Center for Risk Management Lausanne

E4S White Paper

From Buildings to Balance Sheets: How Property Quality Creates ESG Value in Real Estate

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Executive Summary

Does ESG quality drive financial returns in Swiss real estate? We study this question using PRESS scores for 420 vehicle-period observations between December 2022 and June 2025.

We find that environmental practices create tangible operational value. Higher ESG scores predict 2.0 percentage points (pp) higher operating margins, driven entirely by environmental factors that directly reduce costs, while social and governance practices show no financial impact.

Markets recognize these fundamentals: ESG scores predict 1.3% higher 6-month forward returns. Yet despite margin improvements, return on invested capital and return on equity show no ESG effect overall, indicating that compliance expenses and green capital expenditures offset the operational gains.

Fund structure determines monetization in accounting profitability. Listed funds capture value through higher profitability (about +0.4 pp ROIC and +0.7 pp ROE per ESG point), while unlisted funds see margin improvements (+3.9 pp) without profitability translation. Foundations show no statistically significant effects. Real estate companies show patterns consistent with listed funds, though small sample size limits conclusive analysis.

These findings have distinct implications by stakeholder. For performance-focused investors in listed funds (and provisionally real estate companies), ESG can serve as a performance factor, while values-driven investors in other structures can pursue ESG mandates primarily for alignment objectives. For policymakers, emphasizing building-level metrics over fund-level disclosures may help reduce greenwashing and sharpen incentives for genuine environmental improvement.

Résumé Exécutif

La qualité ESG influence-t-elle les rendements financiers de l'immobilier suisse ? Nous étudions cette question avec les scores PRESS pour 420 observations véhicule-période entre décembre 2022 et juin 2025.

Les pratiques environnementales créent une valeur opérationnelle tangible. Des scores ESG élevés prédisent des marges opérationnelles supérieures de 2,0 points de pourcentage (pp), effet attribuable aux facteurs environnementaux réduisant directement les coûts, tandis que les pratiques sociales et de gouvernance n'ont aucun impact financier.

Les valorisations reflètent ces fondamentaux : les scores ESG prédisent des rendements à 6 mois supérieurs de 1,3%. Malgré ces améliorations de marges, le rendement du capital investi et des fonds propres ne montre aucun effet ESG moyen, indiquant que les dépenses de conformité et investissements verts compensent les gains opérationnels.

La structure du fonds détermine la monétisation au niveau de la rentabilité comptable. Les fonds cotés captent la valeur via une rentabilité accrue (environ +0,4 pp de ROIC et +0,7 pp de ROE par point ESG), tandis que les fonds non cotés voient leurs marges s'améliorer (+3,9 pp) sans traduction en rentabilité. Les fondations ne montrent pas d'effets statistiquement significatifs. Les sociétés immobilières montrent des tendances cohérentes avec les fonds cotés, bien que la petite taille d'échantillon limite l'analyse conclusive.

Pour les investisseurs axés sur la performance dans les fonds cotés (et provisoirement les sociétés immobilières), l'ESG peut servir de facteur de performance, tandis que les investisseurs guidés par leurs valeurs peuvent poursuivre des mandats ESG sans pénalité financière. Pour les décideurs, privilégier les indicateurs au niveau des bâtiments peut réduire l'écoblanchiment et renforcer les incitations environnementales.

Zusammenfassung

Beeinflusst ESG-Qualität die finanziellen Renditen in der Schweizer Immobilienbranche? Wir untersuchen diese Frage anhand von PRESS-Scores für 420 Vehikel-Perioden-Beobachtungen zwischen Dezember 2022 und Juni 2025.

Wir stellen fest, dass Umweltpraktiken einen greifbaren operativen Wert schaffen. Höhere ESG-Scores prognostizieren um 2,0 Prozentpunkte (pp) höhere Betriebsmargen, ein Effekt, der vollständig auf Umweltfaktoren zurückzuführen ist, die Kosten direkt senken, während soziale und Governance-Praktiken keine finanziellen Auswirkungen zeigen.

Die Märkte scheinen diese Fundamentaldaten zu erkennen: ESG-Scores prognostizieren über sechs Monate 1,3% höhere Aktienrenditen. Trotz der Margenverbesserungen zeigen die Rendite auf investiertes Kapital und die Eigenkapitalrendite jedoch keinen ESG-Effekt insgesamt, was darauf hindeutet, dass Compliance-Kosten und grüne Kapitalausgaben die operativen Gewinne ausgleichen.

Die Fondsstruktur bestimmt, wer profitiert. Kotierte Fonds erfassen den Wert durch höhere Rentabilität (etwa +0,4 pp ROIC und +0,7 pp höhere Eigenkapitalrendite pro ESG-Punkt), während nicht kotierte Fonds Margenverbesserungen ohne Monetarisierung aufgrund von Illiquidität verzeichnen. Stiftungen zeigen keine Effekte. Immobiliengesellschaften weisen ähnliche Muster wie kotierte Fonds auf, obwohl die kleine Stichprobengrösse definitive Schlussfolgerungen einschränkt.

Diese Ergebnisse haben unterschiedliche Implikationen für die Stakeholder. Für performanceorientierte Anleger in kotierten Fonds (und vorläufig Immobiliengesellschaften) kann ESG als Leistungsfaktor dienen, während werteorientierte Anleger in anderen Strukturen ESG-Mandate ohne finanzielle Nachteile verfolgen können. Für politische Entscheidungsträger könnte die Betonung von Kennzahlen auf Gebäudeebene gegenüber Offenlegungen auf Fondsebene helfen, Greenwashing zu reduzieren und Anreize für echte Umweltverbesserungen zu schärfen.

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1 Introduction

Strong ESG practices in real estate reflect strong fundamentals: Energy-efficient buildings cost less to operate, while well-managed properties generate higher margins. We document these patterns using data from 147 unique Swiss Real Estate Investment Vehicles (REIVs) with financial data spanning six semi-annual periods (December 2022 to June 2025), representing CHF 220 billion in assets as of June 2025. Funds with high ESG scores show 2 percentage points (pp) higher operating margins. Markets recognize these fundamental advantages. ESG scores predict stock returns over the following six months. The relationship operates through tangible operational improvements, not ESG branding. However, fund legal structure determines whether these fundamentals translate to investor returns.

These REIVs operate across four legal structures. Pension foundations manage employee retirement assets. Listed funds trade on SIX with daily liquidity. Unlisted funds serve institutional investors. Real estate companies operate as property management firms. These four legal structures differ in governance, regulation, and investor bases.

ESG integration in real estate is accelerating, notably because of the climate crisis and regulatory requirements for environmental and social disclosure and energy renovation. As a result, investors are demanding reliable sustainability indicators, and asset managers are competing on their ESG credentials. Yet systematic evidence linking ESG to financial performance in real estate remains limited. Most studies focus on individual buildings or single fund types. So, the heterogeneity of REIVs remains unexamined.

This paper addresses this gap. We leverage on a unique combination of data sets

to analyze ESG-performance relationships across all Swiss REIV legal structures. The most important source of data consists of the so-called Public Real Estate Sustainability Switzerland (PRESS) scores developed by CRML at HEC Lausanne in collaboration with Quanthome (Alessandrini et al., 2023). These include a comprehensive list of scores of the ESG profile of REIVs in Switzerland. It covers all different categories of REIVs as well as the individual dimensions of ESG, i.e. environment, social and governance separately. Moreover, the data span four semi-annual releases from December 2023 to June 2025, which allows to evaluate relationships over time as well. The PRESS scores cover 130 of the 147 vehicles, representing the majority of the Swiss market, as of June 2025. Combined with financial data spanning six periods, this yields 420 REIV-period observations for econometric analysis.

Following Alessandrini et al. (2022), we analyze multiple performance metrics separately. We examine operating margin (OM, return on invested capital (ROIC), return on equity (ROE), total expense ratio (TER), and market valuation (agio). We also analyze forward-looking market performance: 6-month stock returns and volatility for traded vehicles. We use legal structure dummy variables to control for structural differences. This approach respects fundamental heterogeneity while enabling rigorous statistical comparison. We employ robust regression specifications controlling for fund size, leverage, and time-varying market conditions.

Four complementary findings emerge from our analysis. First, ESG captures operational fundamentals. Energy-efficient buildings cost less to operate. Operating margins increase 2.0 pp per ESG score point. Environmental practices drive this entire effect (+1.4 pp), while social and governance scores show zero contribution. The operational channel operates through tangible building characteristics: energy systems, certifications, emissions profiles. Social and governance

practices serve stakeholder objectives without comparable cost mechanisms.

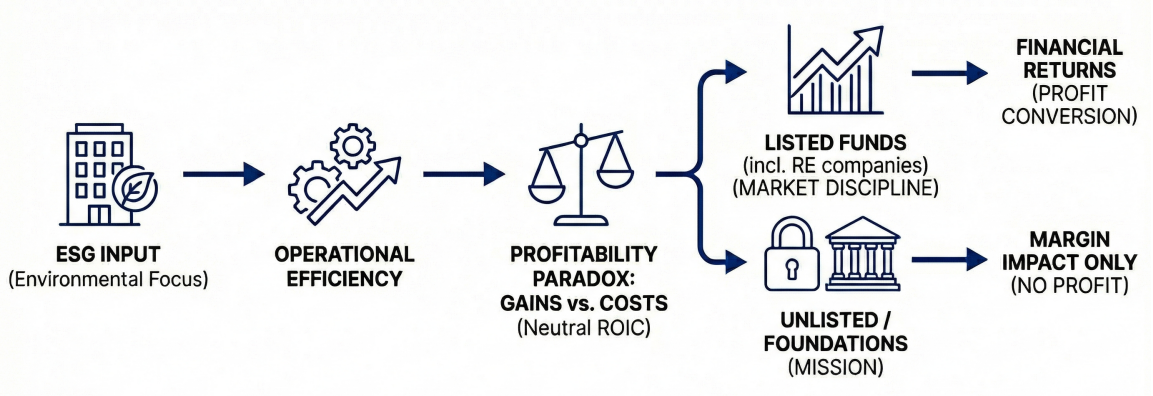
Second, markets recognize these improved fundamentals. ESG scores predict 6-month forward returns (+1.3 pp) with stock prices adjusting as investors observe operational improvements through semi-annual financial reports. Market recognition operates gradually. Robustness checks show coefficients rise across horizons: 0.4% at three months, 1.3% at six months, and 2.2% at one year. Markets incorporate ESG information as reported earnings confirm operational advantages. This finding establishes that ESG signals quality that market participants reward.

Third, implementation costs partly offset operational gains. Despite margin improvements and market recognition, accounting profitability shows zero effects. Return on invested capital and return on equity show no effect. Implementation costs like compliance expenses, reporting overhead and green capital expenditures, therefore appear to offset operational gains. High-ESG vehicles earn normal returns. Financial costs and benefits appear balanced, although there are non-financial benefits to environmental actions.

Fourth, fund structure determines whether ESG monetizes. Listed funds show ESG effects across all metrics: margins (+2.3 pp), ROIC (+0.4 pp), ROE (+0.7 pp). Market discipline seems to convert operational improvements into profitability. Unlisted funds show margin benefits (+3.9 pp), but without profitability translation. Illiquid secondary markets prevent ESG monetization at the return level. Foundations show no effects across all metrics as non-profit mandates and operational simplicity seems to limit ESG differentiation value. Real estate companies show patterns consistent with listed funds in market returns, though small sample size limits conclusive interaction analysis.

This study contributes three conceptual advances for understanding the ESG-

Figure 1: ESG Value Creation Mechanism



performance relationship in real estate (Figure 1). First, mechanism identification: environmental practices drive operational value through tangible building characteristics while social and governance dimensions serve non-financial objectives. This challenges aggregate ESG scoring and motivates sector-specific frameworks. Second, dual-channel value creation: ESG affects both operational fundamentals and market pricing, but implementation costs limit net profitability gains. This reconciles positive operational effects with neutral return outcomes. Third, structural moderators: market discipline determines ESG monetization patterns, explaining why listed vehicles convert sustainability into returns while unlisted vehicles and foundations do not.

These findings provide clear guidance for different investor types. For listed fund investors, ESG represents a performance factor. Operational fundamentals improve and markets recognize this quality. Market discipline enables monetization despite offsetting costs. For unlisted fund and foundation investors, ESG enables values alignment without financial penalty. Margin benefits exist but do not translate to significant financial performance. Environmental implementation offers the primary operational channel across all vehicle types with energy efficiency and building certifications creating measurable value. However, social and governance initiatives serve stakeholder relations without comparable financial mech-

anisms.

Robustness analysis strengthens these findings. Forward-looking temporal alignment shows ESG scores predict future operational efficiency (+2.4 pp vs +2.0 pp in the standard specification). ESG integration associates with future performance, not merely past performance. The 6-month forward return prediction is consistent with gradual incorporation of ESG-relevant fundamentals into valuations as operational advantages materialize in financial statements. Temporal precedence supports causal interpretation, though selection mechanisms cannot be ruled out.

Our analysis faces three constraints that shape interpretation. First, the 2.5-year observation period (2023-2025) limits long-term inferences. Second, cross-sectional identification cannot definitively separate causality from selection. Third, PRESS methodology evolved in June 2024, introducing measurement heterogeneity. Despite these constraints, the evidence consistently reveals systematic patterns across legal structures.

The paper proceeds as follows. Section 2 reviews literature on ESG measurement, performance relationships, and rating divergence. Section 3 describes data sources, PRESS methodology, and sample construction. Section 4 presents descriptive statistics. Section 5 reports econometric analysis with panel regressions and robustness checks. Section 6 discusses implications and concludes.

