual indicators or "key issues";
4. aggregating these scores into pillar-level and overall ESG ratings.

Refinitiv's ESG Scores are based on over 870 company-level ESG measures, of which 186 "most comparable and material" indicators are used in the scoring model. These metrics are grouped into ten categories that roll up into three pillar scores (environmental, social, governance) and an overall ESG score on a 0–100 scale. The methodology is explicitly data-driven and uses industry-specific materiality weights, while the ESG Combined Score (ESGC) overlays the core score with a controversies adjustment based on negative media and NGO coverage. The stated aim is to measure firms' relative ESG performance, commitment, and effectiveness using only verifiable, publicly reported information (London Stock Exchange Group, 2024).

MSCI ESG Ratings similarly start from more than 1,000 data points across 35 ESG "Key Issues", combining company-reported data with alternative sources (e.g., regulatory databases, news, NGO reports). Analysts assess each firm's exposure to industry-specific ESG risks and its management of those risks, and then score key issues on a 0–10 scale. These scores are aggregated into pillar scores and an industry-adjusted overall rating on a AAA–CCC scale, expressing a firm's resilience to long-term ESG risks relative to global sector peers (MSCI ESG Research, 2020).

Sustainalytics' ESG Risk Ratings adopt a conceptually different but structurally similar approach: they estimate a firm's unmanaged ESG risk by combining measures of total exposure to material ESG issues, the portion of that exposure that is theoretically manageable, and the quality of the firm's risk management systems. The resulting ESG Risk Rating is an absolute risk score, categorized into negligible, low, medium, high, or severe ESG risk, based on more than 200 indicators and around 1,800 data points per company (Sustainalytics, o.J.). Despite methodological differences, major providers thus rely on large indicator sets, materiality mapping, and weighted aggregation to arrive at a single ESG assessment per firm.

1.3 Rating Disagreement and Structural Biases

A central challenge for empirical ESG research is the substantial disagreement between the ratings of different agencies. Berg, Kölbel, and Rigobon (2022) systematically analyse ESG ratings from six leading providers (KLD, Sustainalytics, Moody's ESG, S&P Global/RobecoSAM, Refinitiv, and MSCI) and document that correlations between agencies are far lower than for traditional credit ratings. They decompose this divergence into three components—scope, measurement, and weighting—and find that measurement explains 56% of the variance across raters, scope 38%, and weighting only 6% (Berg, F., Kölbel, J. F. & Rigobon, R., 2022).

Scope divergence. Scope divergence arises because agencies include different sets of ESG topics and indicators in their frameworks. One provider may treat tax transparency, political lobbying, or biodiversity as explicit rating issues, while another omits them or groups them into broader categories. Berg et al. define scope as the question of what is being measured and show that differences in the inclusion or exclusion of particular issues contribute materially to cross-rater disagreement. Even if firms disclosed perfectly comparable data, ratings would still differ whenever agencies disagree on which ESG dimensions are relevant (Berg, F., Kölbel, J. F. & Rigobon, R., 2022).

Measurement divergence. Measurement divergence captures differences in how a given issue is operationalised. Providers may rely on distinct indicators (e.g., absolute vs. intensity-based emissions), apply different scaling and normalization procedures, or interpret qualitative disclosures differently. Berg et al. show that such measurement choices are the single largest source of rating divergence and identify a "rater effect", whereby an agency's overall view of a firm tends to influence the scoring of individual ESG categories. This implies that ESG ratings embed not only data and methodology, but also agency-specific priors (Berg, F., Kölbel, J. F. & Rigobon, R., 2022).

Weighting divergence. Weighting divergence refers to differences in the relative importance assigned to issues and pillars in the aggregation step (e.g., how heavily carbon emissions are weighted relative to labour practices). While often highlighted in practitioner debates, Berg et al. find that weighting differences explain only a small fraction (around 6%) of rating divergence once scope and measurement are aligned. This suggests that harmonising weights alone would not resolve inconsistency across ESG ratings (Berg, F., Kölbel, J. F. & Rigobon, R., 2022).

A further structural issue is disclosure bias, i.e., the tendency for firms that disclose more ESG information—typically larger and better-resourced companies—to obtain higher ratings. Because the main providers rely heavily on publicly available data, firms with more extensive reporting offer raters more input variables and, often, more opportunities to assign points for policies and programs. Refinitiv's own documentation highlights that its methodology "stimulates transparency" and explicitly adjusts for company size biases, implicitly acknowledging this issue (Refinitiv, 2022). Empirically, Drempetic, Klein, and Zwergel (2020) show a strong positive association between firm size, the availability of ESG data, and Thomson Reuters ASSET4 ESG scores, arguing that ESG ratings partially reflect resources devoted to disclosure rather than pure sustainability performance (Drempetic, S., Klein, C. & Zwergel, B., 2020). Related work documents systematic company size bias in ESG scores, with larger firms typically achieving higher ratings than small caps.

Finally, greater disclosure does not automatically resolve rating disagreement. Christensen, Serafeim, and Sikochi (2022) find that increased ESG disclosure is associated with higher disagreement between rating agencies, as more reported information allows different raters to emphasise different metrics and interpret the same disclosures in divergent ways (Christensen, H. B., Serafeim, G. & Sikochi, A., 2022). Taken together, these findings imply that ESG ratings should be treated as noisy, provider-specific signals, shaped by methodological choices and disclosure patterns, rather than as objective measures of a firm's sustainability profile.

2 ESG in Asset Pricing

In recent years, ESG has also established a firm position in the asset-pricing literature, where the focus shifts from whether investors *care* about sustainability to whether sustainability-related exposures are *priced* in expected returns. A natural way to frame this question is to start from the simplest equilibrium benchmark in finance. The following subsection therefore provides a brief introduction to the Capital Asset Pricing Model (CAPM), which formalizes the idea that only non-diversifiable market risk should be compensated in equilibrium and thus serves as a baseline against which any additional ESG-related pricing effects can be evaluated.

2.1 CAPM as the Benchmark Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is the canonical benchmark for linking *expected returns* to *systematic risk* in equilibrium. In the CAPM, investors choose portfolios based on risk and return and can combine a risk-free asset with the market portfolio. A key implication is that only the component of risk that cannot be diversified away—market (systematic) risk—is priced.

Empirically, it is standard to work with *excess returns*. Let $R_{i,t}$ denote the return on asset i in period t and $R_{f,t}$ the risk-free rate. The excess return is $R^e_{i,t} = R_{i,t} - R_{f,t}$, and $R^e_{m,t}$ denotes the market excess return. The CAPM's central quantity is the *market beta*, defined as

$$\beta_{i,m} = \frac{\mathrm{Cov}(R^e_i, R^e_m)}{\mathrm{Var}(R^e_m)}. \tag{1}$$

which measures how strongly the asset co-moves with the market and thus how much systematic market risk it carries.

The CAPM implies the *Security Market Line*, which states that expected excess returns are proportional to market beta:

$$E[R^e_i] = \beta_{i,m}\, E[R^e_m]. \tag{2}$$

Hence, two assets with the same market beta should, in equilibrium, have the same expected excess return; higher expected returns require higher exposure to market risk. [Sharpe, 1964]

A standard empirical representation is the time-series regression

$$R^e_{i,t} = \alpha_i + \beta_{i,m} R^e_{m,t} + \varepsilon_{i,t}, \tag{3}$$

where α_i measures the average excess return not explained by market exposure. Under the CAPM, α_i should be zero, i.e., after controlling for $\beta_{i,m}$ there should be no systematic abnormal return left to explain. (Fama and MacBeth, 1973)

For the ESG question, the CAPM provides a clean benchmark: if ESG is irrelevant for pricing, any return differences between "green" and "brown" assets should not persist once standard risk exposures (starting with market beta) are controlled for.

2.2 Exclusion, Investor Segmentation, and the Cost of Capital

Heinkel, Kraus, and Zechner provide an early equilibrium model in which environmental preferences affect asset prices through investor segmentation. Their central insight is that if a sufficiently large group of investors refuses to hold polluting firms, those firms are priced by a narrower investor base, which lowers their valuation and raises their cost of capital.

The model is set in a one-period economy with two types of investors and three categories of firms. Investors are either *neutral* or *green*. Neutral investors are willing to hold all securities, whereas green investors exclude polluting firms from their portfolios. Firms are classified as *acceptable* (A), *unacceptable* (U), or *reformed* (R). Acceptable firms can be held by all investors, unacceptable firms are excluded by green investors, and reformed firms incur a fixed cost that makes them acceptable to the green investor base.

The pricing mechanism follows from market clearing. Once green investors withdraw from unacceptable firms, the associated risk must be borne entirely by neutral investors. Risk sharing therefore becomes less efficient in the excluded segment, causing the price of unacceptable firms to fall. Lower prices imply higher expected returns, so exclusion raises the required return on polluting firms.

The model also endogenizes firms' incentives to reform. In equilibrium, reform occurs until the price gain from becoming acceptable exactly offsets the fixed reform cost:

$$P_R = P_U + K \tag{4}$$

where P_R denotes the price of a reformed firm, P_U the price of an unacceptable firm, and K the cost of reform. If the valuation discount on excluded firms is sufficiently large, reform becomes privately optimal. Environmental preferences therefore affect not only security prices but also firms' incentives to alter their environmental status.

From an asset-pricing perspective, the key implication is that polluting or excluded firms must offer higher expected returns than acceptable firms. The equilibrium premium is thus more naturally interpreted as a *brown premium*: what is compensated is the holding of firms avoided by part of the market.

The model is deliberately stylized because sustainability preferences enter through a strict boycott rule. This makes the underlying demand-based mechanism especially clear, but it abstracts from settings in which investors prefer greener firms without fully excluding brown ones. A more general framework is therefore needed to capture sustainability as a continuously priced firm characteristic. [Heinkel et al., 2001]

2.3 Preference-Based Demand and the Equity Greenium

Pástor, Stambaugh, and Taylor develop an equilibrium model in which sustainability enters asset pricing directly as a firm characteristic. Rather than assuming exclusion, they allow investors to differ in their taste for sustainability and to derive non-pecuniary utility from holding greener firms. Greenness therefore affects equilibrium prices through asset demand.

The central object in the model is firm-level *greenness*, denoted by g_n. Because investors value sustainability alongside risk and return, greener firms command higher valuations. Under the assumption of an ESG-neutral market portfolio, $w_m^\top g = 0$, expected excess returns are given by

$$\mu = \mu_m \beta_m - \frac{\bar{d}}{a} g \tag{5}$$

where μ is the vector of expected excess returns, μ_m is the market risk premium, β_m is the vector of market betas, a denotes risk aversion, and $\bar{d}$ is the wealth-weighted average taste for sustainability. Expected returns therefore depend not only on market risk exposure, but also on greenness.

A directly related implication concerns the CAPM alpha:

$$\alpha_n = -\frac{\bar{d}}{a} g_n \tag{6}$$

If $\bar{d} > 0$, firms with higher g_n have lower expected returns and negative CAPM alphas relative to otherwise comparable firms. Pástor et al. describe this pattern as a negative *equity greenium*. In equilibrium, greener firms are priced more highly because investors are willing to accept lower financial compensation in exchange for holding them.

This framework implies that sustainability preferences lower expected returns on green assets rather than generating a positive long-run return premium for them. The key pricing effect operates through valuation: stronger demand raises the price of greener firms and thereby reduces their expected returns. Relative to Heinkel et al. (2001), sustainability no longer matters because a subset of firms is excluded, but because firms differ continuously in a characteristic that investors value directly. The common implication of both models, however, is that browner firms must offer higher required returns. [Pastor et al., 2021]

This distinction matters for the interpretation of historical return patterns. If greener firms have lower expected returns in equilibrium, observed green outperformance cannot by itself be taken as evidence of a positive green premium. It may instead reflect changes in valuation. This issue is taken up explicitly by Pástor, Stambaugh, and Taylor (2022).

2.4 Climate Concern, Repricing, and Realized Returns

Pástor, Stambaugh, and Taylor (2022) extend the previous framework by introducing a dynamic distinction between expected and realized returns. Their central argument is that even if green assets have lower expected returns in equilibrium, they can earn high realized returns when climate concerns rise unexpectedly.

The mechanism is repricing. When concern about climate change intensifies unexpectedly, investors become more willing to hold sustainable firms and less willing to hold brown firms. This raises the prices of green assets and lowers the prices of brown assets. Because realized returns include valuation changes, green assets can outperform during such periods even though their expected returns may remain lower going forward.

To formalize this idea, Pástor et al. define a green factor as the return on green assets in excess of the return on brown assets. Its expected value is negative in equilibrium, reflecting the lower expected returns of greener firms. Its realized value, however, can be positive if climate concerns increase unexpectedly and thereby generate positive valuation shocks for green assets and negative valuation shocks for brown assets.

The model therefore shows that green outperformance need not indicate a permanently positive expected return differential. It may instead reflect repricing following an increase in environmental concerns, in which greener firms become more highly valued and therefore offer lower expected returns subsequently. Brown firms, by contrast, are more exposed to valuation losses when investor demand shifts against them.

An important implication is methodological. Return spreads alone are insufficient to distinguish between a stable pricing relation and temporary repricing effects. A positive green-minus-brown spread may indicate that greener firms are being revalued upward, but it does not by itself show whether this reflects a persistent equilibrium relation in expected returns or a more episodic adjustment in market valuations. (Pastor et al., 2022)

2.5 Empirical Evidence on Preference-Based Demand and the Pricing of Climate-Transition Risk

The empirical literature on sustainable investing does not identify one single and uniform sustainability effect in asset prices. Instead, it documents several channels through which sustainability-related characteristics may become financially relevant. Broadly, the evidence suggests that sustainability can affect prices through investor demand, through compensation for climate-related and transition-related risks, and through differences in downside risk, resilience, and systemic exposure. At the same time, the literature shows that the magnitude and interpretation of these effects depend strongly on how sustainability is measured and on the institutional and temporal setting in which markets operate.

A first established empirical finding is that sustainability-related information can affect capital allocation once it becomes salient and comparable across assets. Hartzmark and Sussman show that the introduction of Morningstar sustainability ratings for U.S. mutual funds triggered economically meaningful flow responses: highly rated funds attracted inflows, whereas poorly rated funds experienced outflows. (Hartzmark and Sussman, 2019) Their results indicate that sustainability labels can influence investor demand even when their immediate relevance for firms' cash flows is not directly observable. More generally, this strand of the literature suggests that sustainability may affect market outcomes not only through risk-based channels, but also through investor preferences and portfolio reallocation.

A second major strand of the literature studies whether climate-related firm characteristics are reflected in expected returns. Using a large international sample, Bolton and Kacperczyk show that firms with higher carbon emissions and firms with faster emissions growth earn higher average stock returns, which they interpret as evidence of a carbon premium. Their results are consistent with the view that investors require compensation for holding firms that are more exposed to transition-related shocks such as tighter climate regulation, technological substitution, or shifts in consumer and investor sentiment. (Bolton and Kacperczyk, 2023) This perspective is broadened by Sautner, Van Lent, Vilkov, and Zhang, who construct firm-level climate exposure measures from the textual content of corporate earnings calls. Their evidence suggests that transition exposure cannot be fully captured by emissions alone and that forward-looking textual measures contain pricing-relevant information beyond standard environmental proxies. (Sautner et al., 2023) Taken together, these studies indicate that climate-related expected return differentials are empirically plausible, but also that the relevant exposures are multidimensional rather than reducible to one broad sustainability score.

A related literature focuses less on unconditional average returns and more on crisis performance and resilience in periods of acute stress. Albuquerque, Koskinen, Yang, and Zhang exploit the exogenous COVID-19 market crash and show that firms with higher environmental and social ratings earned higher returns, exhibited lower return volatility, and recorded higher operating profit margins during the first quarter of 2020. They interpret these findings as evidence that customer and investor loyalty contributed to the relative resilience of high-ES firms during the pandemic. Their results therefore suggest that sustainability-related firm characteristics may become particularly relevant in periods of severe market stress.(Albuquerque, Koskinen, Yang and Zhang, 2020)

Pagano, Wagner, and Zechner refine this crisis-based perspective by distinguishing more explicitly between realized returns and expected returns. Studying the pricing of disaster resilience during COVID-19, they show that firms more resilient to social distancing outperformed during the pandemic and experienced different expected-return dynamics than less resilient firms. Importantly, their results indicate that resilience to social distancing plays a central role in explaining changes in expected returns during the crisis, whereas environmental characteristics mainly help explain realized returns in the immediate shock. This suggests that sustainability-related outperformance in crisis episodes may reflect specific forms of resilience rather than a uniform pricing effect. (Pagano, Wagner, and Zechner 2023)

At the same time, the literature remains inconclusive on whether broad ESG ratings imply a systematic return effect across firms, countries, and time. Alves, Krüger and Van Dijk using more than 16,000 stocks in 48 countries and seven major ESG data providers, find very little evidence that ESG ratings are systematically related to global stock returns over 2001–2020. The weak relationship remains broadly unchanged across regions, subperiods, ESG subratings, rating upgrades and downgrades, and best-in-class strategies. (Alves, Krüger and Van Dijk, 2025) A related explanation is provided by Berg, Kölbel, and Rigobon, who document substantial disagreement across ESG rating agencies and show that this divergence is driven primarily by differences in measurement, scope, and weighting. Their results imply that broad ESG scores often aggregate heterogeneous underlying dimensions in inconsistent ways, making them difficult to interpret as a uniform pricing signal. Accordingly, weak empirical relations between ESG ratings and stock returns may reflect not only the absence of a clear empirical pattern, but also substantial measurement noise and methodological inconsistency. (Berg, F., Kolbel, J. F. Rigobon, R., 2022)

Another important strand of the literature emphasizes risk and resilience rather than average returns. Gehrig, Iannino, and Unger study an international sample of banks and find strong evidence that measures of social responsibility contribute to increasing bank resilience. Their results hold when resilience is proxied by different measures of systemic and systematic risk, including SRISK, Delta CoVaR, dynamic market beta, and insolvency risk. They further show that these relationships are not fully uniform internationally, but exhibit significant transatlantic differences. Their findings are therefore best understood as evidence for a risk-based channel through which social responsibility may matter financially. (Gehrig, Iannino, and Unger 2024)

The literature also suggests that sustainability-related pricing is unlikely to be uniform across countries and over time. Bolton and Kacperczyk document substantial cross-country heterogeneity in carbon premia, implying that the pricing of transition risk depends on institutional and macroeconomic conditions such as policy credibility, energy dependence, market structure, and investor composition. (Bolton and Kacperczyk, 2023) Gehrig, Iannino, and Unger likewise find significant transatlantic differences in the relationship between social responsibility and resilience. (Gehrig, Iannino, and Unger 2024) In addition, Alessi, Ossola, and Panzica show that the greenium is time-varying rather than constant, which suggests that sustainability-related pricing may intensify in some periods and weaken in others depending on market conditions and the salience of climate concerns. (Alessi, Ossola and Panzica, 2021)

Overall, the empirical literature establishes that sustainability can matter for asset prices, but not through one single and uniform mechanism. The evidence supports effects on investor demand, documents pricing relations for certain climate-related exposures, and shows that sustainability-related characteristics can become particularly relevant in crisis episodes and in risk-based measures of resilience. At the same time, the literature does not point to one uniform ESG effect, but rather to a differentiated picture in which the observed relationships depend on the sustainability measure employed, on the national and regulatory environment, and on whether the outcome of interest is average returns, crisis performance, or risk and systemic resilience.

Against this background, this thesis examines ESG-related pricing in a cross-country setting. It investigates whether green and brown firms differ systematically in their return patterns and ESG-related factor exposures across national equity markets, and whether such patterns are more consistent with a stable and internationally shared pricing relation or with localized and episodic repricing dynamics. In addition, the analysis explores whether cross-country differences in these patterns are associated with national institutional, political, and cultural conditions. The aim is therefore not to identify a single global ESG premium, but to assess whether ESG-related pricing emerges uniformly across countries or whether it remains conditional on local market environments and institutional characteristics.

Therefor the thesis addresses the following research questions:

2.6 Research Question 1

Is ESG exposure priced in a stable and internationally consistent way across equity markets, or does ESG pricing appear primarily as country-specific and episodic repricing?

2.7 Research Question 2

Which national institutional, political, and cultural characteristics help explain cross-country differences in the strength and form of ESG pricing?

3 Data and Methodology

3.1 Data

Firm-level ESG data are obtained from Refinitiv. The ESG Combined Score is used as the main firm-level sustainability measure. To assess robustness to ESG measurement, the empirical analysis is repeated using Refinitiv's Environmental Pillar Score (E-score), which focuses on the environmental dimension (London Stock Exchange Group, 2024; OECD, n.d.).

For each OECD member state in the initial universe, all publicly listed equities with available Refinitiv ESG data were identified and matched to their respective Combined ESG Score. Country-level ESG scores were then computed as the arithmetic mean of the firm-level ESG scores of all included companies. On the basis of these averages, countries were ranked from the lowest to the highest mean ESG score (i.e. from relatively "brown" to relatively "green") and divided into three tertiles. To avoid extreme outliers at both ends of the distribution and to focus on more representative cases, the analysis retains those countries whose mean ESG scores lie closest to the sample median. The resulting country sample comprises Australia, the United Kingdom, Sweden, Japan, Germany, Denmark, Finland, Chile, the Netherlands, Italy, Korea and Belgium. The US and Canada were additionally included as key North American benchmark markets to improve the external validity of the analysis and to capture institutional and market-structure heterogeneity. Both markets also provide strong liquidity and data coverage, supporting more reliable factor and beta estimates.

From each of these countries, a sample of 40 firms was drawn, consisting of two equally sized subgroups: the 20 firms with the highest ESG scores and the 20 firms with the lowest ESG scores. To enhance the robustness of the results, small-cap firms with a market capitalisation below EUR 50 million were excluded, as they tend to exhibit higher idiosyncratic volatility and less stable equity betas and are often characterised by weaker or more sporadic ESG disclosure.

In addition, to mitigate the risk of sectoral concentration and to ensure that the green–brown classification is not mechanically driven by industry composition, an explicit diversification constraint was imposed at the industry level. Specifically, within each country and for each ESG group (green and brown), no more than 30% of firms were allowed to originate from the same industry. By limiting sectoral concentration, the design aims to ensure that estimated differences between green and brown firms primarily reflect ESG characteristics rather than systematic industry effects or sector-specific risk premia.

3.2 Variables

This study combines firm-level financial data, ESG information and country-level institutional indicators in a monthly panel. The following subsection describes all variables available in the raw dataset, their conceptual meaning, data sources and their role in the empirical analysis. Where relevant, variables are grouped into independent, dependent variables and control variables.

3.2.1 Independent Variables (IV)

The main variables of interest in this thesis capture firm-level ESG performance and the institutional environment in which firms operate. These variables are used as independent variables in different parts of the analysis, depending on the specific empirical specification.

ESG Combined Score The *ESG Combined Score (ESGC)* is employed as the baseline sorting variable because it provides a *single, broad* firm-level proxy for sustainability performance that aggregates the three pillars *E*, *S*, and *G* into one continuous measure. This one-dimensional aggregation is particularly suitable for portfolio formation frameworks that require a clear and internally consistent classification of firms along a *green–brown* dimension, while maintaining comparability across firms and time (London Stock Exchange Group, 2024). Moreover, ESGC incorporates a *controversies overlay*, i.e., it adjusts the underlying ESG performance assessment for material, publicly documented negative events, thereby capturing an additional "conduct" component beyond reported policies and disclosures (London Stock Exchange Group, 2024). In this sense, ESGC constitutes a comparatively *conservative* greenness proxy: firms are less likely to be ranked as highly sustainable when their public record indicates significant ESG-related incidents, which mitigates concerns that the selection criterion reflects disclosure intensity alone rather than economically relevant sustainability performance (London Stock Exchange Group, 2024). While ESGC is a useful broad proxy for firm-level sustainability, it may not capture pure sustainability alone. As discussed in Section 1.3, ESG ratings can partly reflect differences in disclosure intensity, data availability, and firm resources, which are often correlated with firm size. Larger and better-resourced firms may therefore obtain higher ESG scores not only because of stronger sustainability performance, but also because they report more extensively and more systematically. Accordingly, ESGC is interpreted in this thesis as a proxy for ESG-related firm characteristics as measured by Refinitiv, rather than as a perfectly clean measure of underlying sustainability.

Robustness / channel proxy: Environmental Pillar Score (E-Pillar). A robustness specification replaces ESGC with the *Environmental Pillar Score (E-Pillar)* while holding the portfolio design constant. This substitution serves two complementary purposes. First, it constitutes a *construct-robustness* check with respect to ESG measurement: it assesses whether the main inferences hinge on the broad composite definition (including the controversies adjustment) or persist when sustainability is operationalized through an alternative, narrower proxy that isolates the environmental dimension (London Stock Exchange Group, 2024). Second, it provides a *channel test*. When the hypothesized pricing mechanism is primarily related to climate and transition-risk considerations, an environmental-only measure is economically closer to the relevant latent construct ("environmental greenness") than an omnibus ESG composite in which S and G components may dilute or offset the environmental signal.

Government Effectiveness Government Effectiveness is a country-level governance indicator taken from the World Bank's Worldwide Governance Indicators (WGI). It summarises perceptions of the quality of public services, the professionalism and independence of the civil service, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Scores are standardised on a scale from approximately -2.5 (weak) to $+2.5$ (strong) (World Bank, n.d.).

In the context of this thesis, Government Effectiveness proxies the strength of the institutional framework within which ESG policies are designed, implemented and enforced.

Environmentally related tax revenue This variable measures revenues from environmentally related taxes as a share of GDP. The underlying data follow the OECD's Environmental Tax Revenue (ERTR) framework, which classifies taxes according to environmentally relevant tax bases such as energy, transport, pollution and resources (OECD, n.d.).

Higher values indicate a greater reliance on environment-related taxation and are interpreted as a proxy for the stringency and breadth of environmental policy. In this thesis, the variable is used to characterise the environmental policy stance of each country and to examine whether stronger environmental policy frameworks are associated with different ESG–risk relationships.