2 Literature Review

2.1 ESG Measurement in Real Estate

ESG assessment frameworks in real estate operate at multiple levels. Four distinct assessment layers have been identified (Newell et al., 2023): fund/asset level (GRESB, Geophy), listed real estate level (MSCI, S&P), building delivery level (LEED, BREEAM, Energy Star), and reporting level (PRI, CDP, TCFD), each serving different stakeholders with varying data requirements and disclosure obligations.

Traditional frameworks have historically emphasized environmental metrics, particularly energy performance and carbon emissions. However, current benchmarks increasingly prioritize assessing ESG performance, outcomes, and impact rather than merely documenting policy implementation (Newell et al., 2023). This gradual shift from policy documentation to performance measurement appears to reflect the market's maturation, and regulatory developments including TCFD and EU Taxonomy disclosure requirements have likely accelerated ESG integration.

The Swiss market presents particular measurement challenges. A comprehensive survey of Swiss institutional property portfolios covering CHF 112.7 billion (approximately 65% of the market) documented substantial heterogeneity in ESG practices across legal structures—investment companies, listed and unlisted funds, and foundations (Alessandrini et al., 2022). This heterogeneity complicates cross-sectional comparison and therefore motivates comprehensive scoring systems that enable consistent assessment across vehicles.

PRESS scores seek to address this coverage gap. They provide standardized ESG assessments for Swiss REIVs using publicly available data. The scores combine building-level quantitative indicators (energy intensity, emissions, certification

status) with fund-level governance metrics and textual analysis of sustainability reporting, thereby offering a unified perspective on ESG practices across heterogeneous structures.

2.2 ESG-Performance Relationship: Mixed Empirical Evidence

Empirical evidence on the relationship between ESG integration and financial performance in real estate presents a mixed picture, with results varying by geography, asset class, performance metric, and ESG measurement approach.

2.2.1 Positive Effects: Valuations and Operational Performance

Several studies document positive relationships between ESG practices and financial outcomes. Analysis of US REITs from 2006 to 2015 using instrumental variables to address endogeneity suggests that environmentally sustainable portfolios attract market valuation premiums beyond operating benefits (Devine and Yönder, 2021). Specifically, these REITs tend to demonstrate higher rental revenues, higher net operating income, and lower interest costs (all statistically significant). They also exhibit lower systematic risk and less uninformed trading. These effects appear to be at least partly driven by reputational mechanisms, as equity market premiums exceed property market premiums.

Examination of global REITs from 2011 to 2014 similarly reveals that GRESB sustainability scores positively affect operational performance (Fuerst, 2015). A 1% increase in GRESB score associates with 1.26% higher ROA and 3.29% higher ROE (both $p < 0.05$). However, unadjusted stock returns show no significant relationship; only risk-adjusted returns demonstrate positive associations, suggesting that markets may price ESG quality once risk differences are taken into account.

Building-level studies further confirm certification premiums. Analysis of US commercial office buildings documents 4.6% effective rent premiums and 10.1% transaction price premiums for Energy Star or LEED certification ($p < 0.001$) (Holtermans and Kok, 2019). Examination of Italian residential markets likewise finds substantial green premiums ranging from 6% to 30% depending on energy performance class (Micelli et al., 2024). Importantly, geographic heterogeneity emerges: metropolitan cities tend to show smaller premiums than medium-sized cities, suggesting that market size may moderate valuation effects.

2.2.2 Null or Negative Effects: Profitability Paradoxes

Other studies find weak or negative ESG-performance relationships. Analysis of Swiss institutional portfolio samples reports no significant impact of ESG scores on financial performance (Alessandrini et al., 2022). This null finding motivates our investigation using PRESS scores on an expanded sample.

A striking paradox emerges from US real estate companies (2003-2010): ESG ratings positively affect Tobin's Q (+0.220, $p < 0.01$) but negatively affect total returns (-0.487, $p < 0.01$) (Cajias et al., 2014). This suggests market valuation recognizes ESG quality, but profitability does not follow. The effect is driven by ESG concerns (negative ratings) rather than strengths. Companies with more concerns have lower market values but those with high overall ESG ratings also experience lower returns.

Analysis of 1,049 MSCI World Index firms, covering all sectors, from 2000 to 2019 across four ESG rating providers reveals that rating disagreement disperses ESG effects (Billio et al., 2021). Even when rating agreement exists, ESG effects become diluted and show no impact on performance. Portfolios of firms with consistent high ESG ratings across providers show no significant alpha relative to

non-ESG benchmarks.

Geographic and regulatory contexts matter. Examination of Swiss residential properties finds an unexpected negative relationship between energy efficiency and rental prices (-29%, $p < 0.001$) (Feige et al., 2013). This appears driven by Swiss lease structures where landlords bundle energy costs into rents. Less efficient buildings command higher rents to cover expected utility expenses. However, water efficiency (+12%), safety (+9%), and health features (+12%) all show positive premiums.

2.2.3 Mixed Evidence and Market Maturity

A systematic literature review of 219 papers on ESG in real estate spanning 1994-2023 confirms a general positive correlation between ESG practices and financial performance, channeled through operational efficiencies, lower risk profiles, and improved investor appeal (Zubizarreta et al., 2024). However, the relationship between ESG factors and financial performance is not uniformly positive across all studies. Additional variables such as market maturity, regional regulatory environments, and specific ESG component impacts appear to influence outcomes.

This heterogeneity motivates our focus on legal structure differences. The literature has not systematically tested whether ESG-performance relationships vary across REIV structures within a single market.

2.3 Measurement Challenges and Rating Divergence

ESG rating divergence poses fundamental challenges for investors and researchers. Analysis of six major ESG rating providers covering general corporate equities decomposes rating divergence into three sources: scope (which attributes to

measure), measurement (how to measure them), and weight (how to aggregate) (Berg et al., 2022). Measurement contributes 56% of divergence, scope 38%, and weight only 6%. A "rater effect" also emerges where a provider's overall view of a firm influences category-specific measurements, with this halo effect explaining 15% of category score variation.

Real estate faces additional sector-specific measurement challenges. Three divergence drivers have been identified in real estate ESG ratings: scope, indicators, and aggregation rules (Kempeneer et al., 2021). Review of six major building assessment systems (BREEAM, CASBEE, DGNB, HQE, LEED, SBTool) shows that these systems focus predominantly on environmental metrics while underweighting social dimensions. Particularly problematic is the conceptualization of occupant health and wellbeing, which receives inconsistent treatment despite strong scientific evidence of its importance.

Firm size introduces a further source of systematic bias. Analysis of 3,828 firms from 2004 to 2015 using Thomson Reuters ASSET4 data shows that larger companies achieve better ESG scores correlated with reporting resources rather than actual sustainability performance (Drempetic et al., 2020). Testing this using greenhouse gas emissions as an objective outcome measure confirms that larger firms do not demonstrate superior environmental performance despite higher ESG scores. This suggests that scores often measure CSR communication rather than substantial implementation in organizational practices.

Rating disagreement also appears to erode investor confidence. Examination of 1,278 European firms from 2019 to 2021 across four ESG providers finds that rating disagreement jeopardizes investors' confidence in ESG ratings and weakens their role in reducing the cost of equity (Mio et al., 2024). Disagreement creates information uncertainty, leading investors to demand higher risk premiums

and thereby moderating the negative ESG-cost of equity relationship.

Taken together, these measurement challenges highlight the value of PRESS scores' standardized methodology for Swiss real estate. By using consistent data sources and percentile ranking across all vehicles, PRESS scores help mitigate some divergence issues documented in broader ESG rating research.

2.4 Theoretical Framework and Research Questions

ESG-performance relationships in real estate may reflect four mechanisms, from which we derive testable hypotheses.

Operational fundamentals. Environmental practices link directly to operational costs through energy efficiency, building quality, and certifications, whereas social practices primarily serve stakeholder objectives (tenant engagement, accessibility) without direct margin impacts. Governance practices affect management quality and transparency and may therefore influence performance indirectly.

H1: Environmental scores drive margin improvements while social and governance scores show null effects.

Market recognition. Valuations may incorporate ESG information as investors observe operational advantages through financial reports. If markets recognize ESG quality, ESG scores should positively predict forward returns in valuation series, with market recognition potentially operating gradually as operational improvements materialize in reported earnings.

H2: ESG scores positively predict forward returns for vehicles with observable valuation series.

Cost-benefit balance. Implementation costs—compliance expenses, reporting overhead, green capital expenditures—may offset operational gains. If costs approximately equal benefits, margins may improve without corresponding profitability translation.

H3: ESG scores positively predict operational margins with no impact on return on invested capital and return on equity.

Structural moderators. Listed funds face continuous price discovery and competitive ESG disclosure, whereas unlisted funds operate in illiquid markets with institutional investors demanding baseline sustainability. Foundations typically prioritize mission over profit optimization, which may attenuate ESG-performance links.

H4: Listed funds monetize ESG into profitability, unlisted funds show margin-only benefits, and foundations show null effects.

Our cross-sectional design cannot definitively separate causality from selection. ESG scores may signal inherent building quality rather than cause performance, and we acknowledge this limitation in Section 6.4.

3 Data and Methodology

We combine two complementary data sources. PRESS scores measure ESG performance of Swiss REIVs, while financial data track returns, fees, and balance sheet metrics. Both datasets are updated semi-annually. PRESS scores cover December 2023 to June 2025 (four releases), whereas financial data cover December 2022 to June 2025 (six periods), thereby providing a slightly longer window for financial outcomes. Additional information regarding the data sources and the construction of the PRESS scores is provided in Appendix A.

3.1 PRESS Scores Data

3.1.1 Overview

The Public Real Estate Sustainability Switzerland (PRESS) scores provide ESG assessments of Swiss REIVs (Alessandrini et al., 2023). CRML at HEC Lausanne developed these scores in collaboration with Quanthome in order to enable investment decisions based on environmental, social, and governance criteria.

PRESS scores rely exclusively on publicly available data and are updated twice annually. As of June 2025, they cover 130 REIVs, representing CHF 220 billion in assets.

3.1.2 Scoring Methodology

PRESS scores are built on three pillars: Environmental (E), Social (S), and Governance (G). Each pillar combines quantitative indicators with qualitative indicators. Quantitative indicators are measured at both building and fund level, while qualitative indicators are derived from textual analysis of annual reports.

The Environmental (E) pillar assesses environmental impact through five building-level quantitative indicators: energy intensity (kWh/m^2), CO_2 emissions intensity (kg CO_2e/m^2), share of fossil-based heating systems, share of electric solar panels, and green area proportion. Energy intensity is estimated using gradient boosting algorithms trained on Geneva building data. CO_2 calculations follow Intep (2022) emission factors covering Scope 1 and Scope 2 emissions. Data sources include the Federal Building and Housing Registry (RegBL), MeteoSwiss solar energy database, and FSO land use databases. The E score combines these quantitative metrics (2/3 weight) with the frequency of environmental keywords in annual reports (1/3 weight).

The Social (S) pillar evaluates social impact through nine indicators that measure tenant well-being and accessibility. These include residential accessibility (services within 700m), commercial accessibility, rental pricing relative to locality averages, outdoor noise pollution, tenant turnover rates, amenities proximity, share of social buildings, and elevator access. Indicators are measured at building level (weighted by property type) or fund level depending on data availability. Key data sources include OpenStreetMap for amenities, FOEN noise maps, Quanthome rental advertisements, and STATPOP demographic data. The S score combines quantitative metrics (2/3 weight) with social keyword frequency in reports (1/3 weight).

The Governance (G) pillar assesses management quality and strategic decision-making through seven indicators, including Minergie certification share, board gender diversity, ratification of international sustainability treaties (e.g., PRI, TCFD, CDP), sustainability reporting practices, capital expenditures for renovations, and spatial diversification (cantonal spread and geographic distance). Indicators combine building-level certifications with fund-level governance metrics. The G score integrates quantitative measures (2/3 weight) with governance keyword frequency

in reports (1/3 weight).

Textual analysis employs dictionary-based word frequency counting. We use an ESG lexicon derived from Baier et al. (2020) and enhanced with word2vec methods. The lexicon covers English, French, and German. Each indicator is scored 0–10 using percentile ranking (Refinitiv, 2020). Within each pillar, quantitative indicators receive 2/3 weight and textual indicators 1/3 weight, and the overall ESG score combines E, S, and G pillars with equal weighting (1/3 each).

This three-pillar structure enables mechanism testing. The Environmental pillar measures operational channels—building-level energy intensity, emissions, heating systems, and certifications—that capture direct cost drivers. The Social pillar assesses accessibility, amenities, and tenant services, which are practices primarily affecting stakeholder relations rather than operating expenses. The Governance pillar evaluates board structure, reporting practices, and strategic decisions, which reflect management quality without necessarily having immediate margin impacts. Decomposing ESG into components therefore allows us to test which mechanisms appear to drive financial performance.

3.1.3 Data Coverage and Evolution

Table 1 and Figure 2 show PRESS scores coverage across four releases. The initial release (December 2023) covered 42 REIVs with CHF 71 billion in assets. Coverage expanded to 128 vehicles in June 2024, following methodology enhancements. Latest data (June 2025) include 130 vehicles with CHF 220 billion

in assets.[1]

Table 1: PRESS Score Coverage by Release

Release Date	N REIVs	N Matched	Total AUM (CHF B)	Median AUM (CHF M)	Coverage (%)
2023-12-31	42	42	71.4	1291	100.0
2024-06-15	128	126	206.3	881	98.4
2024-12-01	126	124	205.9	887	98.4
2025-06-01	130	128	218.1	1004	98.5

Notes: Coverage rate measures percentage of REIVs with PRESS scores that match with financial data.

Figure 2: Evolution of PRESS score coverage across four releases

Notes: The substantial increase in June 2024 reflects methodology expansion and broader REIV universe coverage. Coverage rates remain above 98% throughout.

[1] Several REIVs underwent mergers during the study period. Notable mergers include AXA funds (June 2024), Novavest-SenioResidenz (December 2024), and Cham-Ina plus Helvetica funds (June 2025). After merger, these vehicles appear under the successor entity's ISIN. The temporal matching approach (Section 3.3.1) handles structural changes through asof-join methodology. This preserves panel structure while accounting for market evolution.

3.2 Financial Returns Data

3.2.1 Data Source

Financial data are collected by Quanthome from annual and semi-annual reports. Swiss regulations require REIVs to disclose comprehensive information semi-annually. Our dataset covers 147 unique REIVs across six periods from December 2022 to June 2025.

The dataset contains 115 variables. These include net asset value (NAV), market capitalizations, performance metrics, fee structures, profit and loss (P&L) statements, debt metrics, and valuation indicators.

3.2.2 Performance Metrics

Swiss REIVs report performance heterogeneously. Investment funds report semi-annual returns directly. Real estate companies report return on net assets (RONA) or return on gross assets (ROGA). Foundations report return on equity (ROE). Listed companies may report stock returns. This heterogeneity reflects fundamental differences in regulatory frameworks, accounting standards, and business models across legal structures.

Following Alessandrini et al. (2022), we do not attempt to create unified performance metrics that artificially homogenize across legal structures. Instead, our econometric analysis examines multiple financial metrics separately. These include operating margin (OM, EBIT divided by revenue), return on invested capital (ROIC), return on equity (ROE), total expense ratio (TER), and market valuation (agio). We use legal structure dummy variables to control for structural differences. This approach preserves metric integrity. It enables statistical comparison through categorical controls rather than forced metric conversion.

Multiple metrics enable distinguishing operational efficiencies from bottom-line profitability. If ESG creates cost savings that flow to investors, both margins and profitability should improve. If implementation costs offset operational gains, margins improve while profitability remains neutral. This pattern would suggest costs and benefits balance.

3.2.3 Control Variables

Our econometric analysis incorporates several control variables. Efficiency is measured through Total Expense Ratio (TER), defined as total operating costs divided by net asset value. Market valuation is captured by agio, the premium or discount to NAV computed as (market price / NAV - 1). Size is measured as log of assets under management (AUM) for funds or market capitalization for listed entities, where the logarithmic transformation accounts for non-linear size effects. Leverage is measured through debt-to-equity ratios, reflecting financial risk and capital structure. These controls appear in multivariate regressions alongside ESG scores and legal structure dummies.

3.2.4 Market Performance Data

Market performance metrics are collected by Quanthome from daily trading data for listed REIVs. The dataset provides forward-looking returns and historical volatility measures across multiple time horizons, which enables testing whether ESG scores predict future market performance.

Forward returns are computed at three horizons: 3-month, 6-month, and 1-year. These measures capture total returns, including price appreciation and distributions, over the specified period following each observation date. Historical volatility is computed over three rolling windows: 90-day, 180-day, and 250-

day. Volatility measures therefore summarize price stability and market risk.

Our main analysis uses 6-month forward returns and 180-day historical volatility. These horizons balance statistical power with economic relevance, and their semi-annual alignment matches PRESS score release frequency. Robustness checks employ 3-month and 1-year horizons to test sensitivity to time scale. As market data are available only for listed REIVs that trade on public exchanges, market-based analysis is restricted to the subset of vehicles with public price discovery.

3.3 Sample Construction

3.3.1 Temporal Alignment

Sample construction requires careful temporal alignment of three data sources: PRESS scores, financial reports, and market performance. We therefore employ distinct alignment strategies for (backward-looking) financial data and (forward-looking) market data.

Financial data alignment. For each PRESS score release, we match it with the most recent financial data published before that release date. This backward-looking approach prevents look-ahead bias, as PRESS scores are matched only with financial information that was publicly available at or before publication. December 2023 PRESS scores (reflecting 2022 property data) are matched with June 2023 or December 2022 financial reports, whichever is more recent. June 2024 PRESS scores (reflecting 2023 property data) are matched with December 2023 or June 2023 financial reports.

Market data alignment. Market performance metrics employ forward-looking matching to test predictive power. For each PRESS score release, we match it

with market returns and volatility measured over the subsequent period. The target date is computed as PRESS release date plus the forecast horizon (91 days for 3-month, 182 days for 6-month, 365 days for 1-year). December 2023 PRESS scores are matched with June 2024 market returns (6 months forward) to test whether ESG scores predict future performance. This forward-looking design distinguishes between ESG–performance correlation (financial data) and ESG–performance prediction (market data).

The result is a panel with REIV-period observations spanning December 2022 to June 2025. The panel is unbalanced due to mergers, closures, and coverage expansion, and market data coverage is restricted to listed REIVs with public trading.

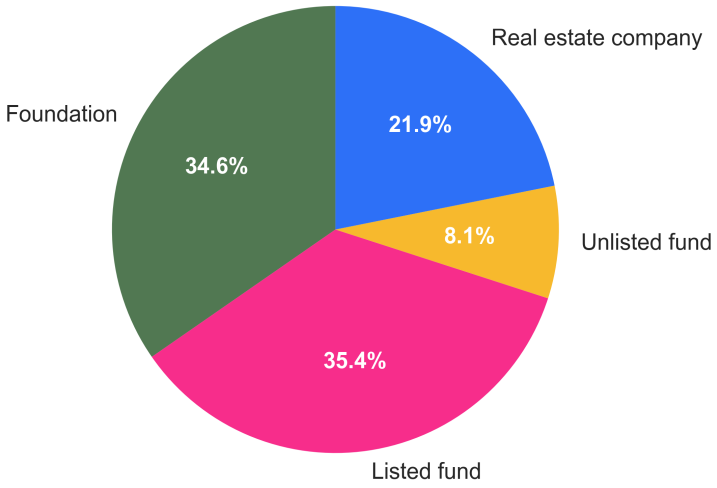
3.3.2 Legal Structure Classification

We classify REIVs into four legal structures following Swiss regulations: foundations, listed funds, unlisted funds, and real estate companies. Figure 3 shows sample composition by legal structure as of June 2025, weighted by AUM. Listed funds represent the largest share at 35.4%, followed by foundations at 34.6%, real estate companies at 21.9%, and unlisted funds at 8.1%.

Legal structures differ in market discipline mechanisms that may affect ESG monetization. Listed funds face continuous public valuation through stock prices. Daily trading and analyst coverage create transparency, investor relations and ESG disclosure become competitive requirements, and greenwashing is penalized through valuation discounts while genuine ESG implementation is rewarded. Unlisted funds operate in illiquid secondary markets, where an institutional investor base and closed structures tend to reduce market discipline. Foundations serve non-profit mandates with mission-driven objectives. Different gov-

ernance structures and objective functions may therefore alter ESG–performance relationships. These structural differences motivate interaction analysis (Section 5.2.4), which tests whether ESG effects vary systematically by legal structure.

Figure 3: Sample composition by legal structure (June 2025)



Notes: Weighted by assets under management.

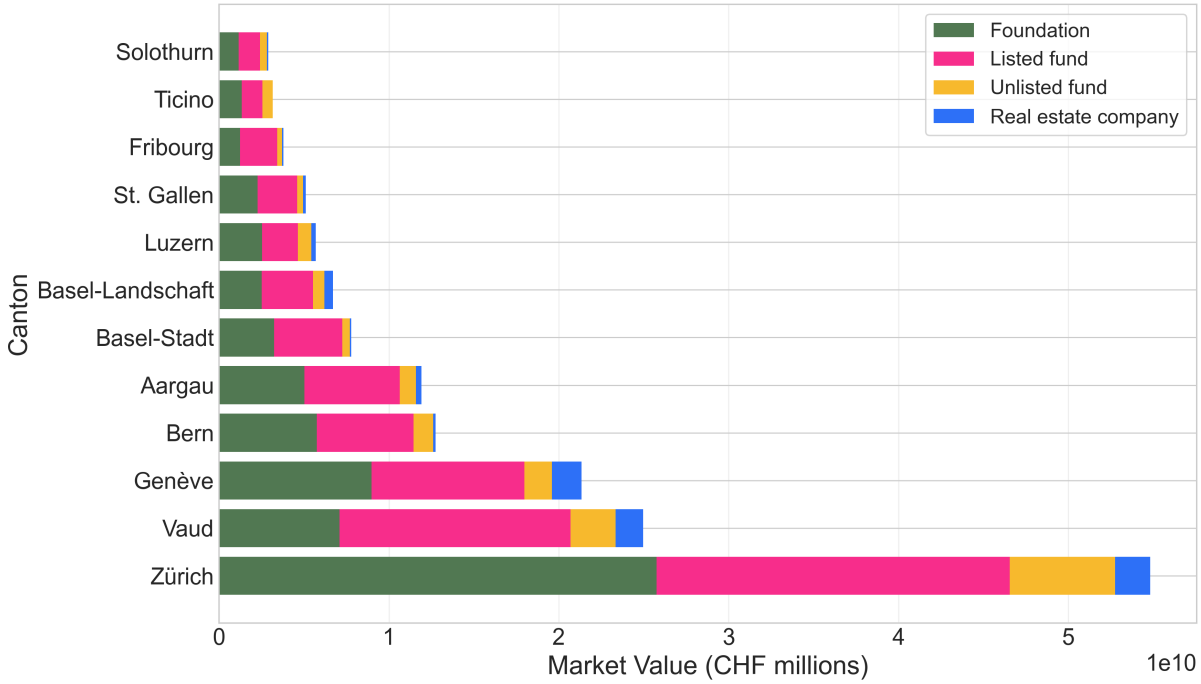
3.3.3 Geographic Distribution

Swiss REIVs concentrate property holdings in major urban centers. Figure 4 represents canton-level geographic distribution. Zurich accounts for 32% of portfolio value. Vaud represents 14%, Geneva 12%, Bern 7%, and Aargau 7%.

Regional concentration varies by legal structure. Foundations show greater geographic diversification. Companies concentrate more heavily in Zurich and Geneva. This heterogeneity may influence both ESG scores and financial performance.

Overall, match rate between PRESS scores and financial data exceeds 98%. Unmatched funds are small or recently created/dissolved vehicles, representing less than 2% of total market AUM.

Figure 4: Distribution of REIV property holdings by canton (June 2025)



Notes: Property values are aggregated at canton level from building-level data.

4 Descriptive Statistics

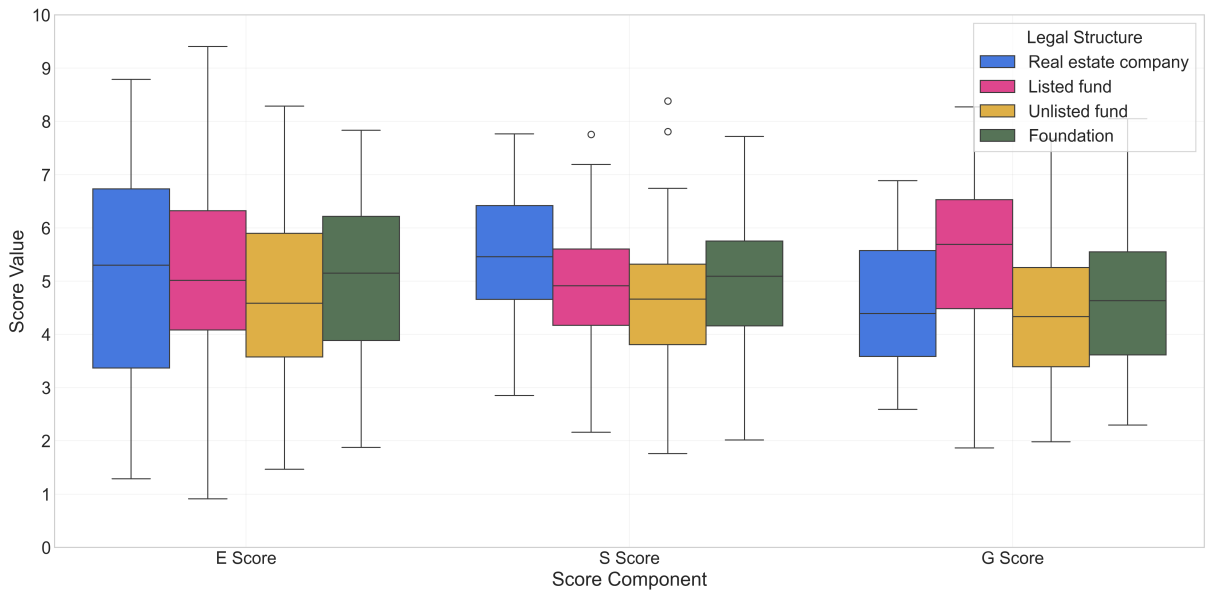
We present descriptive statistics for PRESS scores and financial metrics, with analysis focusing on differences across legal forms and temporal trends.

4.1 PRESS Score Characteristics

4.1.1 Score Distributions by Legal Structure

Figure 5 and Table 2 present PRESS score distributions. PRESS scores range from 0 to 10, with higher scores indicating stronger ESG performance. Aggregate ESG scores range from 4.59 to 5.17 across legal structures, with listed funds scoring highest (5.17 mean) and unlisted funds scoring lowest (4.59 mean). Median values are more compressed, suggesting that outliers may drive part of the cross-sectional dispersion.