Share of institutional investors The Share of institutional investors is a country-level indicator constructed as the sum of financial assets held by insurance corporations and pension funds plus investment funds (money market and non-money-market funds), divided by national GDP. The numerator is based on official statistics on institutional investors' financial assets, such as those reported in the OECD Institutional Investors Statistics, which provide financial assets of investment funds and insurance corporations and pension funds as percentages of GDP (OECD, n.d.).

Using GDP as the denominator ensures comparability across countries, given that alternative measures (e.g. total traded financial assets) are not consistently available. This ratio captures the relative size and importance of the institutional investor sector in the domestic financial system. It is used in the thesis as a proxy for investor sophistication and the potential depth of ESG integration in local capital markets.

3.2.2 Event-study variables (policy and macro shocks)

To examine whether discrete macroeconomic and climate-policy milestones are relevant for the ESG repricing process, a baseline asset-pricing framework with event-study indicators are augmented. The event-study is implemented at monthly frequency and therefore captures abnormal behavior in the outcome variables (e.g., the country-level Green–Brown spread or the estimated prices of risk) during narrowly defined event months.

Let t denote a calendar month. For each event k in the set

$$\mathcal{K} = \{\text{Paris}, \text{SFAP}, \text{COVID}, \text{EGD}\},$$

A binary indicator is defined as

$$D_t^k = 1\{t \in \mathcal{W}_k\}, \tag{4}$$

where $\mathcal{W}_k$ is the event window for event k. Consistent with the monthly frequency of the panel, the baseline event windows are restricted to one (or at most two) months. Operationally, the event indicators are taken directly from the panel dataset and equal one in the pre-specified event month(s) and zero otherwise.

Paris Climate Agreement (COP21). The adoption of the Paris Agreement constitutes a global climate-policy milestone and a coordination signal regarding future decarbonization pathways. From an asset-pricing perspective, the event can shift investors' expectations about future climate policy stringency and transition risk, thereby affecting discount rates and/or the relative valuation of firms with different environmental profiles (green versus brown).

EU Sustainable Finance Action Plan. The EU Sustainable Finance Action Plan represents an institutional step toward integrating sustainability considerations into financial regulation and capital allocation. By promoting standardized sustainability disclosures and classification frameworks, the plan can reduce information frictions and increase the salience of sustainability characteristics for investors. This, in turn, may alter demand for sustainable assets and contribute to repricing dynamics.

COVID-19 shock (ESG resilience shock). The COVID-19 outbreak constitutes a large and abrupt global macroeconomic shock characterized by heightened uncertainty, liquidity stress, and risk aversion. Such an environment can change investors' relative preferences for perceived resilience and long-term risk mitigation, potentially benefiting firms with stronger sustainability profiles, while simultaneously increasing the importance of aggregate risk factors.

European Green Deal. The European Green Deal signals a comprehensive EU-level policy commitment to climate neutrality and an acceleration of the transition agenda. As such, it may alter expectations regarding transition pathways and regulatory risk for emission-intensive firms while improving perceived growth opportunities for environmentally aligned firms.

3.2.3 Dependent Variables

The dependent variable varies across the empirical specifications used in this thesis:

- **Firm-level excess returns.** In the time-series and cross-sectional asset-pricing regressions, the dependent variable is the firm-level excess return,

  $$r_{i,c,t}^{(w)},$$

  i.e., the return of firm i in country c in week t in excess of the risk-free rate.

- **Country-level ESG factor (green–brown spread).** When estimating or analyzing the performance of the ESG factor constructed within each country, the dependent variable is the country-level green-minus-brown return spread,

  $$ESG_{c,t}^{(w)}.$$

- **Price of ESG risk / ESG premium estimates.** In specifications that explain cross-country (or time-varying) differences in the ESG price of risk, the dependent variable is the estimated ESG price of risk, denoted by

  $$\hat{\lambda}_{ESG,c,t} \quad \text{or} \quad \lambda_{ESG,c},$$

3.2.4 Control Variables

To isolate the relationship between ESG beta and expected returns, all Fama–MacBeth regressions include a set of firm-level control variables. Incorporating these controls ensures that the estimated price of ESG risk is not confounded with known return predictors or structural firm characteristics.

(1) Firm Size (Market Value) The logarithm of market capitalisation captures firm size. This follows the classic evidence on the size premium (Banz, 1981; Fama & French, 1993), according to which small firms earn higher average returns than large firms. Because ESG scores often correlate with firm size—large, multinational companies tend to have more developed sustainability reporting—controlling for size prevents ESG-related return patterns from being mechanically driven by size effects. In addition, this control helps address a broader measurement issue inherent in ESG ratings: higher ESG scores may partly reflect greater disclosure intensity, more standardized reporting, and larger firm resources rather than pure sustainability performance alone. Including firm size in the cross-sectional regressions therefore helps reduce the risk that the estimated ESG pricing results merely proxy for a size- or disclosure-related effect.

(2) Leverage (Total Debt to Total Capital) The leverage ratio measures the degree of financial risk borne by a firm. Higher leverage is associated with greater distress risk and refinancing risk and is therefore priced in expected returns (Titman & Wessels, 1988).

(3) Market-to-Book Ratio The market-to-book ratio reflects valuation levels and captures the traditional value–growth dimension (Fama & French, 1992). Without this control, estimated ESG effects could simply reflect differences in fundamental valuation rather than the pricing of ESG-related risk itself.

4 Methodology

4.1 Notation and data structure

The dataset is a monthly firm-level panel with firms $i = 1, \ldots, N_c$ in countries $c = 1, \ldots, C$ observed over months $t = 1, \ldots, T$. All computations are performed at monthly frequency.

Returns. Let $R_{i,c,t}$ denote the *firm log return* in month t and $R^f_{c,t}$ the country-specific risk-free rate. *For notational simplicity, the qualifier "log" is omitted in the remainder of the thesis; all returns R refer to log returns unless stated otherwise.*) The firm excess return is

$$r_{i,c,t} \;=\; R_{i,c,t} - R^f_{c,t}. \tag{5}$$

Let $R^{mkt}_{c,t}$ denote the country market return. The market excess return is

$$MKTEX_{c,t} \;=\; R^{mkt}_{c,t} - R^f_{c,t}. \tag{6}$$

Firm controls. Let $X_{i,c,t}$ be the vector of lagged firm-level controls used in the pricing regressions:

$$X_{i,c,t-1} = \big(\text{Debt-to-capital}_{i,c,t-1},\ \text{LogMV}_{i,c,t-1},\ \text{M/B}_{i,c,t-1}\big).$$

Country-level moderators. Let $Z_{c,t}$ denote a generic country-level moderator (institutional or cultural) and $Z_{c,t-1}$ its one-month lag.

Data cleaning outliers. All firm excess returns, market excess returns, and firm-level controls used in regressions are winsorized at the 1% and 99% quantiles *within each country*. For any variable y in country c,

$$y^{(w)}_{i,c,t} = \min\{\max\{y_{i,c,t}, Q_c(0.01)\}, Q_c(0.99)\}.$$

Whenever country-level time series (e.g., factor series) are winsorized, this is done *within each country over time* (across t).

4.2 Constructing an ESG factor (Green–Brown spread)

To represent ESG as a traded-style factor, a Green–Brown excess return spread is constructed within each country-month.

Portfolio construction, look-ahead bias mitigation, and sector-bias control. The ESG factor is constructed in two steps. First, a country-specific fixed firm cohort is defined by selecting the 20 firms with the highest and the 20 firms with the lowest ESG Combined Score (ESGC) as of the end of the sample period (2023). This end-of-sample cohort definition yields a stable and comparable firm universe across countries and mitigates the strong coverage constraints that would arise from anchoring the universe in earlier years, when ESG reporting and data availability were substantially more limited. Moreover, focusing on end-of-sample tail firms is empirically motivated: ESG characteristics display non-trivial persistence, and tail membership in ESG rankings tends to be more stable than marginal rankings in the center of the distribution. Hence, firms that rank among the highest (lowest) ESGC in 2023 are plausibly high-(low-)ESG firms for substantial parts of the sample period, even though ESG status is not immutable and can change following strategic shifts, regulatory pressure, mergers, or major controversies (Benuzzi et al., 2025).

Second, within this fixed cohort, the year-t classification into the Green and Brown legs is based exclusively on lagged ESG information to mitigate look-ahead bias. Specifically, for each firm, the most recently available ESGC from calendar year t1 is used when forming the Green and Brown legs for year t. Hence, monthly returns in year t are never constructed using ESG information from the return-realization period itself, but only using information that would have been available to investors at the time of portfolio formation. The annual re-formation procedure further accommodates time variation in ESG status by allowing firms to transition between the Leader and Laggard portfolios over time.

The choice of selecting the top 20 and bottom 20 firms is motivated by comparability and sample viability across countries. Several smaller markets in the sample only marginally satisfy minimum coverage requirements; using fixed quantile cutoffs would therefore lead to very small group sizes (or even empty portfolios) in those countries and months. This would mechanically shift the analysis toward the largest equity markets, reduce the cross-country comparability of the factor construction, and introduce variation in portfolio breadth that is unrelated to ESG. A fixed-N approach ensures that each country contributes a leader and laggard portfolio of the same size, improving comparability of the constructed Green–Brown spread across countries and over time. At the same time, focusing on extreme portfolios increases the separation in the underlying ESG characteristic and reduces classification noise that is most severe around the center of the ESGC distribution.

As an additional robustness check, the factor is re-estimated for a subsample of larger equity markets using a broader fixed-N sort, selecting the top 70 and bottom 70 firms by the ESG signal. The larger portfolio breadth exploits deeper cross-sectional coverage in these markets, increases the number of firm-level observations entering each leg, and thereby improves the precision of the constructed Green–Brown return spread. This specification verifies that the main inferences are not driven by small-N sorting in thin markets, while retaining the fixed-N logic that preserves cross-country comparability within the large-market subsample.

To mitigate sector-driven composition effects, the selection procedure imposes a sector cap: no more than 30% of portfolio constituents may belong to the same sector. If adding a firm would breach the cap, that firm is skipped and the next firm in the ESGC ranking is considered until 20 constituents are selected. This constraint is methodologically motivated because ESG scoring frameworks commonly incorporate industry materiality and peer benchmarking, and ESG assessments often rely on industry-specific aggregation rules; absent sector controls, extreme ESG portfolios risk capturing sector bets rather than ESG differences. (Berg, Kölbel and Rigobon, 2022) Although the sector cap reduces the risk that the Green–Brown spread is mechanically driven by industry composition, the ESG sort may still capture non-ESG firm characteristics that are correlated with ESG ratings, particularly disclosure intensity, firm resources, and size. The Green–Brown factor constructed here should therefore be interpreted as a return spread based on Refinitiv-measured ESG-related firm characteristics rather than as a noise-free sustainability factor. The subsequent use of value weights and firm-level controls helps mitigate some of these concerns, but does not remove them completely. This caveat should be kept in mind when assigning an economic interpretation to the estimated ESG factor exposures.

Value-weighted portfolio returns using lagged market value. Let $MV_{i,c,t}$ denote firm market value in *levels*. To avoid simultaneity between returns and weights, lagged market value is used to construct portfolio weights:

$$w_{i,c,t-1} \;=\; \frac{MV_{i,c,t-1}}{\sum_{j \in \mathcal{S}_{c,t}} MV_{j,c,t-1}}, \qquad \mathcal{S}_{c,t} \in \{G_c, B_c\}, \tag{7}$$

where weights are computed from firms with non-missing $MV_{i,c,t-1}$ and positive market value.

The Green–Brown spread is intended to approximate a traded-style long–short factor within each country. Using value weights makes the factor more representative of the investable market opportunity set and reduces the influence of very small firms whose returns can be disproportionately volatile or affected by illiquidity. Moreover, using *lagged* market value in the weights mitigates simultaneity and mechanical correlation between the portfolio weights and the contemporaneous returns used to compute $ESG_{c,t}$.

The value-weighted Green and Brown excess returns are

$$R^G_{c,t} \;=\; \sum_{i\in G_c} w_{i,c,t-1}\, r^{(w)}_{i,c,t}, \qquad R^B_{c,t} \;=\; \sum_{i\in B_c} w_{i,c,t-1}\, r^{(w)}_{i,c,t}. \tag{8}$$

The country-level ESG factor (Green–Brown spread) is

$$ESG_{c,t} \;=\; R^G_{c,t} - R^B_{c,t}. \tag{9}$$

For stability, the time series $\{ESG_{c,t}\}_t$ is winsorized at the 1% and 99% quantiles *within each country* over time; the resulting series is denoted $ESG^{(w)}_{c,t}$.

4.3 Estimating systematic risk exposures (rolling betas)

This study implements a two-pass asset-pricing design. In the first pass, firm-level factor loadings are estimated in rolling time-series regressions; in the second pass, these exposures are priced in monthly cross-sectional regressions.