Figure 5: Distribution of ESG scores by legal structure



Component analysis reveals distinct patterns. Environmental scores show rela-

Table 2: PRESS Scores by Legal Structure

	Foundation		Listed Fund		Unlisted Fund		RE Company	
Metric	Mean	Median	Mean	Median	Mean	Median	Mean	Median
ESG Total	4.92	4.75	5.17	5.15	4.59	4.50	5.04	4.95
E Score	5.04	5.15	5.20	5.01	4.63	4.58	5.07	5.30
S Score	4.95	5.09	4.84	4.91	4.62	4.66	5.48	5.46
G Score	4.76	4.63	5.47	5.69	4.52	4.33	4.57	4.39

tive uniformity across legal structures (4.63–5.20 range), suggesting that building characteristics dominate E scores more than fund-level policies. This foreshadows our finding that environmental effects are mechanism-driven rather than structure-dependent. Social scores vary more (4.62–5.48), with real estate companies scoring highest, likely reflecting portfolio size advantages in geographic diversification. Governance scores vary most (4.52–5.47), and listed funds substantially outperform, driven by public disclosure requirements. This heterogeneity foreshadows legal structure interactions in the econometric analysis.

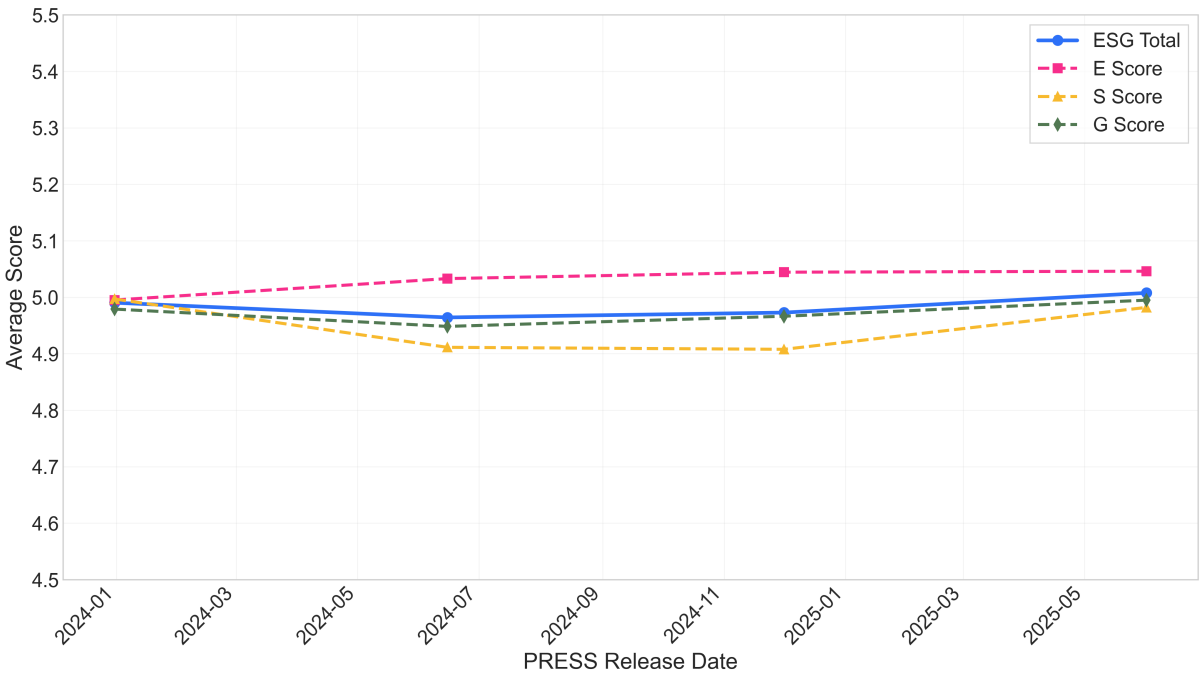
4.1.2 Temporal Evolution

Figure 6 tracks ESG score evolution across four PRESS scores releases. Overall scores show a modest upward trend from December 2023 to June 2025. Listed funds maintain the highest scores throughout, while unlisted funds show the strongest improvement trajectory.

Two caveats affect temporal comparisons. First, methodology expanded in June 2024, when new metrics for green space, accessibility, reinvestment, and diversification were added, which may induce discontinuities.

Second, sample composition changed substantially: December 2023 covered 42 vehicles, whereas June 2024 covered 128. Score improvements may therefore

Figure 6: Evolution of ESG scores



reflect better-performing new entrants as well as within-fund improvements.

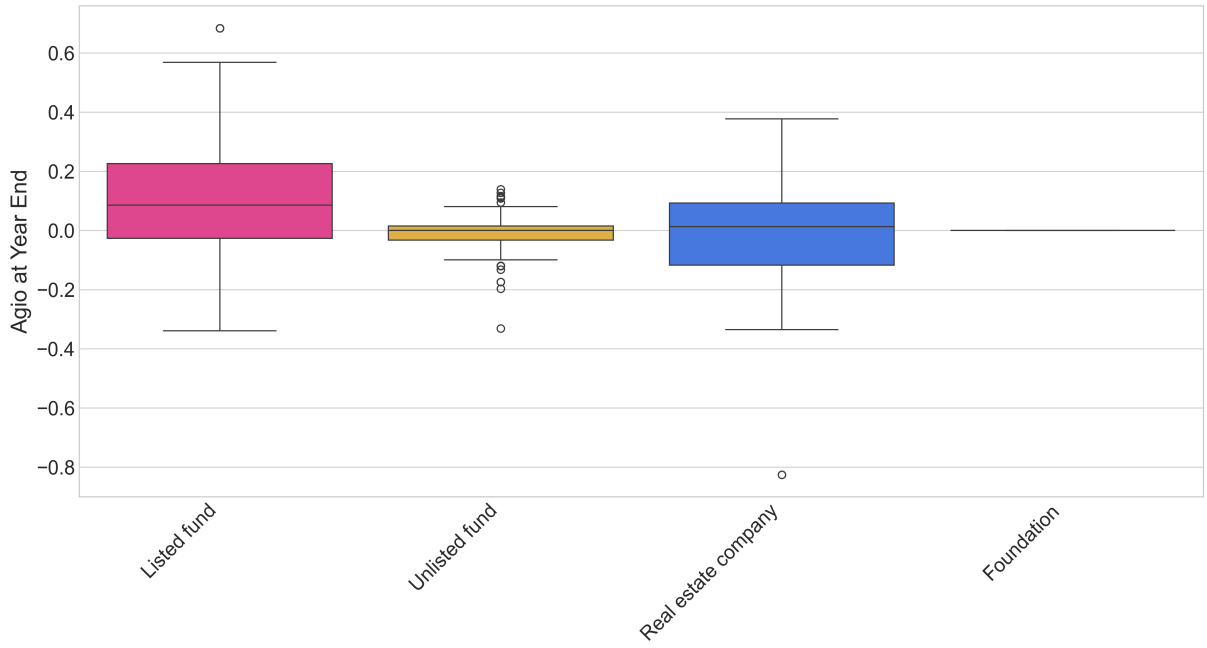
4.2 Financial Performance and Characteristics

4.2.1 Valuation Metrics

Figure 7 presents valuation metric distributions. For investment funds, agio measures premium/discount to NAV. For companies, we use (Price-to-Book-1) as a comparable metric, where Price-to-Book is the ratio of market capitalization to book value of equity.

Listed funds trade at a 10.07% average premium to NAV (8.54% median), a pattern that appears consistent with strong market demand and liquidity. Unlisted funds trade near NAV (-1.06% average, 0% median), reflecting limited secondary markets and redemption at NAV. Real estate companies trade at a slight discount (-3.58% average). Investor skepticism about book value appraisals

Figure 7: Distribution of valuation metrics by legal structure



may contribute, and a holding company discount may also play a role.

4.2.2 Efficiency and Fees

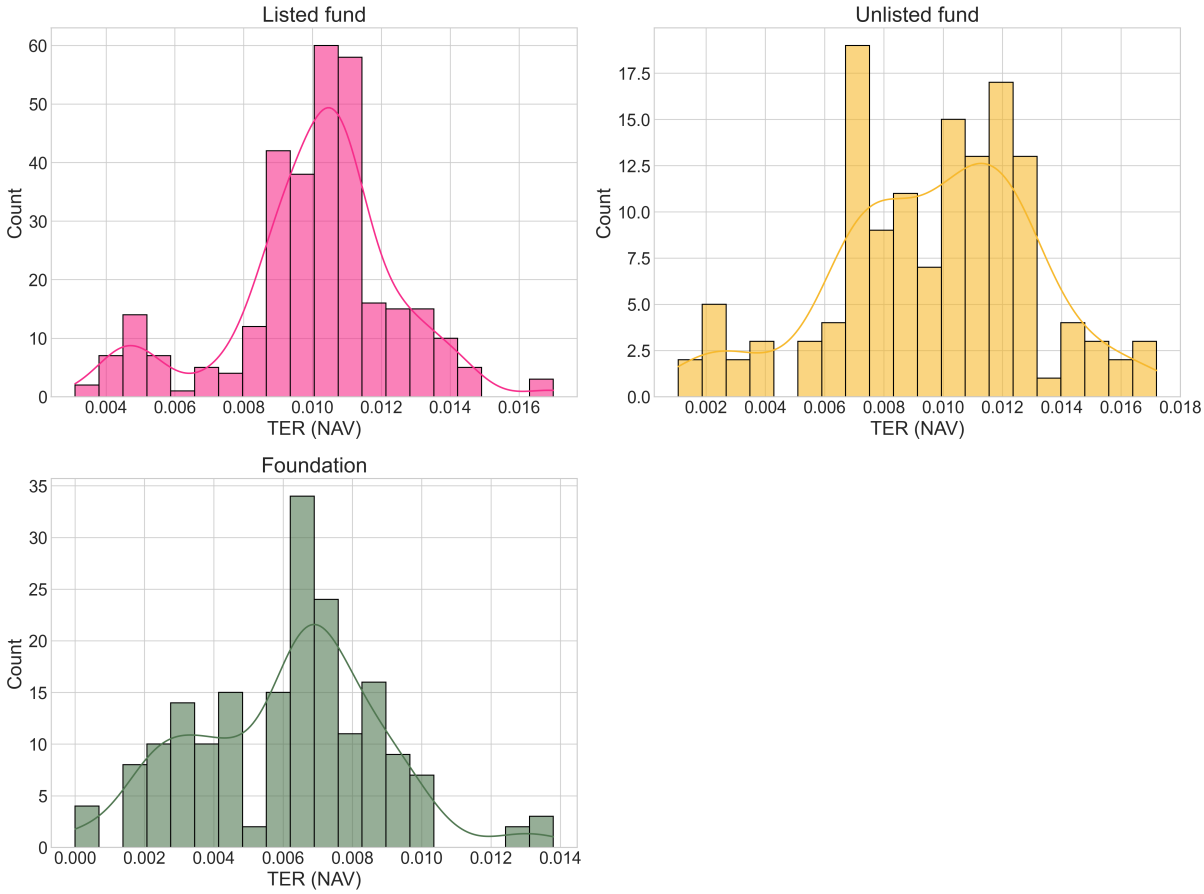
Figure 8 shows TER distributions. Average TERs range from 0.61% (foundations) to 1.01% (listed funds).

Foundations' lower fees (0.61%) reflect their non-profit structure and simpler governance. Listed funds incur higher costs (1.01%) due to public listing requirements and investor relations, while unlisted funds fall between (0.97%).

4.2.3 Assets Under Management

Figure 9 presents total market value distributions by legal structure. Table 5 (Panel C) reports summary statistics. Foundations and listed funds are largest on average (CHF 1.78B and CHF 1.65B), while unlisted funds average CHF 908M and companies average CHF 787M.