For each firm i in country c, time-varying factor loadings are estimated using a rolling window of length $W = 36$ months. For each month t, the following time-series regression is estimated over $\tau = t - W + 1, \ldots, t$:

$$r^{(w)}_{i,c,\tau} \;=\; \alpha_{i,c,t} + \beta^{MKT}_{i,c,t}\, MKTEX^{(w)}_{c,\tau} + \beta^{ESG}_{i,c,t}\, ESG^{(w)}_{c,\tau} + \epsilon_{i,c,\tau}. \tag{10}$$

To mitigate simultaneity in the pricing step, the cross-sectional tests use one-month lagged estimated betas:

$$\widehat{\beta}^{MKT}_{i,c,t-1},\; \widehat{\beta}^{ESG}_{i,c,t-1}. \tag{11}$$

4.4 Pricing factor exposures via Fama–MacBeth style cross-sectional regressions

To test whether systematic ESG risk is priced, monthly within-country cross-sectional regressions are estimated and the resulting time series of coefficients is aggregated (Fama–MacBeth style).

Predetermined factor exposures. Firm-level exposures to the local market and the country-specific ESG spread, $\widehat{\beta}^{MKT}_{i,c,t-1}$ and $\widehat{\beta}^{ESG}_{i,c,t-1}$, are obtained from the rolling-window time-series procedure described in Section 4.3 and are lagged by one month to mitigate look-ahead bias.

Country-level pricing (within-country Fama–MacBeth). For each country c, the monthly price of risk is estimated from the cross-section of firms:

$$r_{i,c,t} = \lambda_{0,c,t} + \lambda_{MKT,c,t}\, \widehat{\beta}^{MKT}_{i,c,t-1} + \lambda_{ESG,c,t}\, \widehat{\beta}^{ESG}_{i,c,t-1} + \epsilon_{i,c,t}. \tag{12}$$

Monthly estimation is conducted only if at least $N_{c,t} \geq N_{\min}$ firms are available in the cross-section.

Aggregation and inference. For each country c, the estimated coefficients $\{\lambda_{ESG,c,t}\}_t$ are averaged over time to obtain the country-specific ESG price of risk $\widehat{\lambda}_c^{ESG}$. Inference is based on the time-series variation of $\lambda_{ESG,c,t}$ using heteroskedasticity- and autocorrelation-consistent standard errors (Newey–West).

Time-series aggregation and inference. Let $\{\widehat{\lambda}_{k,c,t}\}_{t=1}^{T_c}$ denote the estimated monthly coefficient series for $k \in \{MKT, ESG\}$. The reported prices of risk are time-series means:

$$\overline{\lambda}_{k,c} \;=\; \frac{1}{T_c}\sum_{t=1}^{T_c}\widehat{\lambda}_{k,c,t}.$$

Statistical inference is based on Newey–West HAC standard errors applied to the coefficient time series $\{\widehat{\lambda}_{k,c,t}\}$ with lag length $L = 6$. The primary object used in subsequent steps is the estimated monthly ESG price of risk $\widehat{\lambda}_{ESG,c,t}$.

Event-study extension. To assess whether major policy and macro shocks coincide with temporary changes in ESG pricing, the event analysis is conducted in a second step using the estimated time series of ESG prices of risk from the Fama–MacBeth procedure. Specifically, after estimating the within-country monthly pricing regression and obtaining $\widehat{\lambda}_{c,t}^{ESG}$ for each country c and month t, the following regression is estimated:

$$\widehat{\lambda}_{c,t}^{ESG} = \alpha_c + \sum_{e=1}^{E}\gamma_e\, D_{e,t} + \varepsilon_{c,t}, \tag{13}$$

where $D_{e,t}$ is an event indicator equal to one in the event month(s) and zero otherwise for event $e \in \mathcal{E} = \{\text{Paris}, \text{SFAP}, \text{COVID}, \text{EGD}\}$. The country fixed effect α_c absorbs time-invariant differences in average ESG pricing across countries, while γ_e captures the average deviation in the ESG price of risk during event months.

4.5 Institutional and cultural moderation of ESG pricing

To test whether the pricing of ESG risk varies systematically with country conditions, the monthly global Fama–MacBeth cross-sectional regression is augmented with an interaction between the ESG beta and a lagged country-level moderator $Z_{c,t-1}$:

$$r_{i,c,t} = \lambda_{0,t}+\lambda_{MKT,t}\,\widehat{\beta}_{i,c,t-1}^{MKT}+\lambda_{ESG,t}\,\widehat{\beta}_{i,c,t-1}^{ESG}+\theta_t\big(\widehat{\beta}_{i,c,t-1}^{ESG}\cdot Z_{c,t-1}\big)+\delta_t^{\top}X_{i,c,t-1}+\sum_{c=1}^{C-1}\gamma_{c,t}\,D_{i,c}+\varepsilon_{i,c,t}. \tag{14}$$

$Z_{c,t-1}$ denotes a country-level moderator observed at the country-month frequency and lagged by one month to reduce simultaneity concerns. A positive θ_t implies that the ESG price of risk increases with the moderator. In particular, the conditional ESG risk price in month t equals $\lambda_{ESG,t} + \theta_t Z_{c,t-1}$.

5 Results

5.1 Alpha Results (Intercepts)

Table 1 presents country-specific time-series regressions of the monthly ESG Green–Brown spread on the respective local market excess return. In this specification, the intercept captures the average return of the Green–Brown strategy that is not explained by general market movements. Economically, the alpha can therefore be interpreted as the abnormal monthly performance of a long–short portfolio that buys relatively high-ESG firms and shorts relatively low-ESG firms within each national market. At the same time, this spread is based on the constructed ESG sort described above and should therefore be interpreted as a return differential linked to Refinitiv-measured ESG-related firm characteristics, rather than as a perfectly clean measure of pure sustainability.

Overall, the estimates provide only limited support for the existence of a broad and economically meaningful risk-adjusted ESG return premium across countries. In the majority of markets, the estimated alphas are statistically insignificant and economically small. In many cases, the intercept is close to zero, suggesting that the abnormal return generated by the Green–Brown strategy is too limited to support the claim that investors can systematically earn substantial excess returns from ESG-based sorting once domestic market exposure has been taken into account. This weak alpha evidence speaks against a simple and internationally pervasive green outperformance story.

Sweden constitutes the principal exception. Its estimated monthly alpha of 0.00435 implies an abnormal Green–Brown spread of approximately 0.44% per month, corresponding to about 5.35% on a compounded annual basis. This magnitude is economically meaningful and suggests that, in Sweden, high-ESG firms outperformed low-ESG firms even after controlling for market risk. The U.S. estimate is smaller at 0.00230, corresponding to roughly 0.23% per month or about 2.79% annualized, and is only marginally statistically significant. These exceptions indicate that abnormal ESG-related return differentials may arise in some local markets, but they do not overturn the broader pattern of weak and heterogeneous alpha estimates.

Importantly, the alpha results should be interpreted as only the first step of the overall argument. A statistically significant alpha indicates abnormal performance of the Green–Brown spread, but it does not by itself establish that ESG-related firm characteristics are systematically priced in the cross-section of expected returns. Moreover, any abnormal performance of the Green–Brown spread cannot automatically be attributed to ESG alone, since the firms in the two portfolio legs may also differ along other dimensions correlated with the sorting variable, such as size, disclosure intensity, leverage, or valuation characteristics. Alpha evidence therefor speaks to the performance of the spread portfolio, whereas the pricing question requires examining whether firms with different ESG-factor exposures earn systematically different expected returns. This distinction is crucial for the interpretation of the subsequent results.

The cross-country pattern is therefore informative in two ways. First, the absence of strong and consistent alphas in most countries weakens the case for a stable and uniform global ESG premium. Second, the fact that a few countries display economically larger intercepts suggests that ESG-related return differentials may emerge selectively in particular domestic environments. Whether these differences reflect genuine pricing of ESG-factor exposure, however, cannot be concluded from alpha results alone and is examined next through the estimated ESG betas and the Fama–MacBeth pricing tests.

Table 1: Alpha (Intercept) by Country

Country	$\hat{\alpha}$	**Std. Error**	**t-stat**	**p-value**	R^2
Australia	-0.000741	0.001879	-0.395	0.694	0.0134
Belgium	0.001266	0.001495	0.847	0.399	0.0663
Canada	0.000101	0.001834	0.055	0.956	0.0243
Chile	-0.000893	0.001196	-0.747	0.456	0.0217
Denmark	0.001733	0.011256	0.154	0.878	0.0478
Finland	0.000989	0.002111	0.468	0.640	0.0266
Germany	0.000906	0.001395	0.650	0.517	0.0239
Italy	0.001507	0.001753	0.860	0.392	0.1692
Japan	0.000765	0.001555	0.492	0.623	0.0688
Korea	0.002182	0.001717	1.271	0.206	0.0223
Netherlands	-0.000677	0.001220	-0.554	0.580	0.0228
Sweden	0.004352***	0.001312	3.316	0.001	0.1157
USA	0.002297*	0.001326	1.733	0.086	0.0704
United Kingdom	0.001893	0.001286	1.473	0.143	0.0248

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

5.2 Mean ESG and Market Betas

Table 2 reports the mean ESG and market betas across firms within each country. These estimates provide an initial indication of how the average firm in a national equity market is exposed to the two systematic return dimensions considered in this thesis: the country-specific Green–Brown factor and the domestic market portfolio. In this framework, the mean ESG beta captures the direction and magnitude of firms' average sensitivity to the constructed ESG factor, whereas the mean market beta summarizes their exposure to broad market-wide fluctuations. At the same time, the ESG beta should be interpreted as an exposure to the Refinitiv-based Green–Brown spread defined in Section 4.2, and thus as a sensitivity to ESG-related firm characteristics as captured by the underlying measure rather than to a fully purified notion of sustainability.

One notable feature of Table 2 is that the mean ESG beta is negative in almost all countries. This indicates that, in most markets, the representative stock tends to co-move inversely with the Green–Brown factor. Periods in which green firms outperform brown firms are therefore, on average, associated with relatively weaker returns for the typical stock in these national samples. The negative exposure is particularly pronounced in Chile ($\hat{\beta}^{ESG} = -0.539$), Sweden ($\hat{\beta}^{ESG} = -0.474$), and Australia ($\hat{\beta}^{ESG} = -0.442$), with sizeable negative coefficients also observed in Denmark ($\hat{\beta}^{ESG} = -0.409$), Germany ($\hat{\beta}^{ESG} = -0.391$), and Finland ($\hat{\beta}^{ESG} = -0.352$). In economic terms, coefficients of this magnitude imply that a one-percentage-point increase in the country-specific ESG factor is associated with a decline of roughly 0.4 to 0.5 percentage points in the return of the representative stock, relative to its baseline.

These estimates are informative with respect to cross-country differences in exposure, but they should not be interpreted too broadly. A negative mean ESG beta establishes systematic co-movement with the constructed factor, yet it does not by itself demonstrate that ESG-related characteristics are priced in expected returns. Nor does it imply that the factor isolates pure sustainability rather than a broader bundle of attributes that may still overlap with disclosure intensity, firm resources, or size. The results in this section therefore speak primarily to heterogeneity in ESG-related return sensitivities across countries, not yet to the existence of a priced ESG factor.

The Netherlands constitutes the sole case with a positive mean ESG beta ($\hat{\beta}^{ESG} = 0.197$), which makes it economically noteworthy. Unlike the predominantly negative-beta markets, the average Dutch stock tends to move in the same direction as the Green–Brown factor. One possible interpretation is that ESG-related characteristics are more broadly represented among listed firms in the Dutch market, or that market composition and investor demand generate a more general positive association between firm returns and the relative performance of green firms.

The mean market betas provide a useful benchmark for interpreting these ESG-related sensitivities. Several countries display average market betas close to or above unity, including the United Kingdom ($\hat{\beta}^{M} = 1.277$), Japan ($\hat{\beta}^{M} = 1.150$), Australia ($\hat{\beta}^{M} = 1.097$), Sweden ($\hat{\beta}^{M} = 1.074$), and Finland ($\hat{\beta}^{M} =$

1.029). In these markets, firm returns remain strongly tied to aggregate domestic equity conditions, suggesting that broad macro-financial shocks continue to dominate return variation. By contrast, the mean market beta is comparatively low in Chile ($\hat{\beta}^M = 0.145$) and the United States ($\hat{\beta}^M = 0.191$), indicating weaker average sensitivity of the sampled firms to domestic market-wide movements. This cross-country variation in market exposure is relevant because it shows that ESG-related sensitivities are observed against markedly different broader risk environments.

Table 2 therefore establishes an important intermediate result: firms differ materially in their exposure to the constructed ESG factor across countries. This heterogeneity is economically relevant, but it is not equivalent to evidence of pricing. The observed cross-country variation in ESG-factor exposure is, however, also informative for the broader interpretation of the results, since it suggests that the underlying ESG-related sensitivities are themselves not uniform across markets. In that sense, the exposure evidence is more naturally aligned with the possibility of differentiated country-level pricing patterns than with a fully uniform global pricing relation. The next section therefore turns to the central question of whether these ESG betas are actually associated with differences in expected returns in the Fama–MacBeth cross-sectional regressions.

Table 2: Mean ESG and Market Betas by Country

Country	β^{ESG}	β^{MKT}
Australia	-0.4417	1.0971
Belgium	-0.1746	0.5267
Canada	-0.2046	0.4070
Chile	-0.5393	0.1447
Denmark	-0.4085	0.6743
Finland	-0.3519	1.0291
Germany	-0.3907	0.9443
Italy	-0.1927	0.9639
Japan	-0.2052	1.1502
Korea	-0.2657	0.9195
Netherlands	0.1967	0.7854
Sweden	-0.4744	1.0738
USA	-0.1830	0.1911
United Kingdom	-0.3005	1.2774

5.3 Pricing of ESG Betas (Fama–MacBeth)

Table 3 reports the Fama–MacBeth estimates of the price of lagged ESG beta by country. This section represents the central pricing test of the thesis. Whereas Section 5.1 examined whether the Green–Brown spread itself generated abnormal returns and Section 5.2 documented cross-country heterogeneity in firms' exposures to the constructed ESG factor, the present analysis addresses the core asset-pricing question more directly: whether firms with different ESG-factor exposures earn systematically different expected returns in the cross-section.

From an economic perspective, the estimated coefficient on lagged ESG beta, $\hat{\lambda}^{ESG}$, captures whether exposure to the constructed country-specific Green–Brown factor is compensated in expected returns. A positive and statistically significant estimate indicates that firms with higher ESG-factor exposure earn higher subsequent returns, whereas a negative and statistically significant estimate indicates that such exposure is associated with lower expected returns. Importantly, the object being priced here is the ESG-related factor constructed from Refinitiv-based sorting rather than a fully noise-free measure of pure sustainability. The results should therefore be interpreted as evidence on the pricing of Refinitiv-measured ESG-related firm characteristics.

The baseline estimates provide only limited evidence that ESG exposure is priced in a meaningful and systematic way across countries. In most markets, the estimated coefficients are close to zero and statistically insignificant. This applies, for instance, to Australia ($\hat{\lambda}^{ESG} = -0.000075$), Belgium ($\hat{\lambda}^{ESG} = -0.001153$), Canada ($\hat{\lambda}^{ESG} = -0.000799$), Chile ($\hat{\lambda}^{ESG} = -0.000578$), Finland ($\hat{\lambda}^{ESG} = -0.001255$), Germany ($\hat{\lambda}^{ESG} = 0.000945$), Korea ($\hat{\lambda}^{ESG} = 0.001165$), the Netherlands ($\hat{\lambda}^{ESG} = 0.001749$), Sweden ($\hat{\lambda}^{ESG} = 0.001043$), the United Kingdom ($\hat{\lambda}^{ESG} = -0.001023$), and the United States ($\hat{\lambda}^{ESG} = -0.000902$). In substantive terms, these estimates are small. Even pronounced cross-sectional differences in ESG beta would therefore translate into only limited variation in expected monthly returns, which suggests that ESG exposure is neither systematically rewarded nor penalized to a notable extent in the average month.

Only Italy and Japan display weak baseline pricing signals, and even these results remain suggestive rather than conclusive. In Italy, the estimated ESG risk price amounts to $\hat{\lambda}^{ESG} = 0.003911$ per month and is marginally significant at the 10% level. Economically, this implies that a one-unit increase in ESG beta is associated with approximately 0.39 percentage points higher expected monthly return. In Japan, the estimated coefficient is $\hat{\lambda}^{ESG} = -0.002728$ per month and likewise only marginally significant, implying that a one-unit increase in ESG beta is associated with roughly 0.27 percentage points lower expected monthly return. These coefficients are not negligible in isolation, but the limited statistical precision and the opposing signs make it difficult to interpret them as evidence of a stable and internationally shared ESG price of risk.

This lack of cross-country consistency is central to the broader interpretation of the thesis. If ESG beta represented a common and persistently priced dimension of systematic risk, one would expect the estimated risk prices to exhibit greater uniformity in sign and a clearer pattern in magnitude across markets. Instead, the results are characterized by coefficients that are generally small, imprecisely estimated, and heterogeneous in direction. The pricing evidence is therefore more consistent with selective local pricing relations than with a broad, stable, and internationally integrated ESG premium.

Section 5.2 showed that firms differ materially in their co-movement with the constructed ESG factor across countries. Table 3 adds the crucial second step by examining whether these differences in ESG exposure are associated with differences in expected returns. The fact that this relation appears weak in most countries, yet somewhat more visible in a limited number of cases, suggests that ESG-related pricing is conditional rather than universal. This makes the event-time analysis in the next section particularly relevant, as it allows the price of ESG exposure to vary with periods of heightened policy salience and macro-financial stress.

Table 3: Fama–MacBeth Pricing of Lagged ESG Betas by Country

Country	$\hat{\lambda}^{ESG}$	**Std. Error**	**t-stat**	**p-value**	**95% CI (lo)**	**95% CI (hi)**
Australia	-0.000075	0.001911	-0.046	0.964	-0.003864	0.003713
Belgium	-0.001153	0.001823	-0.505	0.614	-0.004768	0.002461
Canada	-0.000799	0.002609	-0.258	0.797	-0.005971	0.004372
Chile	-0.000578	0.001267	-0.514	0.608	-0.003090	0.001934
Denmark	0.002217	0.005714	0.218	0.828	-0.009111	0.013545
Finland	-0.001255	0.002163	-0.467	0.642	-0.005544	0.003034
Germany	0.000945	0.001529	0.607	0.545	-0.002086	0.003975
Italy	0.003911*	0.002230	1.725	0.087	-0.000511	0.008332
Japan	-0.002728*	0.001672	-1.669	0.098	-0.006043	0.000588
Korea	0.001165	0.001792	0.735	0.464	-0.002387	0.004717
Netherlands	0.001749	0.002056	0.883	0.380	-0.002336	0.005834
Sweden	0.001043	0.002205	0.432	0.667	-0.003342	0.005429
United Kingdom	-0.001023	0.007245	-0.136	0.893	-0.016048	0.014001
USA	-0.000902	0.001735	-0.535	0.594	-0.004341	0.002538

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

5.4 Event-Time Variation in the Pricing of ESG Betas

Table 4 examines whether the cross-sectional price of ESG beta changes during major ESG-related, policy-related, and macro-financial event windows. In this specification, each event coefficient captures the incremental change in the monthly price of ESG exposure relative to non-event periods. The estimates are informative because they indicate whether the pricing of the constructed ESG factor becomes more pronounced when climate policy, sustainability regulation, or macro-financial stress is especially salient, rather than remaining constant over the full sample.

Across the full set of events, the evidence does not point to a uniform repricing pattern. Both the sign and the magnitude of the event-specific coefficients vary substantially across countries. This is important for the interpretation of the baseline results in Section 5.3. If ESG exposure were priced through a stable and internationally shared mechanism, one would expect event-related coefficient shifts to display greater consistency across markets. Instead, the results suggest a conditional pattern in which the price of ESG exposure changes only in selected country–event combinations.

The COP21 window provides some of the clearest evidence of event-driven repricing. Australia exhibits a strongly negative and statistically significant

Table 4: Pricing of Events on ESG Beta Results

Country	**Event**	**Estimate**	**Std. Error**	**t-stat**	**p-value**
Australia	Paris Climate Agreement (COP 21)	-0.0106***	0.0033	-3.190	0.0018
	Covid 19/ESG Resilienz Schoc	0.0045	0.0070	0.642	0.5217
Belgium	Paris Climate Agreement (COP 21)	0.0070*	0.0043	1.646	0.1021
	EU Sustainable FInance Action Plan	-0.0006	0.0034	-0.179	0.8581
	Covid 19/ESG Resilienz Schoc	-0.0025	0.0018	-1.402	0.1633
	European Green Deal	0.0094***	0.0010	9.249	0.0000
Canada	Paris Climate Agreement (COP 21)	0.0056	0.0108	0.516	0.6064
	Covid 19/ESG Resilienz Schoc	-0.0214*	0.0116	-1.849	0.0666
Chile	Paris Climate Agreement (COP 21)	-0.0125	0.0087	-1.435	0.1534
	Covid 19/ESG Resilienz Schoc	0.0009	0.0037	0.250	0.8028
Denmark	Paris Climate Agreement (COP 21)	0.0137*	0.0083	1.649	0.1013
	EU Sustainable FInance Action Plan	0.0174	0.0110	1.576	0.1171
	Covid 19/ESG Resilienz Schoc	-0.0234	0.0595	-0.393	0.6947
Finland	Paris Climate Agreement (COP 21)	0.0036	0.0047	0.771	0.4419
	EU Sustainable FInance Action Plan	-0.0132**	0.0052	-2.554	0.0117
	Covid 19/ESG Resilienz Schoc	0.0033	0.0054	0.597	0.5514
	European Green Deal	-0.0072***	0.0015	-4.908	0.0000
Germany	Paris Climate Agreement (COP 21)	0.0010	0.0082	0.125	0.9008
	EU Sustainable FInance Action Plan	0.0055	0.0110	0.501	0.6174
	Covid 19/ESG Resilienz Schoc	-0.0108	0.0072	-1.503	0.1352
	European Green Deal	-0.0166***	0.0014	-11.542	0.0000
Italy	Paris Climate Agreement (COP 21)	0.0098*	0.0053	1.863	0.0646
	EU Sustainable FInance Action Plan	0.0052	0.0117	0.446	0.6566
	Covid 19/ESG Resilienz Schoc	-0.0099	0.0072	-1.366	0.1741
	European Green Deal	-0.0184***	0.0015	-12.163	0.0000
Japan	Paris Climate Agreement (COP 21)	0.0053***	0.0018	2.900	0.0043
	Covid 19/ESG Resilienz Schoc	-0.0037	0.0043	-0.857	0.3930
Korea	Paris Climate Agreement (COP 21)	0.0033	0.0181	0.184	0.8542
	Covid 19/ESG Resilienz Schoc	-0.0157*	0.0087	-1.819	0.0711
Netherlands	Paris Climate Agreement (COP 21)	0.0131***	0.0025	5.240	0.0000
	EU Sustainable FInance Action Plan	-0.0031	0.0065	-0.472	0.6378
	Covid 19/ESG Resilienz Schoc	-0.0054	0.0056	-0.979	0.3291
	European Green Deal	-0.0257***	0.0021	-12.335	0.0000
Sweden	Paris Climate Agreement (COP 21)	0.0092	0.0070	1.306	0.1946
	EU Sustainable FInance Action Plan	0.0027	0.0097	0.281	0.7792
	Covid 19/ESG Resilienz Schoc	0.0010	0.0065	0.155	0.8770
	European Green Deal	-0.0046**	0.0020	-2.259	0.0260
United Kingdom	Covid 19/ESG Resilienz Schoc	0.0000	0.0084	0.001	0.9992
USA	Paris Climate Agreement (COP 21)	0.0105	0.0083	1.267	0.2073
	Covid 19/ESG Resilienz Schoc	-0.0037	0.0073	-0.507	0.6130

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Intercepts are omitted.

shift of $\hat{\gamma}^{ESG} = -0.0106$, implying that ESG exposure was priced less favorably during the Paris climate summit than in ordinary months. By contrast, Japan shows a positive and significant coefficient of $\hat{\gamma}^{ESG} = 0.0053$, while the Netherlands records an even larger positive effect of $\hat{\gamma}^{ESG} = 0.0131$. Italy also displays a positive coefficient of $\hat{\gamma}^{ESG} = 0.0098$, significant at the 10% level. These estimates indicate that the same globally salient climate-policy event did not induce one common repricing response. Rather, its effects appear to have been mediated by domestic market structure, investor expectations, and country-specific institutional conditions.

The EU Sustainable Finance Action Plan yields a more selective pattern. In some markets, the estimated coefficients suggest that the policy initiative coincided with a temporary strengthening of ESG-related pricing, whereas in others no statistically discernible shift is visible. This heterogeneity is economically meaningful. If sustainable-finance regulation triggered a common repricing of ESG exposure, one would expect more consistent coefficient changes across affected markets. The absence of such uniformity suggests that regulatory salience alone is not sufficient; its pricing relevance appears to depend on domestic implementation, investor uptake, and market structure.

The COVID-19 window also does not reveal a single common effect. Instead, the results are consistent with the view that macro-financial stress can alter the pricing of ESG exposure in some environments while leaving it largely unchanged in others. This interpretation is plausible in light of the broader characterization of COVID-19 as a resilience shock. If investors reassess the value of firm characteristics associated with stability, long-term orientation, or non-financial risk management during crisis periods, the pricing of ESG-related exposures may become temporarily more pronounced. At the same time, the lack of a common sign across countries indicates that such reassessments are conditional on local market composition and investor demand rather than reflecting a uniform global response.

A similarly differentiated picture emerges for the European Green Deal. Although the initiative represents a major climate-policy signal in the European context, its estimated effects are not sufficiently uniform to support the interpretation of a shared regional repricing mechanism. Instead, the results suggest that even within Europe, the impact of climate-policy commitments on the price of ESG exposure is filtered through country-specific institutional and market environments.

These event-time results help clarify the broader pattern of findings in the thesis. Section 5.3 showed that baseline pricing of ESG beta is generally weak and heterogeneous across countries. Table 4 indicates that this weak average evidence does not necessarily imply that ESG-related pricing effects are economically unimportant. Rather, such effects may emerge primarily in periods of heightened policy salience or macro-financial stress and may therefore be obscured in full-sample averages. At the same time, the absence of a common sign or magnitude across events and countries argues against the existence of a stable and internationally shared ESG premium. The event evidence is therefore more consistent with episodic, state-dependent, and locally mediated repricing than with a constant global ESG risk–return relation.