Figure 8: Distribution of Total Expense Ratio by legal structure



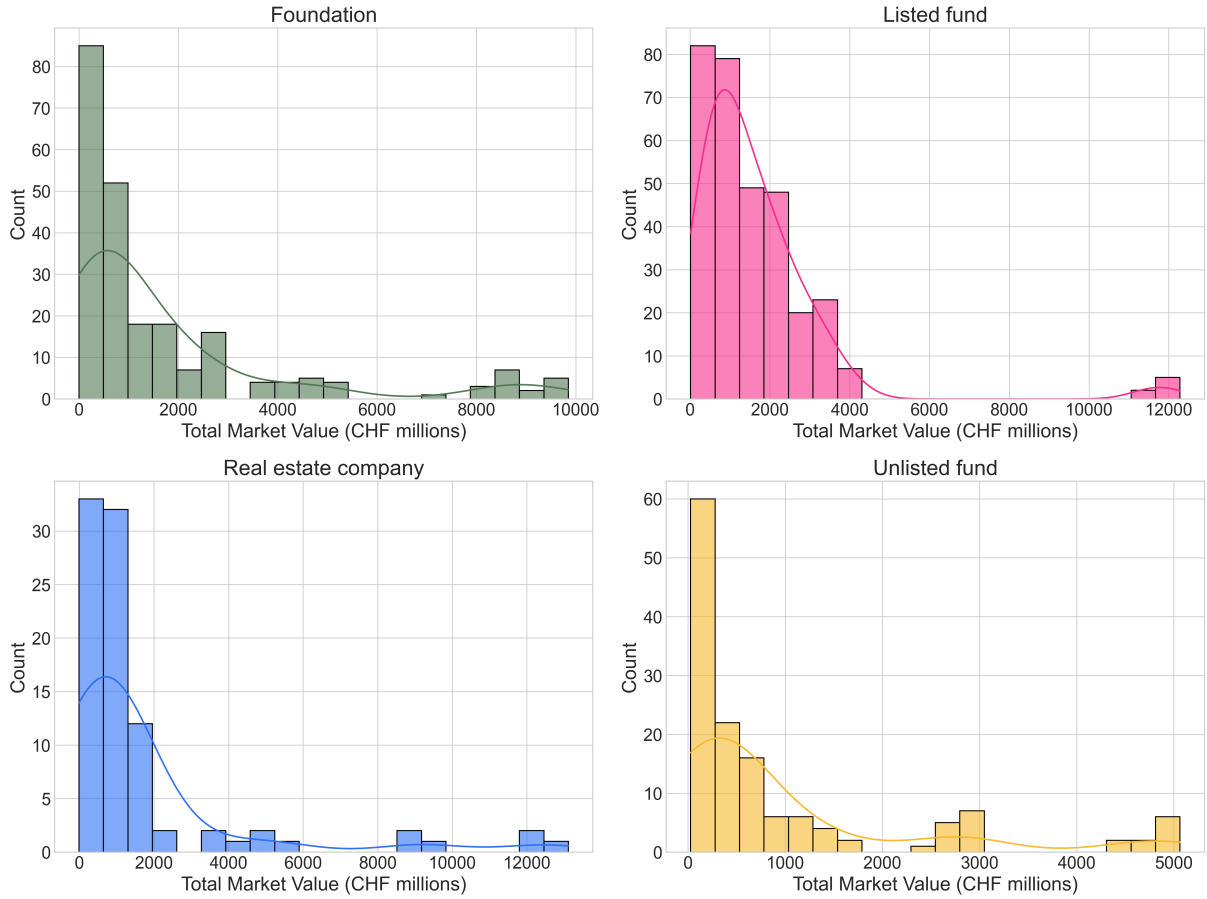
Size distributions are right-skewed across all legal structures. Medians (CHF 435M to CHF 1.23B) fall below means, indicating concentration. A small number of large funds dominate total market capitalization. Overall market size totals CHF 220 billion as of June 2025.

4.3 Correlations Between ESG and Financial Metrics

4.3.1 Overall Patterns

We examine ESG correlations with three performance metrics: operating margin, ROIC, and ROE. These metrics form the core of our regression analysis in

Figure 9: Distribution of total market value by legal structure



Section 5.

Operating margin shows a consistent positive correlation with ESG scores, whereas ROIC and ROE show weaker, less consistent patterns. The correlation strength varies substantially across time periods and legal structures.

These correlations are unconditional. They do not account for legal structure, fund size, leverage, or other characteristics. Section 5 demonstrates that most bivariate relationships disappear in multivariate regressions with appropriate controls, so the correlations serve primarily to motivate the econometric analysis.

4.3.2 Correlation by Period

Table 3 shows ESG correlations with operating margin, ROIC, and ROE across four periods. Operating margin exhibits consistent positive correlations. The pattern strengthens from December 2023 ($r = 0.35$, $p < 0.05$, $N = 42$) to June 2025 ($r = 0.26$, $p < 0.01$, $N = 102$). All four periods show significant positive correlations.

ROIC and ROE show weaker patterns. Most correlations are near zero and non-significant. December 2023 shows modest positive correlations for both metrics, but these do not persist in later periods.

Table 3: ESG-Performance Correlations by Period

	Operating Margin	ROIC	ROE	6-Mo Forward Return
2023-12-31	0.352* (42)	0.112 (42)	0.119 (42)	0.350* (41)
2024-06-15	0.227* (96)	0.020 (97)	0.022 (97)	0.233* (93)
2024-12-01	0.233* (95)	-0.029 (96)	-0.022 (96)	0.270** (92)
2025-06-01	0.279** (108)	0.003 (108)	0.037 (120)	–

Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Correlations computed using Pearson's r. Sample sizes (N) shown in parentheses.

Sample composition changed substantially across periods. December 2023 includes 42 vehicles, while June 2024 expands to 96-97 observations as coverage increases. The PRESS methodology also expanded in June 2024, with new metrics capturing additional ESG dimensions. This compositional shift complicates interpretation, as new vehicles may differ systematically from the original sample and definition changes may explain some temporal variation.

Section 5 controls for time-varying effects through period fixed effects. The temporal patterns in these unconditional correlations do not translate into significant ESG coefficients in multivariate specifications.

4.3.3 Correlation by Legal Structure

Table 4 shows ESG correlations across legal structures, and substantial heterogeneity emerges across both legal structures and performance metrics.

Listed funds exhibit strong positive correlations across all three metrics: operating margin ($r = 0.38$, $p < 0.001$), ROIC ($r = 0.25$, $p < 0.01$), and ROE ($r = 0.27$, $p < 0.001$). Sample size is substantial ($N = 174$).

Unlisted funds show strong positive correlation for operating margin ($r = 0.48$, $p < 0.001$) but weak negative correlations for ROIC and ROE. Sample size is smaller ($N = 57$).

Foundations show weak correlations across all metrics. None reaches statistical significance. Sample sizes range from $N = 105$ to 110 across metrics. However, the weak correlations might reflect the non-profit mandate structure rather than statistical power limitations. For foundations, traditional performance metrics may not capture the full value proposition, which includes mission alignment and stakeholder benefits beyond financial returns.

Real estate companies have insufficient data for reliable correlation estimates. Only 5 observations available for operating margin. ROIC has fewer than 5 observations.

Table 4: ESG-Performance Correlations by Legal Structure

	Operating Margin	ROIC	ROE
Foundation	0.003 (105)	-0.105 (110)	-0.162 (108)
Listed fund	0.382*** (174)	0.250** (174)	0.265*** (174)
Real estate company	–	–	0.277 (16)
Unlisted fund	0.484*** (57)	-0.142 (57)	-0.145 (57)

Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Correlations computed using Pearson's r. Sample sizes (N) shown in parentheses. "–" indicates insufficient data ($N < 10$) for reliable correlation.

These patterns reflect both ESG effects and structural differences. Listed funds trade at premiums, face higher fees, and differ systematically in size and leverage. Section 5 disentangles these effects through multivariate regression with appropriate controls.

4.4 Summary Comparison Across Legal Structures

Table 5 consolidates financial and ESG metrics by legal structure, providing a comprehensive snapshot of REIV characteristics.

Table 5: Summary Statistics by Legal Structure

	Foundation		Listed Fund		Unlisted Fund		RE Company	
Metric	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Performance Metrics								
Reported Performance (%)	3.32	3.37	2.01	2.50	2.49	2.30	10.02	10.05
Operating Margin (%)	73.88	74.88	68.22	68.70	67.68	69.55	57.29	53.82
ROE (%)	2.91	3.29	2.09	1.78	2.58	2.13	4.64	5.30
ROIC (%)	2.52	2.96	1.78	1.52	2.17	1.74	3.53	3.60
Panel B: ESG Scores								
ESG Total	4.92	4.75	5.17	5.15	4.59	4.50	5.04	4.95
E Score	5.04	5.15	5.20	5.01	4.63	4.58	5.07	5.30
S Score	4.95	5.09	4.84	4.91	4.62	4.66	5.48	5.46
G Score	4.76	4.63	5.47	5.69	4.52	4.33	4.57	4.39
Panel C: Other Characteristics								
TER (%)	0.61	0.66	1.01	1.03	0.97	1.02	–	–
Agio (%)	0.00	0.00	10.07	8.54	-1.06	0.00	-3.58	1.30
AUM (CHF M)	1,743	776	1,641	1,220	960	435	1,660	811

Notes: Panel A: performance metrics (semi-annual returns in %). Different legal structures report different metrics (investment funds: NAV-based returns; companies: operating metrics). Panel B: PRESS scores (0-10 scale). Panel C: other characteristics (fees in %, AUM in CHF millions).

Several patterns emerge. Real estate companies report the highest returns on average (10.02%), while other vehicles report performance ranging from 2.0% to 3.3% across fund types. Listed funds achieve the highest overall ESG score (5.17), driven by governance (5.47), while real estate companies excel on social

metrics (5.48) and environmental scores remain fairly uniform (4.6–5.2). Foundations exhibit the lowest fees (0.61% TER), while listed funds show the highest (1.01%). Listed funds trade at substantial premiums (10.07% agio), whereas companies trade at slight discounts (-3.58%).

4.5 Market Performance Metrics

For REIVs covered in market dataset, we analyze forward total returns and historical volatility. Table 6 presents summary statistics for 6-month forward returns and 180-day historical volatility by legal structure.

Table 6: Market Performance Metrics by Legal Structure

	6-Month Forward Return			180-Day Volatility		
Legal Form	Mean	SD	N	Mean	SD	N
All Funds	5.86%	7.62%	226	16.69%	34.74%	201
Unlisted fund	0.71%	4.49%	39	20.31%	35.55%	22
Foundation	2.21%	0.65%	22	0.77%	0.54%	14
Listed fund	6.93%	6.96%	129	13.31%	2.97%	129
Real estate company	9.85%	10.75%	36	32.80%	75.40%	36

Notes: Market returns measured as 6-month forward returns starting 182 days after PRESS release. Volatility measured as historical volatility over 180-day forward window. Sample restricted to vehicles with liquid trading (listed funds, real estate companies, and foundations with market data). Returns expressed as percentages.

Listed funds show mean 6-month returns of 6.93% with relatively low volatility (13.31%). Real estate companies exhibit higher returns (9.85%) but substantially higher volatility (32.80%). Foundations show minimal returns (2.21%) and volatility (0.77%), reflecting limited trading activity. These market metrics provide forward-looking performance measures that complement the backward-looking accounting metrics analyzed in Section 5.

These descriptive patterns reveal substantial heterogeneity across legal struc-

tures in both ESG scores and financial characteristics. The correlations between ESG and performance observed above may reflect confounding factors. Size, leverage, fee structures, and other characteristics vary systematically by legal structure. Section 5 addresses this concern through multivariate regression analysis. We control for legal structure using dummy variables, fund size (log AUM), debt ratios, and time-varying market conditions. These controls reveal the patterns described in the introduction: operational benefits offset by implementation costs, environmental dominance over social and governance dimensions, and differential effects across legal structures driven by market discipline.

5 Econometric Analysis

5.1 Model Specification

Following Alessandrini et al. (2022), we estimate separate regressions for each financial metric and do not create unified performance measures. This approach respects the heterogeneity of performance reporting across legal structures and enables statistical comparison through categorical controls. We analyze five key metrics. Operating margin (EBIT divided by Revenue) captures operational efficiency. Return on invested capital (ROIC) measures capital productivity. Return on equity (ROE) reflects shareholder returns. Total expense ratio (TER) measures cost efficiency. Agio (market price divided by NAV minus 1) captures market valuation relative to net assets.

Our baseline specification takes the form:

$$\begin{aligned}\text{Financial Metric}_{i,t} = \alpha + \beta \cdot \text{ESG}_{i,t} + \gamma' \cdot \text{Legal Structure}_i \\ + \delta \cdot \log(\text{AuM}_{i,t}) + \theta \cdot \text{Debt Ratio}_{i,t} + \sum_t \lambda_t \cdot \text{Period}_t + \varepsilon_{i,t}\end{aligned} \tag{1}$$

Here, i indexes funds and t indexes semi-annual periods. Legal Structure is a vector of dummy variables (Listed Fund, Unlisted Fund, Real Estate Company), with Foundation serving as the reference category. Period fixed effects (λ_t) control for time-varying macroeconomic conditions. We use log(AuM) to account for nonlinear size effects and potential economies of scale, while Debt Ratio controls for leverage effects on performance and risk.

We estimate both aggregate and component specifications. The baseline results (Section 5.2) use total ESG scores. Component models decompose total ESG

into Environmental (E), Social (S), and Governance (G) scores to identify which dimensions drive observed relationships. Section 5.3.2 presents a more detailed component analysis across all metrics.

For TER regressions, we omit the debt ratio, as leverage is not directly relevant to expense structures. All specifications use HC3 heteroskedasticity-robust standard errors. We do not include fund fixed effects because our primary interest is in cross-sectional variation in ESG practices. ESG scores change slowly over our short panel (2023–2025), which limits within-fund variation.

Our sample comprises approximately 410 REIV-period observations across 147 unique vehicles. Operating Margin regressions use 329 observations (including real estate companies that report EBIT). ROIC regressions use 334 observations. ROE regressions use 335 observations. TER regressions use 337 observations (funds only; companies do not report TER). Agio regressions use 233 observations (closed-end funds only; foundations and some companies lack market prices). Market return regressions use 198 observations (limited to vehicles with liquid trading).

5.2 Main Results: Four Complementary Findings

Our analysis reveals four complementary patterns that together help explain when, how, and why ESG relates to financial performance in real estate. We present these findings in order of their causal logic: operational fundamentals, market recognition, cost offsetting, and structural heterogeneity.

5.2.1 Finding #1: ESG Captures Operational Fundamentals

ESG integration is associated with operational efficiencies. Table 7 presents operating margin results.

Operating margin shows a significant positive ESG effect (coefficient = 0.020, $p < 0.001$). A one-point increase in ESG score associates with 2.0 pp higher EBIT margin (Table 7). This effect is economically meaningful and statistically robust. As we demonstrate in Section 5.3.2, this effect appears to operate specifically through environmental practices: energy-efficient buildings have lower utility costs, building certifications attract premium tenants, and systematic asset management improves operational execution.

Table 7: Regression Results: Operating Margin

Dependent variable: Operating Margin (EBIT/Revenue)			
Variable	Coefficient	Std. Error	t-stat
ESG Score	0.020***	0.004	4.79
Listed Fund	-0.072***	0.012	-6.22
Unlisted Fund	-0.066***	0.016	-4.18
Real Estate Company	-0.152*	0.071	-2.14
Log(AuM)	-0.002	0.004	-0.46
Debt Ratio	0.020	0.067	0.29
Period 2 (Jun 2024)	-0.007	0.011	-0.66
Period 3 (Dec 2024)	-0.006	0.011	-0.52
Period 4 (Jun 2025)	-0.006	0.011	-0.55
Constant	0.695***	0.087	7.97
R^2		0.235	
Adjusted R^2		0.216	
N		329	

Notes: HC3 heteroskedasticity-robust standard errors. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

The legal structure dummies are highly significant. Listed funds show 7.1 pp lower operating margins than foundations ($p < 0.001$). Unlisted funds show 6.4 pp lower margins ($p < 0.001$). Real estate companies show 15.2 pp lower margins

($p = 0.032$). This reflects foundations' simpler governance structures and lower administrative costs. Size (log AuM) and leverage show no significant relationship with operating efficiency. Period fixed effects are insignificant. This suggests stable operating margins across our sample period.

The operational mechanism operates specifically through environmental practices. Environmental scores increase operating margins by 1.4 pp ($p < 0.001$), as detailed in Section 5.3.1. Social and governance practices show no effect. This concentration reflects tangible building characteristics: energy systems, structural attributes, and certifications determined at construction or major renovation.

5.2.2 Finding #2: Markets Recognize tThese Fundamentals

The operating performance analysis establishes that ESG scores predict operating margin improvements. We now test whether markets recognize and price this operational advantage. For listed funds and real estate companies with traded shares, we analyze stock market returns.

Table 8 presents regression results for 6-month forward returns and 180-day volatility. Forward returns are defined over the 182 days following each PRESS release, measuring market performance over the subsequent six months.

ESG scores predict 6-month forward returns with coefficient 0.013 ($p = 0.016$). A one-point increase in ESG score associates with 1.3 pp higher returns over the subsequent 6 months. This effect is economically meaningful: the interquartile range in ESG scores (roughly 1.5 points) implies 2.0 pp return difference.

The 6-month horizon aligns with semi-annual reporting cycles. PRESS scores are released in June and December. Financial reports follow 6 months later. Markets gradually incorporate ESG information as operational improvements materialize in reported financial statements. Robustness checks (Table C1, Section C)

Table 8: Market Performance: Returns and Volatility

	Market Performance Metrics					
	6-Month Forward Return			180-Day Volatility		
Variable	Coef.	Std. Err.	t-stat	Coef.	Std. Err.	t-stat
ESG Score	0.013*	0.005	2.41	-0.014	0.022	-0.62
Listed Fund	0.071***	0.012	5.85	-0.020	0.108	-0.19
Unlisted Fund	0.006	0.016	0.36	0.025	0.191	0.13
Real Estate Company	0.055	0.038	1.45	0.358	0.259	1.38
Log(AuM)	-0.003	0.007	-0.45	0.015	0.035	0.43
Debt Ratio	-0.146	0.083	-1.75	1.220	0.742	1.64
R^2		0.237			0.231	
Adjusted R^2		0.205			0.194	
N		198			175	

Notes: OLS regressions with HC3 robust standard errors. Market metrics are matched forward relative to PRESS releases, so 6-month return corresponds to the six months following each PRESS release (matched to the 6-month return series at approximately release date + 182 days). 180-day volatility is matched analogously over the same post-release window. Sample restricted to vehicles with available series (N=198 for returns, N=175 for volatility). All specifications include legal structure dummies, log(AuM), debt ratio, and period fixed effects. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

show coefficients increase across prediction horizons: 0.4% at 3 months (not significant), 1.3% at 6 months (significant), and 2.2% at 1 year (larger but underpowered with $N = 120$).

Listed funds drive this effect. The intercept coefficient for listed funds is 7.1 pp ($p < 0.001$), substantially higher than foundations (reference category). Unlisted funds show no significant return effect, consistent with illiquid trading in these vehicles. Real estate companies show a positive coefficient (+5.5 pp, $p = 0.146$), economically similar to listed funds but with wider confidence intervals reflecting the smaller subsample ($N \approx 36$ company-period observations vs. $N \approx 120$ for listed funds). Robustness checks with winsorized returns reveal this effect becomes significant (+7.5 pp, $p = 0.002$), suggesting the baseline result is attenuated by outliers rather than absent. This pattern aligns with the listed fund findings, as both structures face market discipline through public trading.

ESG scores do not reduce return volatility, with an insignificant estimated coefficient of -0.014 ($p = 0.532$). This null result rules out the "defensive investment" interpretation. ESG does not function as downside protection or risk mitigation. The value creation channel operates through operational efficiency and market recognition, not through volatility reduction.

The market return findings complement the operating margin results. ESG creates value through two channels. First, operational efficiency improvements are immediate and persistent. Environmental scores reduce operating costs by 2 pp ($p < 0.001$). This effect persists across horizons and strengthens under maintenance controls. It reflects physical building characteristics embedded in properties.

Second, markets gradually recognize this operational efficiency over time. ESG scores predict 1.3% forward returns over 6 months ($p = 0.016$), aligned with reporting cycles. The effect emerges as financial reports confirm PRESS predictions.

The 6-month timing is not arbitrary. Semi-annual reports published in June and December provide verifiable financial data. Investors observe operating margin improvements. Prices adjust to reflect changes in fundamentals. The increasing coefficients across horizons (0.4% $\rightarrow$ 1.3% $\rightarrow$ 2.2%) suggest compounding value creation with peak statistical power at the reporting cycle, albeit with diminishing precision at the 1-year horizon.

The market return findings complement the operating margin results. These patterns indicate that ESG creates value through both operational efficiency and market recognition, though interaction analyses in Section 5.3.2 reveal additional heterogeneity by legal structure.

5.2.3 Finding #3: Implementation Costs Offset Gains

Despite margin improvements and market recognition, accounting profitability shows zero ESG effects. As Table 9 shows, ESG scores have no effect on the return on invested capital (coefficient = 0.001, $p = 0.390$) and the return on equity (coefficient = 0.001, $p = 0.392$). This disconnect reveals cost-benefit balancing.

Table 9: Regression Results: Profitability Metrics (ROIC and ROE)

	Profitability Metrics					
	ROIC			ROE		
Variable	Coef.	Std. Err.	t-stat	Coef.	Std. Err.	t-stat
ESG Score	0.001	0.001	0.86	0.001	0.002	0.86
Listed Fund	-0.008***	0.002	-3.56	-0.011**	0.003	-3.28
Unlisted Fund	-0.000	0.003	-0.02	0.001	0.004	0.30
Real Estate Company	–	–	–	-0.018	0.040	-0.45
Log(AuM)	-0.000	0.001	-0.16	0.000	0.002	0.11
Debt Ratio	-0.011	0.012	-0.94	-0.002	0.017	-0.14
Period 2 (Jun 2024)	-0.001	0.004	-0.29	-0.002	0.005	-0.30
Period 3 (Dec 2024)	-0.001	0.004	-0.24	-0.001	0.005	-0.26
Period 4 (Jun 2025)	0.010**	0.003	2.97	0.013*	0.005	2.49
Constant	0.023	0.026	0.88	0.013	0.037	0.36
R^2	0.173			0.135		
Adjusted R^2	0.152			0.111		
N	334			335		

Notes: HC3 heteroskedasticity-robust standard errors. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 9 presents regression results for ROIC and ROE. Listed funds show significantly lower ROIC and ROE than foundations (coefficient = -0.008, $p < 0.001$ and coefficient = -0.011, $p = 0.001$, respectively). Size and leverage show no significant effects, while only the June 2025 period dummy is significantly positive.

Implementation costs, including compliance expenses, reporting overhead, green capital expenditures, and specialized personnel, appear to offset margin improvements. High-ESG vehicles incur costs to achieve margin efficiencies, whereas low-ESG vehicles avoid these costs but show lower operational efficiency. At the

margin, both groups earn normal returns. This pattern suggests that costs and benefits balance despite operational improvements, although this cost-benefit balance appears to operate differently across legal structures, as we demonstrate next.

5.2.4 Finding #4: Fund Structure Determines Monetization

Correlations by legal structure (Section 4.3.3) revealed striking heterogeneity: listed funds display positive correlation ($r = 0.28$), unlisted funds negative correlation ($r = -0.29$), and foundations approximately zero. This raises the question of whether ESG–performance relationships fundamentally differ by legal structure or whether correlations primarily reflect omitted characteristics.

We test this using interaction models that estimate whether ESG effects vary across vehicle structures. Foundation serves as the reference category, and interaction terms capture differential effects for listed funds, unlisted funds, and real estate companies.

Market discipline appears to determine whether operational efficiencies translate to profitability. Table 10 presents interaction analysis for operating margin, ROIC, and ROE.

Listed funds show strong positive ESG effects across metrics. Operating margins increase 2.3 pp per ESG score point ($p < 0.001$), ROIC increases 0.4 pp ($p < 0.01$), and ROE increases 0.7 pp ($p < 0.001$). These effects are statistically robust and economically meaningful, indicating that high-ESG listed funds systematically outperform low-ESG peers.

Unlisted funds show mixed results. Operating margins increase 3.9 pp ($p < 0.001$), representing the strongest margin effect we observe, but profitability does not improve. ROIC shows no statistically significant relationship, while ROE is neg-

Table 10: Interaction Analysis: ESG Effects by Legal Structure

	Marginal ESG Effect by Legal Structure			
Metric	Foundation	Listed Fund	Unlisted Fund	RE Company
Operating Margin	-0.000	0.023***	0.039***	–
ROIC	-0.002	0.004**	-0.003	–
ROE	-0.004	0.007***	-0.005	0.006
Joint F-test for ESG interaction terms (H0: all = 0):				
Operating Margin	F(3, 318) = 6.95, p = 0.001			
ROIC	F(3, 323) = 8.41, p = <0.001			
ROE	F(3, 322) = 6.90, p = <0.001			

Notes: Marginal ESG effects by legal structure are linear combinations of baseline and interaction coefficients. Reported p-values are computed using the HC3 robust covariance of the fitted model (not by reusing the interaction-term p-values). Joint F-tests assess significance of the three interaction terms. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

ative (about -0.5 pp per ESG point, $p < 0.05$). Unlisted funds therefore appear to capture operational efficiency gains that do not translate to higher profitability, consistent with costs offsetting operational benefits.

Foundations show no statistically significant ESG effects across operating margin, ROIC, and ROE. ESG integration neither improves nor harms foundation performance in our sample.

F-tests confirm that interactions are jointly significant: operating margin F(3,318) = 6.95, $p = 0.001$; ROIC F(3,323)=8.41, $p < 0.001$; ROE F(3,322)=6.90, $p < 0.001$. ESG effects are thus not uniform across legal structures, and pooled models misspecify by imposing homogeneity.

Market discipline mechanisms help explain this heterogeneity. Listed funds face continuous public valuation, as stock prices adjust daily to new information. Analyst coverage and investor relations create transparency, ESG disclosure requirements become competitive necessities, greenwashing is penalized through valuation discounts, and genuine ESG implementation contributes to market pre-

miums.

Unlisted funds operate without comparable discipline because limited secondary markets reduce the signaling value of ESG information. The institutional investor base may still demand sustainability effort, so that efficiency gains translate to margins, but costs and structural frictions appear to limit profitability monetization.

Foundations operate under non-profit mandates. Mission alignment may already incorporate sustainability considerations, and operational simplicity limits margin improvement opportunities. Lower competitive pressure further reduces ESG differentiation value.

5.2.5 Interpretation Framework

Four patterns emerge together. They form a coherent framework for understanding ESG in real estate.

First, operational benefits are real. ESG is associated with margin improvements of 2.0 pp ($p < 0.001$). Energy efficiency is associated with lower costs and building certifications are associated with premium tenants. These factors are associated with measurable value.

Second, valuations recognize fundamentals. ESG scores predict 6-month forward returns (+1.3 pp, $p = 0.016$). Investors gradually incorporate operational advantages as semi-annual financial reports confirm margin improvements. Market recognition operates through observable performance, not ESG branding.

Third, implementation costs offset gains. Zero profitability effects despite margin benefits and market recognition indicate costs appear to offset gains. Expenditures, such as compliance expenses, reporting overhead, green capital expendi-

tures, and specialized personnel, appear to neutralize bottom-line impacts.

Fourth, market structure determines monetization in accounting profitability. This balance operates differently across legal structures: listed funds show ESG associations with profitability; unlisted funds show margin benefits without profitability translation; foundations show no statistically significant effects. Market discipline is associated with whether operational improvements translate into profitability.

Real estate companies show imprecise effects due to smaller samples. We observe a negative association with ROIC, while operating margin and ROE effects are not statistically distinguishable from zero in the interaction specification.

Together, these patterns help reconcile contradictory prior findings. Studies of listed REITs often find positive profitability effects, consistent with stronger disclosure and investor scrutiny. Evidence for unlisted portfolios is more mixed, consistent with weaker profitability translation and greater valuation frictions. Our framework identifies patterns in when, how, and under what conditions ESG is associated with performance.

Our identification strategy cannot establish causal direction definitively, and three interpretations fit the evidence.

Under a causal interpretation, ESG integration drives operational improvements that are then offset by implementation costs. Forward-looking results (+2.4 pp for future margins) suggest that at least some causal effects may operate.

Under a selection interpretation, asset quality generates both high ESG scores and strong performance. Environmental metrics capture largely fixed building characteristics, and cross-sectional variation reflects quality sorting rather than ESG integration effects.