5.5 Moderator Regressions: Institutional Conditions and the ESG Price of Risk

Table 5 examines whether variation in the estimated ESG price of risk is systematically related to lagged country-level institutional and macroeconomic conditions. The moderator coefficients indicate whether ESG pricing becomes stronger or weaker as a given institutional characteristic changes. If these moderators exerted a stable and generalizable influence, one would expect a clearer and more consistent pattern across countries. Instead, the evidence remains selective and highly country-specific, with most estimates small in magnitude and statistically indistinguishable from zero. This weakens the case for a common cross-country mechanism through which institutional conditions systematically shape the ESG risk premium.

The most pronounced result concerns Government Effectiveness in the United Kingdom, where the coefficient is positive and highly significant ($\hat{\phi} = 0.0262$). This estimate is economically substantial and suggests that periods of stronger institutional capacity and greater policy credibility coincide with more positive pricing of ESG exposure in the UK. In this respect, the United Kingdom constitutes the clearest case in which the institutional environment appears to strengthen the financial relevance of ESG-related risk. At the same time, the absence of similarly robust estimates in most other countries indicates that this channel is not broadly replicated across the sample.

For Institutional Ownership, the results point to notable but conflicting associations across markets. Canada exhibits a positive and highly significant coefficient ($\hat{\phi} = 0.0538$), whereas Denmark shows a large negative coefficient ($\hat{\phi} = -0.2861$). The Netherlands also records a positive but only marginally significant estimate ($\hat{\phi} = 0.0996$). These magnitudes are economically non-trivial. They imply that the relationship between institutional investor presence and ESG pricing differs substantially across countries: in some markets, greater institutional ownership is associated with a more positive ESG risk premium, whereas in others it coincides with a markedly weaker one. This reversal in sign is particularly informative, as it suggests that institutional investors do not operate as a uniform transmission channel for ESG pricing. Rather, their role appears to depend on country-specific investor composition, stewardship practices, and market structure.

The Consumer Confidence results display a similarly mixed pattern. Denmark ($\hat{\phi} = -0.0116$) and Sweden ($\hat{\phi} = -0.0016$) show negative and statistically significant relationships, while Finland ($\hat{\phi} = 0.0024$) and Korea ($\hat{\phi} = 0.0030$) exhibit positive and significant coefficients. Chile shows a marginally significant positive estimate ($\hat{\phi} = 0.0008$). These results suggest that changes in macroeconomic sentiment can coincide with shifts in ESG pricing, but not in a consistent direction. In some countries, stronger confidence appears to be associated with more favorable pricing of ESG exposure; in others, it coincides with weaker ESG pricing. The pattern therefore points to local market environments rather than to a common international sentiment channel.

For Environmentally Related Tax Revenue, the only clearly robust result appears in Finland, where the coefficient is positive and highly significant ($\hat{\phi} = 0.0257$). This suggests that a stronger environmental tax framework coincides with a more positive ESG price of risk in that market, which is consistent with the view that fiscal policy signals can reinforce the valuation relevance of ESG exposure when they are credible and salient. In most other countries, however, the estimates remain statistically uninformative, indicating that this channel does not generalize across the broader sample.

A central feature of Table 5 is therefore not only the limited number of statistically significant coefficients, but also the absence of directional consistency across countries. Positive effects in one market are frequently offset by negative effects elsewhere, even for the same moderator. This makes it difficult to interpret institutional quality, investor structure, or macroeconomic sentiment as operating through a single common mechanism. A more plausible reading is that institutional conditions shape ESG pricing only when filtered through country-specific market structures, regulatory environments, and investor clienteles.

Table 5: Environmental-Pillar Score: Institutional Moderators Results

Country	Moderator	$\hat{\theta}$	Std. Error	t-stat	p-value
Australia	Government Effectiveness	-0.0545	0.0415	-1.313	0.1919
	Institutional Ownership	-0.0195	0.0179	-1.095	0.2761
	Consumer Confidence	-0.0002	0.0020	-0.103	0.9185
	Environmental Tax Revenue	-0.0000	0.0022	-0.014	0.9885
Belgium	Government Effectiveness	0.0114	0.0127	0.900	0.3700
	Institutional Ownership	-0.1552*	0.0863	-1.800	0.0747
	Consumer Confidence	-0.0020	0.0014	-1.388	0.1682
	Environmental Tax Revenue	-0.0095	0.0063	-1.502	0.1360
Canada	Government Effectiveness	-0.0215	0.0359	-0.599	0.5507
	Institutional Ownership	0.0538***	0.0162	3.311	0.0013
	Consumer Confidence	–	–	–	–
	Environmental Tax Revenue	–	–	–	–
Chile	Government Effectiveness	-0.0030	0.0071	-0.426	0.6708
	Institutional Ownership	-0.0386	0.0924	-0.418	0.6767
	Consumer Confidence	0.0008*	0.0005	1.874	0.0637
	Environmental Tax Revenue	0.1170	0.0973	1.202	0.2319
Denmark	Government Effectiveness	-0.0528	0.0771	-0.685	0.4947
	Institutional Ownership	-0.2861***	0.0899	-3.182	0.0019
	Consumer Confidence	-0.0116***	0.0043	-2.697	0.0081
	Environmental Tax Revenue	-0.0070	0.0084	-0.840	0.4029
Finland	Government Effectiveness	-0.0093	0.0121	-0.769	0.4434
	Institutional Ownership	-0.0893	0.0659	-1.356	0.1781
	Consumer Confidence	0.0024***	0.0008	3.028	0.0031
	Environmental Tax Revenue	0.0257***	0.0077	3.350	0.0011
Germany	Government Effectiveness	0.0001	0.0699	0.001	0.9993
	Institutional Ownership	0.0204	0.0345	0.591	0.5558
	Consumer Confidence	-0.0001	0.0013	-0.053	0.9581
	Environmental Tax Revenue	0.0011	0.0190	0.060	0.9525
Italy	Government Effectiveness	0.0147	0.0262	0.561	0.5760
	Institutional Ownership	0.0015	0.0015	0.982	0.3284
	Consumer Confidence	-0.0303	0.2242	-0.135	0.8927
	Environmental Tax Revenue	-0.0033	0.0055	-0.604	0.5470
Japan	Government Effectiveness	0.0044	0.0114	0.387	0.6995
	Institutional Ownership	0.0265	0.0305	0.868	0.3875
	Consumer Confidence	-0.0018	0.0013	-1.312	0.1924
	Environmental Tax Revenue	-0.0232	0.0288	-0.807	0.4214
Korea	Government Effectiveness	0.0030	0.0088	0.339	0.7352
	Institutional Ownership	0.0238	0.0715	0.333	0.7402
	Consumer Confidence	0.0030**	0.0013	2.233	0.0276
	Environmental Tax Revenue	0.0013	0.0049	0.275	0.7841
Netherlands	Government Effectiveness	0.0109	0.0289	0.377	0.7069
	Institutional Ownership	0.0996*	0.0547	1.821	0.0721
	Consumer Confidence	-0.0006	0.0013	-0.506	0.6143
	Environmental Tax Revenue	-0.0001	0.0049	-0.021	0.9834
Sweden	Government Effectiveness	-0.0440	0.0314	-1.402	0.1647
	Institutional Ownership	0.0257	0.0185	1.392	0.1676
	Consumer Confidence	-0.0016**	0.0008	-2.131	0.0361
	Environmental Tax Revenue	-0.0116	0.0099	-1.173	0.2441
United Kingdom	Government Effectiveness	0.0262***	0.0091	2.866	0.0050
	Institutional Ownership	0.0257	0.0346	0.743	0.4589
	Consumer Confidence	0.0001	0.0010	0.103	0.9185
	Environmental Tax Revenue	0.0070	0.0120	0.587	0.5582
USA	Government Effectiveness	–	–	–	–
	Institutional Ownership	-0.0141	0.0137	-1.030	0.3056
	Consumer Confidence	0.0014	0.0011	1.260	0.2104
	Environmental Tax Revenue	–	–	–	–

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

6 Robustness Analysis

The robustness analysis evaluates whether the main conclusions are sensitive to two design changes. The first expands the firm universe by constructing Green–Brown portfolios and pricing cross-sections using a 70×70 grid instead of 20×20. The second replaces the ESG Combined Score with the Environmental Pillar (E-Pillar) score while keeping the 20×20 design. The key questions are whether these changes alter the evidence on a persistent ESG price of risk, the extent of event dependence, and the role of institutional moderators. In line with the baseline focus of this thesis, the discussion below concentrates on the pricing of the sustainability beta and its event-time shifts (market-beta results are not reported here).

6.1 Summary of robustness results

Persistent pricing of ESG exposure. Neither robustness design delivers broad evidence of a stable and pervasive price of ESG exposure. Under the 70×70 specification, the lagged ESG-beta price remains statistically indistinguishable from zero in most countries, with statistically reliable positive pricing appearing only in Italy and Korea at conventional levels. Under the Environmental Pillar specification, the set of significant countries changes: Chile and the United Kingdom exhibit positive and statistically significant E-beta prices, while Korea shows a marginally significant negative E-beta price. These shifts in where significance appears and, in some cases, in the sign of the estimate, are consistent with the baseline interpretation that a constant linear sustainability risk premium is not a uniform feature across markets.

Table 6: Environmental-Pillar Score: Pricing of ESG Beta Results

Country	$\hat{\lambda}^{ESG}$	Std. Error	t-stat	p-value	95% CI (lo)	95% CI (hi)
Australia	0.002516	0.001710	1.192	0.2352	-0.000864	0.005895
Belgium	-0.000262	0.001042	-0.236	0.8139	-0.002322	0.001798
Canada	-0.000709	0.001922	-0.340	0.7341	-0.004509	0.003091
Chile	0.001925**	0.000915	2.559	0.0115	0.000117	0.003733
Denmark	0.001834	0.003554	0.529	0.5976	-0.005192	0.008860
Finland	0.001409	0.001148	1.143	0.2548	-0.000861	0.003679
Germany	0.001825	0.001407	1.009	0.3148	-0.000957	0.004606
Italy	0.000203	0.001254	0.152	0.8797	-0.002276	0.002681
Japan	-0.001783	0.001456	-1.251	0.2128	-0.004661	0.001096
Korea	-0.003159*	0.001571	-1.682	0.0948	-0.006265	-0.000053
Netherlands	0.001701	0.001351	1.204	0.2304	-0.000970	0.004372
Sweden	0.003130	0.001831	1.215	0.2263	-0.000490	0.006750
United Kingdom	0.003649**	0.001459	2.580	0.0109	0.000764	0.006534
USA	0.001197	0.002229	0.564	0.5733	-0.003209	0.005604

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Confidence intervals are 95%.

Table 7: 70x70 Portfolio: Pricing of ESG Beta Results

Country	$\hat{\lambda}^{ESG}$	Std. Error	t-stat	p-value	95% CI (lo)	95% CI (hi)
Australia	0.000618	0.001308	0.434	0.6655	-0.001975	0.003211
Canada	0.003032	0.001762	1.309	0.1934	-0.000461	0.006525
Germany	0.001331	0.000981	1.307	0.1939	-0.000614	0.003276
Italy	0.001711**	0.001119	2.191	0.0306	-0.000507	0.003929
Japan	-0.001077	0.000926	-1.335	0.1848	-0.002912	0.000758
Korea	0.002433**	0.001440	2.209	0.0293	-0.000421	0.005287
Sweden	-0.001019	0.000989	-0.884	0.3788	-0.002979	0.000941
United Kingdom	-0.000558	0.002087	-0.296	0.7681	-0.004695	0.003579
USA	-0.002255	0.001611	-1.592	0.1142	-0.005448	0.000938

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$. Confidence intervals are 95%.

Event dependence. Both robustness continues to show that sustainability-beta pricing can move sharply during discrete event windows and that these movements are strongly country-specific. Under the 70×70 design, COP21 coincides with a large positive shift in Korea and a statistically significant negative shift in the United Kingdom. European policy windows remain salient in some cases: Germany exhibits a significant negative change during the European Green Deal window, while Sweden shows statistically significant shifts around EU policy windows, including a positive effect around the EU Sustainable Finance Action Plan and a negative shift around the Green Deal. The COVID-19 window is associated with a significant positive shift in the United States in this robustness setting. Under the Environmental Pillar design, European Green Deal effects are pronounced in several markets, with Belgium showing a large positive shift while Italy and the Netherlands show large negative shifts, and Sweden displaying a significant positive shift as well. COP21 is associated with a strong negative shift in Sweden and a negative shift in the United Kingdom. COVID-19 coincides with significant negative shifts in Finland and Korea. Across both designs, the event evidence reinforces that sustainability-related pricing dynamics are episodic and concentrated in particular windows, while the direction of repricing differs across countries.

Moderators. Table 10 shows that the moderator evidence remains selective and does not overturn the main robustness conclusion of weak average ESG-beta pricing. Across most countries and moderators, slope estimates are economically small and statistically insignificant, indicating limited support for a stable, broadly uniform link between institutional and macroeconomic conditions and the estimated ESG risk premium.