A hybrid mechanism may also operate. High-quality assets provide the founda-

tion through inherent characteristics (selection), while professional management of those assets enhances ESG reporting and achieves marginal operational gains (causality).

Environmental dominance supports the selection channel. The E score measures largely immutable building characteristics. Energy systems, structural attributes, and certifications are determined at construction or major renovation and are typically not changed through ongoing ESG integration practices. Social and governance policies can be modified more easily, yet they show zero financial effects.

For investors, the association matters regardless of mechanism. High-ESG vehicles deliver superior margins whether through causality or selection, so portfolio allocation should incorporate ESG scores as performance signals. For fund managers seeking performance improvements through ESG integration, the selection channel implies limits: much of the ESG–margin relationship may reflect immutable asset characteristics.

5.3 Supporting Evidence

5.3.1 Mechanism Identification: Environmental Dominance

Component decomposition reveals which ESG dimensions drive financial performance. Environmental practices drive operational efficiency, while social and governance practices do not. Table 11 presents results for all five metrics.

Environmental scores increase operating margins by 1.4 pp ($p < 0.001$). This is the strongest component effect we observe. Social and governance scores show no significant effect on operating margins ($p = 0.386$ and $p = 0.736$, respectively).

For profitability metrics (ROIC, ROE), no individual ESG component shows significance. For cost efficiency (TER) and market valuation (agio), Social scores

show negative associations (TER: S = -0.0003, $p = 0.016$; Agio: S = -0.029, $p = 0.020$), though these effects are secondary to the dominant operating margin channel. The concentration of effects in operating margins reflects operational mechanisms. Energy efficiency upgrades reduce utility costs directly. Emissions reduction improves asset quality. Green certifications (Minergie, SNBS) attract premium tenants and create regulatory advantages. These environmental initiatives translate to measurable margin improvements through identifiable channels.

Social and governance initiatives lack comparable operational mechanisms. Tenant engagement programs, diversity policies, and board independence serve stakeholder objectives. They do not reduce operating costs, while benefits operate through different channels—reputation, legal risk reduction, employee retention—not captured in short-run margins.

For financially-focused investors, this suggests concentrating ESG budgets on environmental retrofits rather than broad sustainability mandates. The environmental dominance finding aligns with literature on green building premiums (Holtermans and Kok, 2019). Our results suggest these premiums translate to operational margins but not bottom-line profitability once implementation costs are considered.

5.3.2 Additional Market Performance Details

Beyond the core 6-month return finding documented in Section 5.2.2, we examine component decomposition and legal structure heterogeneity for market metrics. Table 12 decomposes ESG effects into Environmental, Social, and Governance components for market metrics.

For 6-month returns, none of the E/S/G components are statistically significant (Social = 0.004, $p = 0.304$; Environmental = 0.002, $p = 0.562$; Governance = 0.008,

Table 11: Component Analysis: E, S, G Effects on Financial Metrics

	ESG Specification			
Metric	Total ESG	E Score	S Score	G Score
Operating Margin	0.020***	0.014***	0.003	-0.001
ROIC	0.001	0.001	-0.001	0.001
ROE	0.001	0.001	-0.001	0.001
TER	0.0001	0.0002	-0.0003*	0.0001
Agio	-0.028	-0.007	-0.029*	0.001

Notes: Each column compares total ESG specification with E/S/G decomposition. All models include legal structure dummies, log(AuM), debt ratio (where relevant), and period fixed effects. HC3 robust standard errors. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 12: Market Performance: Component Analysis

	ESG Specification			
Metric	Total ESG	E Score	S Score	G Score
6-Month Forward Return	0.013*	0.002	0.004	0.008
180-Day Volatility	-0.014	-0.025	0.024	0.006

Notes: Component specifications replace total ESG score with E, S, G scores separately. All models include legal structure dummies, log(AuM), debt ratio (where relevant), and period fixed effects. HC3 robust standard errors. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

$p = 0.071$). This contrasts with operating margin, where Environmental dominates. The component analysis for returns should be interpreted as exploratory given the small, imprecise coefficients. Volatility components are all insignificant, reinforcing that ESG does not affect return variability.

Table 13 presents marginal ESG effects by legal structure using interaction models. Interaction models suggest that ESG-return predictability may vary across legal structures, but the evidence is not sufficiently sharp to make legal-structure-specific market claims the main takeaway. We therefore treat these interactions as exploratory, and emphasize the pooled predictive relationship documented in

Table 8.

Table 13: Market Performance: Legal Structure Interactions

	Marginal ESG Effect by Legal Form			
Metric	Foundation	Listed Fund	Unlisted Fund	RE Company
6-Month Forward Return	-0.005	0.005	0.021*	0.127*
180-Day Volatility	0.024	0.021	0.101	-0.963

Notes: Table reports marginal ESG effects on 6-month returns and 180-day volatility by legal structure as linear combinations of baseline and interaction terms. Reported p-values are computed using the HC3 robust covariance of the fitted model. Models include log(AuM), debt ratio, and period fixed effects. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

5.3.3 Cost Efficiency and Market Valuation

Table 14 examines cost efficiency, based on the TER. The ESG coefficient is insignificant ($p = 0.417$). ESG integration does not systematically increase or decrease expense ratios.

Table 14: Regression Results: Total Expense Ratio

Dependent variable: TER (Annual Operating Costs / NAV)			
Variable	Coefficient	Std. Error	t-stat
ESG Score	0.0001	0.0002	0.81
Listed Fund	0.004***	0.0003	12.60
Unlisted Fund	0.004***	0.0005	9.02
Log(AuM)	-0.001***	0.0002	-4.47
Period 2 (Jun 2024)	0.0001	0.0005	0.14
Period 3 (Dec 2024)	0.0001	0.0005	0.17
Period 4 (Jun 2025)	-0.0002	0.0005	-0.38
Constant	0.021***	0.003	6.45
R^2		0.429	
Adjusted R^2		0.417	
N		337	

Notes: HC3 heteroskedasticity-robust standard errors. Debt ratio omitted as it is not directly relevant. for cost structures. Sample limited to investment funds (companies do not report TER). $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Both listed and unlisted funds show significantly higher TERs than foundations (coefficients=0.004, $p < 0.001$ for both). Larger funds benefit from economies of scale (log (AuM) coefficient=$-$0.001, $p < 0.001$). The high R^2 (0.429) indicates legal structure and size strongly predict expense ratios. ESG scores add no explanatory power.

Table 15 examines whether ESG affects market valuation, through vehicle's agio. The ESG coefficient is negative but not statistically significant (coefficient=$-$0.028, $p = 0.090$).

Table 15: Regression Results: Market Valuation (Agio)

Dependent variable: Agio (Market Price / NAV - 1)			
Variable	Coefficient	Std. Error	t-stat
ESG Score	-0.028	0.016	-1.70
Listed Fund	0.215***	0.049	4.35
Unlisted Fund	0.150**	0.055	2.71
Real Estate Company	-0.071	0.146	-0.48
Log(AuM)	0.058***	0.014	4.16
Debt Ratio	-0.520**	0.167	-3.12
Period 2 (Jun 2024)	0.014	0.034	0.41
Period 3 (Dec 2024)	0.014	0.034	0.43
Period 4 (Jun 2025)	0.106**	0.033	3.23
Constant	-1.089***	0.271	-4.01
R^2		0.289	
Adjusted R^2		0.261	
N		233	

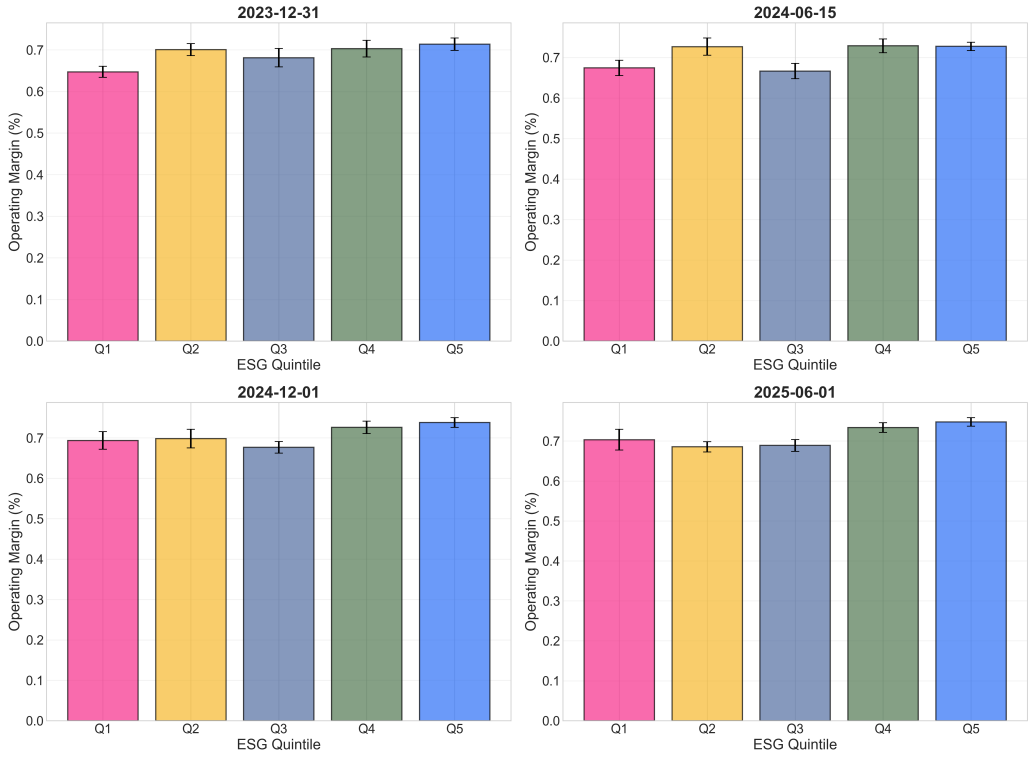
Notes: HC3 heteroskedasticity-robust standard errors. Sample limited to closed-end funds with market prices (excludes foundations and some companies). $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Listed and unlisted funds trade at significant premiums to NAV (coefficients=0.215 and 0.150, $p < 0.01$). Larger funds command higher premiums (coefficient=0.058, $p < 0.001$). Higher leverage associates with discounts (coefficient=$-$0.520, $p = 0.002$).

5.3.4 Quintile Analysis

To visualize ESG-performance relationships, we divide the sample into ESG score quintiles. Q1 represents lowest ESG scores and Q5 represents highest. We examine operating margin patterns. Figure 10 presents results. Operating margin shows modest improvement from Q1 (68%) to Q5 (75%). This is consistent with our regression finding of a 2.0 pp increase per ESG score point.

Figure 10: Operating margin by ESG score quintile



Notes: Each bar shows mean operating margin within ESG quintiles (Q1=lowest, Q5=highest). Error bars represent 95% confidence intervals. The gradient from Q1 to Q5 confirms the positive ESG-margin relationship identified in regression analysis.

This visual pattern reinforces the regression results. The monotonic gradient across quintiles provides univariate evidence of ESG-margin association. As shown in multivariate regressions controlling for legal structure, size, and leverage (Section 5.2.1), this relationship operates specifically through environmental prac-

tices. Distributional analysis for other financial metrics (ROIC, ROE, TER, agio) appears in Appendix B.

Appendix C presents comprehensive robustness checks across multiple dimensions: alternative time horizons (3-month, 1-year returns), clustered standard errors, forward vs. backward-looking specifications, subperiod stability, winsorized treatments, and maintenance cost adjustments. The main findings remain stable across all specifications. The operating margin effect (2.0 pp per ESG point) survives all robustness checks and strengthens in forward-looking specifications (2.4 pp), supporting predictive power. Return coefficients increase across time horizons (0.4% at 3 months, 1.4% at 6 months, 2.2% at 1 year), aligning with semi-annual reporting cycles. Profitability metrics (ROIC, ROE) remain insignificant on average across all specifications. Controlling for maintenance intensity strengthens rather than eliminates the operating margin effect, suggesting ESG captures operational efficiency beyond capital deployment. Detailed results appear in Tables C5–C4.

6 Discussion and Conclusion

6.1 Core Findings

Three complementary patterns characterize ESG–performance relationships in Swiss real estate. First, ESG appears to capture operational fundamentals, with operating margins increasing 2.0 percentage points per ESG score point through environmental practices (energy efficiency, building certifications). Second, markets recognize these fundamentals: ESG scores predict 6-month forward stock returns of 1.3 percentage points as investors gradually incorporate operational advantages confirmed in semi-annual reports. Third, implementation costs offset operational gains at the profitability level, as return on invested capital and return on equity show zero ESG effects as compliance expenses, reporting overhead, and green capital expenditures neutralize bottom-line impacts. Fund structure then determines monetization: listed funds convert sustainability into profitability gains through market discipline (margins +2.3 pp, ROIC +0.4 pp, ROE +0.7 pp), while unlisted funds capture margin benefits (+3.9 pp) without profitability translation and foundations show no effects. Real estate companies exhibit patterns similar to listed funds in market returns, though limited sample size ($N \approx 36$) prevents conclusive interaction analysis.

6.2 Mechanism and Interpretation

Environmental practices drive operational value through tangible building characteristics. Energy efficiency reduces utility costs directly, emissions reduction improves asset quality, and green certifications (Minergie, SNBS, LEED) attract premium tenants and create regulatory advantages (Fuerst and McAllister, 2011;

Holtermans and Kok, 2019). These environmental initiatives thus translate to measurable margin improvements through identifiable cost mechanisms. Physical building characteristics appear to matter more than fund-level policies, consistent with findings on green building premiums (Devine and Yönder, 2021).