Where significant patterns emerge, they are strongly country-specific. The clearest institutional result is for the United Kingdom, where *Government Effectiveness* is positively and statistically significant ($\hat{\theta} = 0.0262^{***}$), suggesting that ESG pricing becomes more positive when institutional capacity and policy

Table 8: Environmental-Pillar Score: Pricing of Events on ESG Beta Results

Country	**Event**	**Estimate**	**Std. Error**	**t-stat**	**p-value**
Australia	Paris Climate Agreement (COP 21)	-0.0033	0.0107	-0.308	0.7584
	COVID-19 / ESG Resilience Shock	0.0006	0.0062	0.095	0.9242
Belgium	Paris Climate Agreement (COP 21)	-0.0003	0.0031	-0.101	0.9193
	EU Sustainable Finance Action Plan	0.0005	0.0043	0.124	0.9016
	COVID-19 / ESG Resilience Shock	0.0057	0.0041	1.373	0.1719
	European Green Deal	0.0070***	0.0012	5.983	0.0000
Canada	Paris Climate Agreement (COP 21)	0.0023	0.0045	0.518	0.6054
	COVID-19 / ESG Resilience Shock	-0.0041	0.0072	-0.578	0.5643
Chile	Paris Climate Agreement (COP 21)	-0.0041	0.0066	-0.614	0.5400
	COVID-19 / ESG Resilience Shock	-0.0018	0.0035	-0.531	0.5961
Denmark	Paris Climate Agreement (COP 21)	-0.0032	0.0286	-0.112	0.9106
	EU Sustainable Finance Action Plan	0.0034	0.0177	0.190	0.8496
	COVID-19 / ESG Resilience Shock	0.0636	0.0672	0.947	0.3451
Finland	Paris Climate Agreement (COP 21)	0.0050*	0.0030	1.682	0.0949
	EU Sustainable Finance Action Plan	0.0015	0.0040	0.384	0.7018
	COVID-19 / ESG Resilience Shock	-0.0049**	0.0021	-2.377	0.0188
	European Green Deal	0.0003	0.0014	0.237	0.8128
Germany	Paris Climate Agreement (COP 21)	-0.0041	0.0059	-0.707	0.4810
	EU Sustainable Finance Action Plan	-0.0004	0.0069	-0.062	0.9506
	COVID-19 / ESG Resilience Shock	-0.0043	0.0081	-0.530	0.5971
	European Green Deal	0.0013	0.0019	0.690	0.4915
Italy	Paris Climate Agreement (COP 21)	0.0022	0.0043	0.516	0.6066
	EU Sustainable Finance Action Plan	0.0048	0.0087	0.557	0.5787
	COVID-19 / ESG Resilience Shock	-0.0047	0.0066	-0.718	0.4742
	European Green Deal	-0.0127***	0.0014	-8.838	0.0000
Japan	Paris Climate Agreement (COP 21)	0.0020	0.0078	0.253	0.8004
	COVID-19 / ESG Resilience Shock	-0.0016	0.0055	-0.289	0.7729
Korea	Paris Climate Agreement (COP 21)	-0.0006	0.0127	-0.051	0.9596
	COVID-19 / ESG Resilience Shock	-0.0168***	0.0052	-3.223	0.0016
Netherlands	Paris Climate Agreement (COP 21)	0.0112*	0.0065	1.724	0.0869
	EU Sustainable Finance Action Plan	0.0024	0.0098	0.250	0.8030
	COVID-19 / ESG Resilience Shock	-0.0096	0.0082	-1.175	0.2422
	European Green Deal	-0.0127***	0.0014	-8.847	0.0000
Sweden	Paris Climate Agreement (COP 21)	-0.0210***	0.0062	-3.393	0.0009
	EU Sustainable Finance Action Plan	-0.0018	0.0078	-0.231	0.8173
	COVID-19 / ESG Resilience Shock	-0.0061	0.0084	-0.724	0.4703
	European Green Deal	0.0116***	0.0027	4.268	0.0000
United Kingdom	Paris Climate Agreement (COP 21)	-0.0055**	0.0022	-2.528	0.0126
	COVID-19 / ESG Resilience Shock	-0.0143	0.0117	-1.219	0.2250
USA	Paris Climate Agreement (COP 21)	0.0097	0.0091	1.075	0.2843
	COVID-19 / ESG Resilience Shock	-0.0081	0.0077	-1.044	0.2982

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 9: Event Effects on ESG Beta by Country

Country	Event	Estimate	Std. Error	t-stat	p-value
Australia	Paris Climate Agreement (COP 21)	-0.000612	0.006314	-0.097	0.9229
	Covid 19/ESG Resilience Shock	-0.001178	0.002646	-0.445	0.6571
Canada	Paris Climate Agreement (COP 21)	-0.000593	0.005543	-0.107	0.9151
	Covid 19/ESG Resilience Shock	0.001435	0.008097	0.177	0.8596
Germany	Paris Climate Agreement (COP 21)	-0.004769	0.005023	-0.949	0.3446
	EU Sustainable Finance Action Plan	-0.006054	0.007327	-0.826	0.4106
	Covid 19/ESG Resilience Shock	0.003508	0.005492	0.639	0.5244
	European Green Deal	-0.003557***	0.001070	-3.325	0.0012
Italy	Paris Climate Agreement (COP 21)	-0.001241	0.004019	-0.309	0.7582
	EU Sustainable Finance Action Plan	0.005656	0.013441	0.421	0.6748
	Covid 19/ESG Resilience Shock	-0.001626	0.004286	-0.379	0.7051
	European Green Deal	-0.000811	0.000925	-0.876	0.3829
Japan	Paris Climate Agreement (COP 21)	0.002306	0.002794	0.825	0.4111
	Covid 19/ESG Resilience Shock	0.004479	0.006077	0.737	0.4627
Korea	Paris Climate Agreement (COP 21)	0.017067***	0.002588	6.594	0.0000
	Covid 19/ESG Resilience Shock	-0.003746	0.006722	-0.557	0.5785
Sweden	Paris Climate Agreement (COP 21)	-0.001345	0.003135	-0.429	0.6689
	EU Sustainable Finance Action Plan	0.008326***	0.002242	3.714	0.0003
	Covid 19/ESG Resilience Shock	-0.008539*	0.004448	-1.920	0.0576
	European Green Deal	-0.003207**	0.001329	-2.413	0.0176
United Kingdom	Paris Climate Agreement (COP 21)	-0.007577**	0.003633	-2.086	0.0394
	Covid 19/ESG Resilience Shock	0.000071	0.007277	0.010	0.9923
USA	Paris Climate Agreement (COP 21)	0.004469	0.003210	1.392	0.1669
	Covid 19/ESG Resilience Shock	0.015740***	0.004786	3.289	0.0014

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

credibility are stronger. *Institutional Ownership* shows significant associations in opposite directions. Canada exhibits a positive effect ($\hat{\theta} = 0.0538^{***}$), while Denmark displays a large negative effect ($\hat{\theta} = -0.2861^{***}$). Belgium also shows a negative and marginally significant effect for *Institutional Ownership*, with $\hat{\theta} = -0.1552^{*}$ (0.0747). This sign reversal implies that institutional ownership is not a uniform amplifier of ESG pricing and likely interacts with local investor structure and micro-institutions. For *Consumer Confidence*, significant effects also have mixed signs. Denmark ($\hat{\theta} = -0.0116^{***}$) and Sweden ($\hat{\theta} = -0.0016^{**}$) are negative, whereas Finland ($\hat{\theta} = 0.0024^{***}$) and Korea ($\hat{\theta} = 0.0030^{**}$) are positive. Chile also shows a marginally significant effect, with $\hat{\theta} = 0.0008^{*}$ (0.0637). Finally, *Environmental Tax Revenue* shows robust evidence only in Finland ($\hat{\theta} = 0.0257^{***}$), while estimates elsewhere remain uninformative. Some entries are unavailable because of insufficient time-series coverage and are treated as missing.

In Table 11 (70×70 score, Fama–MacBeth pricing of lagged ESG beta by moderator), statistically significant moderator effects are even more limited. *Institutional Ownership* is negative and significant for Germany ($\hat{\theta} = -0.0440^{**}$). For Korea, *Institutional Ownership* is positive at the 10% level ($\hat{\theta} = 0.0597^{*}$) and *Environmental Tax Revenue* is negative at the 10% level ($\hat{\theta} = -0.0024^{*}$). All other coefficients remain insignificant.

Table 10: Environmental-Pillar Score: Institutional Moderators Results

Country	**Moderator**	$\hat{\theta}$	**Std. Error**	**t-stat**	**p-value**
Australia	Government Effectiveness	-0.0545	0.0415	-1.313	0.1919
	Institutional Ownership	-0.0195	0.0179	-1.095	0.2761
	Consumer Confidence	-0.0002	0.0020	-0.103	0.9185
	Environmental Tax Revenue	-0.0000	0.0022	-0.014	0.9885
Belgium	Government Effectiveness	0.0114	0.0127	0.900	0.3700
	Institutional Ownership	-0.1552*	0.0863	-1.800	0.0747
	Consumer Confidence	-0.0020	0.0014	-1.388	0.1682
	Environmental Tax Revenue	-0.0095	0.0063	-1.502	0.1360
Canada	Government Effectiveness	-0.0215	0.0359	-0.599	0.5507
	Institutional Ownership	0.0538***	0.0162	3.311	0.0013
	Consumer Confidence	–	–	–	–
	Environmental Tax Revenue	–	–	–	–
Chile	Government Effectiveness	-0.0030	0.0071	-0.426	0.6708
	Institutional Ownership	-0.0386	0.0924	-0.418	0.6767
	Consumer Confidence	0.0008*	0.0005	1.874	0.0637
	Environmental Tax Revenue	0.1170	0.0973	1.202	0.2319
Denmark	Government Effectiveness	-0.0528	0.0771	-0.685	0.4947
	Institutional Ownership	-0.2861***	0.0899	-3.182	0.0019
	Consumer Confidence	-0.0116***	0.0043	-2.697	0.0081
	Environmental Tax Revenue	-0.0070	0.0084	-0.840	0.4029
Finland	Government Effectiveness	-0.0093	0.0121	-0.769	0.4434
	Institutional Ownership	-0.0893	0.0659	-1.356	0.1781
	Consumer Confidence	0.0024***	0.0008	3.028	0.0031
	Environmental Tax Revenue	0.0257***	0.0077	3.350	0.0011
Germany	Government Effectiveness	0.0001	0.0699	0.001	0.9993
	Institutional Ownership	0.0204	0.0345	0.591	0.5558
	Consumer Confidence	-0.0001	0.0013	-0.053	0.9581
	Environmental Tax Revenue	0.0011	0.0190	0.060	0.9525
Italy	Government Effectiveness	0.0147	0.0262	0.561	0.5760
	Institutional Ownership	0.0015	0.0015	0.982	0.3284
	Consumer Confidence	-0.0303	0.2242	-0.135	0.8927
	Environmental Tax Revenue	-0.0033	0.0055	-0.604	0.5470
Japan	Government Effectiveness	0.0044	0.0114	0.387	0.6995
	Institutional Ownership	0.0265	0.0305	0.868	0.3875
	Consumer Confidence	-0.0018	0.0013	-1.312	0.1924
	Environmental Tax Revenue	-0.0232	0.0288	-0.807	0.4214
Korea	Government Effectiveness	0.0030	0.0088	0.339	0.7352
	Institutional Ownership	0.0238	0.0715	0.333	0.7402
	Consumer Confidence	0.0030**	0.0013	2.233	0.0276
	Environmental Tax Revenue	0.0013	0.0049	0.275	0.7841
Netherlands	Government Effectiveness	0.0109	0.0289	0.377	0.7069
	Institutional Ownership	0.0996*	0.0547	1.821	0.0721
	Consumer Confidence	-0.0006	0.0013	-0.506	0.6143
	Environmental Tax Revenue	-0.0001	0.0049	-0.021	0.9834
Sweden	Government Effectiveness	-0.0440	0.0314	-1.402	0.1647
	Institutional Ownership	0.0257	0.0185	1.392	0.1676
	Consumer Confidence	-0.0016**	0.0008	-2.131	0.0361
	Environmental Tax Revenue	-0.0116	0.0099	-1.173	0.2441
United Kingdom	Government Effectiveness	0.0262***	0.0091	2.866	0.0050
	Institutional Ownership	0.0257	0.0346	0.743	0.4589
	Consumer Confidence	0.0001	0.0010	0.103	0.9185
	Environmental Tax Revenue	0.0070	0.0120	0.587	0.5582
USA	Government Effectiveness	–	–	–	–
	Institutional Ownership	-0.0141	0.0137	-1.030	0.3056
	Consumer Confidence	0.0014	0.0011	1.260	0.2104
	Environmental Tax Revenue	–	–	–	–

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 11: 70x70 Portfolio: Institutional Moderators Results

Country	**Moderator**	$\hat{\theta}$	**Std. Error**	**t-stat**	**p-value**
Australia	Government Effectiveness	-0.0360	0.0246	-1.463	0.1463
	Institutional Ownership	0.0150	0.0312	0.480	0.6321
	Consumer Confidence	0.0001	0.0020	0.057	0.9546
	Environmental Tax Revenue	-0.0030	0.0021	-1.394	0.1660
Canada	Government Effectiveness	-0.0150	0.0161	-0.933	0.3530
	Institutional Ownership	0.0118	0.0115	1.027	0.3066
	Consumer Confidence	–	–	–	–
	Environmental Tax Revenue	–	–	–	–
Germany	Government Effectiveness	0.0258	0.0373	0.691	0.4908
	Institutional Ownership	-0.0440**	0.0195	-2.256	0.0259
	Consumer Confidence	0.0008	0.0007	1.009	0.3150
	Environmental Tax Revenue	0.0118	0.0089	1.329	0.1863
Italy	Government Effectiveness	-0.0004	0.0126	-0.031	0.9751
	Institutional Ownership	-0.0004	0.0005	-0.806	0.4219
	Consumer Confidence	0.0068	0.0748	0.091	0.9277
	Environmental Tax Revenue	-0.0032	0.0023	-1.374	0.1721
Japan	Government Effectiveness	-0.0101	0.0080	-1.265	0.2085
	Institutional Ownership	0.0137	0.0144	0.946	0.3462
	Consumer Confidence	0.0007	0.0016	0.445	0.6575
	Environmental Tax Revenue	0.0019	0.0165	0.117	0.9074
Korea	Government Effectiveness	0.0068	0.0053	1.287	0.2007
	Institutional Ownership	0.0597*	0.0358	1.667	0.0983
	Consumer Confidence	-0.0001	0.0009	-0.157	0.8752
	Environmental Tax Revenue	-0.0024*	0.0013	-1.907	0.0589
Sweden	Government Effectiveness	0.0147	0.0106	1.384	0.1691
	Institutional Ownership	0.0056	0.0052	1.082	0.2814
	Consumer Confidence	-0.0007	0.0005	-1.231	0.2208
	Environmental Tax Revenue	-0.0083	0.0055	-1.510	0.1338
USA	Government Effectiveness	–	–	–	–
	Institutional Ownership	0.0003	0.0083	0.037	0.9703
	Consumer Confidence	0.0008	0.0007	1.124	0.2632
	Environmental Tax Revenue	–	–	–	–
United Kingdom	Government Effectiveness	0.0016	0.0104	0.150	0.8809
	Institutional Ownership	-0.0228	0.0413	-0.551	0.5826
	Consumer Confidence	0.0002	0.0007	0.243	0.8085
	Environmental Tax Revenue	0.0121	0.0106	1.139	0.2572

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

6.2 Robustness takeaway

Across both robustness exercises, the qualitative conclusions remain stable. Evidence for a broad and persistent sustainability price of risk is limited. Event windows continue to coincide with statistically significant repricing in subsets of countries, with strong cross-country heterogeneity in sign and magnitude. Overall, the robustness checks support an interpretation in which sustainability-related premia are more consistent with localized and event-driven repricing than with a stable and globally uniform ESG risk–return relationship.

7 Key Findings

The empirical findings provide only limited support for the view that ESG exposure, as proxied by the constructed Refinitiv-based ESG factor, is priced in a broad, stable, and internationally consistent manner in average stock returns. In the baseline Fama–MacBeth regressions, the estimated price of lagged ESG beta is generally small in magnitude and statistically indistinguishable from zero. Although isolated borderline estimates arise in individual countries, these do not form a coherent pattern in either sign or economic magnitude. The baseline evidence therefore does not support the interpretation of ESG exposure as a uniformly priced return factor across the sampled equity markets.

The alpha results point in a similar direction. Once local market exposure is taken into account, the Green–Brown return spread is statistically insignificant in most countries and the estimated intercepts are generally modest in size. Sweden constitutes the clearest exception, while the evidence for the United States remains comparatively weak. In this respect, ESG-based sorting does not appear to generate a broad and persistent abnormal return pattern across markets.

At the same time, the results do not imply that ESG-related pricing effects are absent altogether. The event-time analysis shows that the price of ESG beta can shift meaningfully during periods of heightened policy salience and macro-financial stress. Significant changes are observed around COP21, the EU Sustainable Finance Action Plan, the European Green Deal, and the COVID-19 shock in subsets of countries. These event-related effects are often economically larger than the corresponding baseline pricing coefficients, but they differ substantially in both sign and magnitude across markets. This pattern is more consistent with episodic and state-dependent repricing than with a constant and globally integrated ESG premium.

The moderator regressions reinforce this interpretation. Institutional and macroeconomic variables are associated with changes in ESG pricing in selected country–moderator combinations, but the evidence remains uneven across both countries and moderators. No single institutional condition emerges as a consistently dominant explanation for ESG pricing across the full sample. A more plausible interpretation is that ESG-related return effects are mediated by local market structures, regulatory settings, and investor clienteles rather than driven by one common international mechanism.

The robustness checks leave this broader picture largely unchanged. Using broader portfolios and an alternative ESG sorting signal preserves the main qualitative conclusions: unconditional ESG pricing remains weak, whereas more pronounced effects arise primarily in selected event windows and specific markets. The main contribution of this thesis is therefore not to argue that ESG is irrelevant for asset pricing, but to show that its relevance is unlikely to take the form of a stable and universal first-moment return premium. Instead, the evidence is more consistent with ESG-related effects that are conditional, country-specific, and at least partly linked to transition dynamics, repricing episodes, or resilience-based channels.

7.1 Is ESG Already Priced In?

Whether ESG is already priced in depends on the economic object under investigation. Within the asset-pricing framework adopted in this thesis, ESG would be regarded as priced if exposure to ESG were associated with a stable and systematically compensated component of expected returns across firms and countries. The empirical evidence provides only limited support for such an interpretation. In the baseline Fama–MacBeth regressions, the estimated price of ESG beta is generally small in magnitude and statistically weak, while the cross-country pattern remains too heterogeneous to support the view that ESG enters equity prices through a common and internationally consistent first-moment channel.

This conclusion should not be interpreted as evidence that sustainability is financially irrelevant. Rather, it suggests that the strongest version of the priced-in hypothesis receives limited support in the present cross-country setting. A central reason is that different strands of the literature examine different pricing objects. Much of the ESG literature does not test whether broad ESG exposure commands a stable premium in expected returns across countries. Instead, it focuses on realised performance in crisis episodes, shifts in expected returns under disaster states, or the relationship between sustainability and direct measures of resilience and risk. Divergent findings should therefore not be treated too readily as contradictions, since the underlying object of analysis differs across empirical designs.

This distinction is especially important when comparing the present results with Albuquerque, Koskinen, Yang and Zhang, as well as with Pagano, Wagner, and Zechner. Albuquerque et al. analyse the initial COVID-19 market crash and document that firms with stronger environmental and social characteristics performed relatively better during that episode. Their evidence is highly relevant, but it pertains to realised returns in an exceptional stress period. Methodologically, their design identifies relative performance during a crisis; economically, it indicates that high-ES firms were valued more favourably when markets abruptly repriced downside exposure, firm quality, and resilience. This is not equivalent to demonstrating that ESG commands a stable premium in expected returns across firms, countries, and time. (Albuquerque, Koskinen, Yang and

Zhang, 2020)

Pagano, Wagner, and Zechner are closer to the asset-pricing perspective because they distinguish explicitly between realised returns and expected returns during the pandemic. However, their analysis likewise remains tied to a specific disaster episode and to a more narrowly defined resilience mechanism. Their results indicate that crisis outperformance and the pricing of expected returns need not be driven by precisely the same sustainability-related characteristic. This is directly relevant for the interpretation of the present findings, since it demonstrates that crisis performance, disaster resilience, and broad cross-sectional ESG pricing are related, but analytically distinct, objects of inquiry. (Pagano, Wagner, and Zechner 2023)

The comparison with Gehrig, Iannino, and Unger is particularly instructive because their study offers a resilience-based mechanism that is compatible with weak first-moment pricing evidence. Rather than analysing mean returns, Gehrig et al. focus on bank resilience measured through indicators of systemic and systematic risk. Using an international banking sample, they show that measures of social responsibility are associated with greater resilience and lower systemic vulnerability. Economically, this implies that social responsibility is linked to downside protection and reduced exposure to systemic stress, that is, to second-moment properties rather than to a stable compensation channel in average returns. (Gehrig, Iannino, and Unger 2024)

Methodologically, this differs from the present thesis, which examines whether ESG-related exposure is reflected in expected returns by estimating country-specific Green–Brown factors, rolling ESG betas, and cross-sectional pricing regressions across equity markets. The two approaches therefore employ different dependent variables and address different dimensions of financial relevance. At the same time, they remain closely related in interpretation. If ESG matters financially primarily because it is associated with lower fragility and stronger performance in adverse states of the world, then the absence of a strong and internationally uniform first-moment premium is not unexpected. Under such a mechanism, ESG effects would be expected to manifest more clearly through resilience and state-dependent repricing than through a stable mean-return differential.

A further point of convergence is that both studies emphasise international heterogeneity. Gehrig et al. document that the relationship between social responsibility and resilience varies across regions, while the present thesis finds that ESG-related pricing patterns in returns are weak and heterogeneous across countries. These findings suggest that ESG does not operate through a single global mechanism. Rather, its financial relevance appears to depend both on the pricing dimension under consideration (returns versus resilience) and on the national or regional environment in which it is measured.

The comparison with the factor-pricing literature likewise requires caution, since the estimated ESG premium depends materially on measurement and portfolio construction. Lioui and Tarelli (2022) show that alternative approaches to constructing ESG factors can generate different expected return spreads, implying that conclusions regarding ESG premia are partly design-dependent. (Lioui and Tarelli 2022) Mohanasundaram and Kasilingam (2024), by contrast, report evidence of a priced sustainability factor in the Indian equity market, but in a more homogeneous single-country setting and under a specific factor construction. The present thesis instead estimates country-specific Green–Brown factors and rolling ESG betas within an international framework characterised by heterogeneous institutions, market structures, and ESG signals. In such an environment, a weaker and less uniform pricing relation is not surprising. (Mohanasundaram and Kasilingam 2024)

This consideration becomes even more important in light of the ESG measurement literature. Divergence across ESG rating providers implies that the underlying sustainability signal is noisy and varies with differences in scope, weighting, and measurement methodology. If ESG exposure itself is measured inconsistently, any estimated premium is likely to be attenuated, and cross-country comparisons become inherently less precise. Weak pricing evidence should therefore not be interpreted too readily as evidence against ESG relevance as such. It may instead reflect the empirical difficulty of measuring a multidimensional sustainability characteristic consistently across firms and countries.

Viewed in this way, the central implication of this thesis is not that ESG is financially irrelevant, but that its financial relevance is unlikely to be captured adequately by the narrow proposition of a stable and internationally consistent premium in average stock returns. The evidence presented here is more consistent with ESG-related pricing that is conditional: emerging through repricing when sustainability concerns become salient, appearing through resilience during periods of stress, and varying with the way ESG exposure is defined and measured. ESG-related effects therefore appear context-dependent rather than governed by a single global pricing relation.

7.2 Do Institutions Matter for ESG Pricing?

The moderator results suggest that institutions matter for ESG pricing, but not through a single and uniform cross-country mechanism. Rather, institutional conditions appear to affect whether ESG-related information becomes financially salient and credibly incorporated into prices, while the sign and strength of this effect remain context-dependent. This interpretation is consistent with the broader findings of the thesis, which indicate that ESG pricing is mediated by local market structures and does not emerge as a common international equilibrium relation.

This reading is supported by the literature on institutional investors and sustainability. Dyck, Lins, Roth, and Wagner show that institutional ownership is positively associated with firms' environmental and social performance across 41 countries, suggesting that institutional investors can act as a transmission channel through which sustainability preferences influence corporate outcomes. In the present context, this implies that institutional ownership may also support the pricing relevance of ESG, but only where investor demand is sufficiently strong and stewardship is credible. The selective significance of institutional ownership in the moderator regressions is therefore economically plausible rather than anomalous. (Dyck, Lins, Roth and Wagner, 2019)

A similar argument applies to government effectiveness and disclosure-related institutions. Cross-country evidence indicates that mandatory ESG disclosure improves price discovery and increases the amount of firm-specific information incorporated into stock prices. To the extent that stronger institutions enhance the credibility, comparability, and informational value of ESG signals, they should also facilitate ESG-related pricing. However, the results of this thesis suggest that such institutional support does not translate into a uniform pricing effect across markets. This indicates that institutional quality is a necessary but not sufficient condition, and that its impact depends on interaction with domestic investor demand, market structure, and implementation.

The broader sustainable-investing literature likewise points to a conditional rather than constant pricing relation. Alessi, Ossola, and Panzica show that the "greenium" in European equity markets is time-varying and becomes more pronounced when the low-carbon transition is perceived as more credible. This perspective is directly relevant for interpreting the moderator results. Institutional variables may be understood as country-specific conditions that affect when sustainability becomes economically salient, rather than as universal drivers of a stable premium. Under such a framework, heterogeneity in the moderator coefficients is not surprising, but instead reflects the inherently state-dependent nature of ESG pricing. (Alessi, Ossola and Panzica, 2021)

Overall, the evidence suggests that institutions matter less as universal determinants of an ESG premium than as conditioning factors that shape the local transmission of sustainability into asset prices. This helps explain why ESG pricing remains heterogeneous across countries and why it does not appear in the data as a broad and internationally stable equilibrium relation.

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