Social and governance practices serve different objectives. Tenant engagement programs, diversity policies, and board independence primarily address stakeholder relations. These initiatives do not reduce operating costs, and benefits instead operate through reputation, legal risk reduction, and employee retention, which are channels not captured in short-run margins. The zero financial effects we document for S and G are consistent with this fundamental difference in operational mechanisms.

Implementation costs offset operational gains at the profitability level. Green retrofits require significant capital, energy system upgrades demand specialized expertise, compliance expenses include reporting personnel and verification costs, and sustainability reporting demands additional resources. These expenditures appear to neutralize the margin benefits observed in high-ESG vehicles. At the margin, costs and benefits therefore tend to balance.

Market structure determines whether operational improvements translate to investor returns. Listed funds face continuous price discovery through daily trading, analyst coverage creates transparency, and investor relations and ESG disclosure become competitive requirements. Greenwashing is penalized through valuation discounts, so this market discipline converts margin improvements into profitability gains. Unlisted funds operate in illiquid secondary markets with institutional investor bases, where limited trading reduces the signaling value of ESG information. Foundations serve non-profit mandates where mission alignment supersedes profit optimization. Real estate companies, as publicly traded enti-

ties, show patterns consistent with listed funds, though sample constraints limit definitive conclusions. These structural differences help explain why identical margin benefits produce different profitability outcomes.

6.3 Practical Implications

6.3.1 For Performance-Focused Investors

Listed fund investors should incorporate ESG as a performance factor. On average, high-ESG listed vehicles deliver 2.3 pp higher margins, 0.4 pp higher ROIC, and 0.7 pp higher ROE. Market discipline converts operational improvements into profitability gains. Real estate companies, though a small sample, show similar return patterns, suggesting comparable market dynamics.

Environmental scores drive all observed financial benefits. Energy efficiency and building certifications (Minergie, SNBS) create tangible operational advantages. Social and governance dimensions show insignificant financial effects in our sample, though they may offer non-financial benefits such as stakeholder relations, regulatory compliance, and risk mitigation. For performance-focused portfolios, emphasizing environmental metrics may therefore be more effective than relying on aggregate ESG scores.

ESG serves as a tiebreaker among otherwise similar vehicles. Legal structure and manager quality should drive primary allocation decisions, while listed fund liquidity premiums, foundation fee advantages, and unlisted fund illiquidity discounts dominate performance differences.

6.3.2 For Values-Driven Investors

Unlisted fund and foundation investors can pursue ESG mandates without financial penalty. Unlisted funds show margin benefits of 3.9 pp but no profitability translation. Foundations show no effects across all metrics. ESG integration enables values alignment at zero cost.

Expectations should be realistic. ESG does not generate systematic outperformance in these structures. Margin benefits exist but implementation costs offset them. Investment committees should frame ESG as stakeholder alignment and risk management, not alpha generation.

6.3.3 For Fund Managers

Listed fund managers should pursue aggressive ESG integration. Market discipline converts sustainability practices into profitability gains. The 2.3 pp margin premium and 0.4 pp ROIC improvement justify substantial ESG investments. Transparency and reporting become competitive advantages. Investor scrutiny rewards genuine implementation over superficial compliance.

Unlisted fund and foundation managers face different incentives. ESG represents regulatory compliance and stakeholder alignment rather than performance differentiation. Managers should pursue cost-effective sustainability practices that satisfy investor mandates.

6.3.4 For Regulators and Industry

Sector-specific ESG frameworks are needed for real estate. Energy efficiency and building performance create direct value. Social and governance practices operate through different channels, notably as risk mitigators.

PRESS scores demonstrate the value of standardized assessment based on public data. Coverage now reaches 130 vehicles representing CHF 220 billion. Public data reduces reliance on self-reported metrics and mitigates greenwashing risks. Building-level indicators provide objective performance measures. Methodology transparency enables external validation. This transparency-based approach should become industry standard.

6.4 Limitations and Boundary Conditions

Four boundary conditions define the applicability of our findings.

The first concerns identification. Cross-sectional identification cannot establish causal direction definitively. Our analysis exploits variation across funds and periods but not within-fund changes over time. ESG scores evolve slowly in our 2.5-year panel, so we identify primarily from differences between high-ESG and low-ESG vehicles. Environmental dominance suggests selection plays a meaningful role: E scores measure largely fixed building characteristics determined at construction or major renovation, and energy efficiency systems, structural attributes, and certifications reflect inherent building quality. High-quality assets naturally achieve superior environmental ratings and operational efficiency. Forward-looking results provide some support for causal effects—ESG scores predict future margins more strongly than contemporaneous margins—yet this evidence remains consistent with persistent quality differences. For investors, the association matters regardless of mechanism, as high-ESG listed funds deliver measurably better margins. For fund managers, the selection channel implies limits, since purchasing high-quality buildings differs from improving existing portfolios through retrofits.

The second concerns temporal scope. Our sample spans 2.5 years (December

2022 to June 2025), which limits inferences about long-run relationships. ESG effects may manifest over longer horizons: building retrofits require years to complete and reputation benefits accumulate gradually. Our analysis captures short-to-medium-run effects in a specific market context, associated with interest-rate and property-market volatility and accelerating ESG adoption. The cost–benefit balance we document therefore applies to this period and context. Whether this balance persists over full economic cycles remains unknown; structural shifts in regulation, investor preferences, or technology could alter relationships. Longer panels spanning multiple market cycles would strengthen inference.

The third concerns measurement evolution. PRESS methodology expanded substantially in June 2024, when new metrics for green space, accessibility, reinvestment, and diversification were added. Sample composition changed dramatically: December 2023 covered 42 vehicles, whereas June 2024 covered 128 vehicles. The 87 new vehicles added may differ systematically from the original sample. These changes create potential measurement discontinuity, although our subperiod robustness checks show stable results pre- and post-expansion. Time fixed effects and legal structure controls mitigate composition concerns, but changing metrics still complicate temporal comparisons. Balanced-panel analysis over longer horizons would address this concern.

The fourth concerns performance heterogeneity. Different legal structures report different metrics: investment funds report NAV-based returns; real estate companies report RONA/ROGA; foundations report ROE. This heterogeneity in accounting bases requires methodological compromises. Following Alessandrini et al. (2022), we analyze multiple metrics separately rather than create artificial unified measures. Operating margin, ROIC, and ROE capture different performance aspects. This complicates synthesis across specifications but respects fundamental structural differences. Unified metrics would impose additional as-

sumptions given heterogeneous business models.

6.5 Conclusion

This study contributes three conceptual advances for understanding the ESG and performance relationship in real estate.

First, mechanism identification. Environmental practices drive operational value through tangible building characteristics. Energy efficiency and building certifications create direct cost savings, while social and governance dimensions serve stakeholder objectives without comparable operational mechanisms. This challenges aggregate ESG scoring and motivates sector-specific frameworks. In real estate, physical building performance creates measurable value; policy initiatives serve different purposes.

Second, dual-channel value creation. ESG affects both operational fundamentals and market pricing. Operating margins improve through energy efficiency, and markets recognize these improvements through stock prices. However, implementation costs limit net profitability gains, as compliance expenses, reporting overhead, and green capital expenditures offset margin benefits. This reconciles positive operational effects with neutral return outcomes: costs and benefits balance at the margin.

Third, structural moderators. Market discipline determines ESG monetization patterns. Listed funds face continuous valuation, investor scrutiny, and secondary market liquidity, and this discipline converts operational improvements into profitability gains. Unlisted funds operate in illiquid markets that prevent monetization, while foundations serve non-profit mandates where differentiation value is limited. These structural differences help explain contradictory findings in prior research—studies of listed REITs find positive effects (Fuerst, 2015), whereas

evidence for unlisted vehicles is weaker. Our framework identifies boundary conditions under which ESG is associated with performance.

These advances provide actionable guidance. Performance-focused investors in listed vehicles should incorporate ESG as a performance factor. Values-driven investors in unlisted funds and foundations can pursue ESG mandates without financial penalty. Fund managers should tailor strategies to legal structure: listed funds can justify more aggressive integration, whereas unlisted funds and foundations may prioritize cost-effective compliance. For financially oriented strategies, environmental retrofits show the clearest measurable returns, although social and governance initiatives may offer complementary benefits through stakeholder relations and risk management.

The framework applies to real estate with sector-specific operational mechanisms. The documented cost–benefit balance reflects the current market context (2023-2025), and market structure determines whether operational improvements translate to investor returns. Beyond typical ESG–return correlations, this analysis seeks to identify when, how, and why ESG affects performance in real estate.

A Data Sources and Construction

A.1 PRESS Scores Data Sources

PRESS scores combine building-level quantitative indicators with fund-level qualitative indicators. Data sources include:

Building Registry Data: Federal Building and Housing Registry (RegBL) provides property locations, construction years, and structural characteristics for all Swiss buildings.

Energy Data: Energy intensity estimates use gradient boosting algorithms trained on Geneva building data, while the MeteoSwiss solar energy database provides solar panel installation data.

Emissions Data: CO_2 calculations follow Intep (2022) emission factors, covering Scope 1 (direct) and Scope 2 (indirect) emissions.

Land Use Data: Federal Statistical Office (FSO) land use databases provide green space measurements and geographic context.

Accessibility Data: OpenStreetMap provides amenities location data. Distance calculations use geographic coordinates to measure accessibility within a 700m radius for residential properties.

Noise Data: Federal Office for the Environment (FOEN) noise maps provide outdoor noise pollution metrics.

Rental Data: Quanthome rental advertisements provide market rental pricing data, enabling comparison of fund properties to local market averages.

Demographic Data: STATPOP provides demographic context for accessibility calculations.

A.2 Financial Data Sources

Quanthome collects financial data from annual and semi-annual reports. Swiss regulations require REIVs to disclose comprehensive information semi-annually, and the dataset covers 147 unique REIVs across six periods from December 2022 to June 2025.

Data collection follows standardized procedures. Each report is downloaded from fund websites or regulatory filings, and financial metrics are extracted using automated parsing with manual verification. The resulting dataset contains 115 variables including net asset value, market capitalizations, performance metrics, fee structures, profit and loss statements, debt metrics, and valuation indicators.

A.3 Temporal Alignment Methodology

Matching PRESS scores with financial data requires careful temporal alignment. We use asof-join methodology implemented in Polars. For each PRESS score release, we match it with the most recent financial data published before that release date.

The matching proceeds as follows. First, we filter financial records to those published before the PRESS release date. Second, for each ISIN, we select the most recent financial report. Third, we join PRESS scores to matched financial records on ISIN and date. This backward-looking approach prevents look-ahead bias and ensures PRESS scores are matched only with information that was publicly available at the time.

Forward temporal alignment (robustness check) reverses this logic: each PRESS score is matched with the earliest financial report published after the release date. This tests whether ESG scores predict future performance rather than merely relating to past performance. Results appear in Appendix C.3.

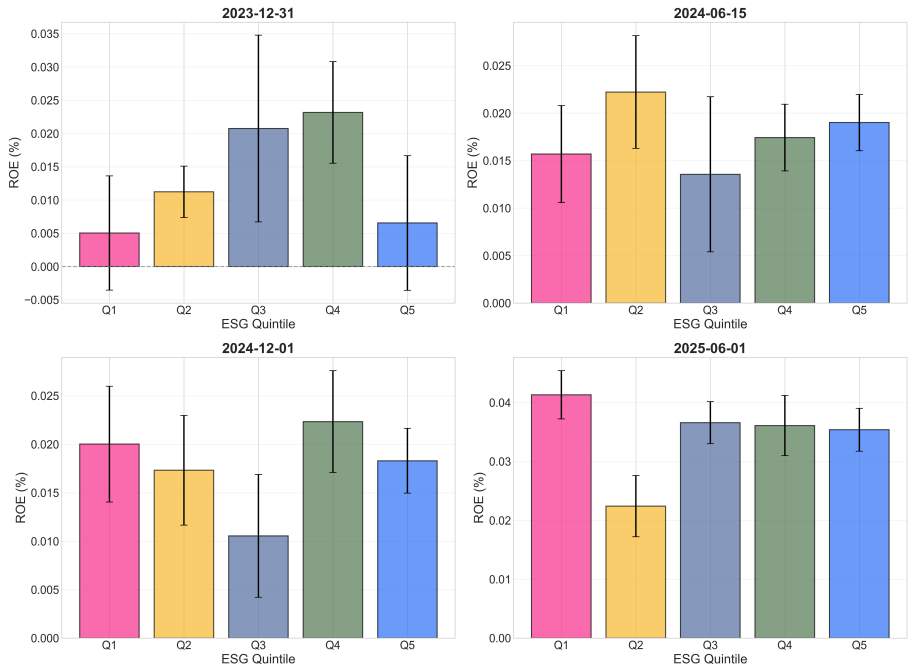
B Distributional Analysis: Financial Metrics by ESG Quintiles

This appendix presents quintile-level visualizations for all five financial metrics examined in the main analysis. We divide the sample into ESG score quintiles (Q1=lowest, Q5=highest) and compare mean values. These figures complement the regression analysis by illustrating distributional patterns across the ESG spectrum.

Figure B1 shows return on equity across quintiles. No monotonic pattern emerges, consistent with the null regression finding (coefficient = 0.001, $p = 0.390$). Similarly, Figure B2 presents return on invested capital, which shows no clear gradient. Total expense ratio (Figure B3) exhibits no systematic variation across ESG levels, aligning with the insignificant regression coefficient. Market valuation measured by agio (Figure B4) shows no consistent ESG relationship in quintile comparisons.

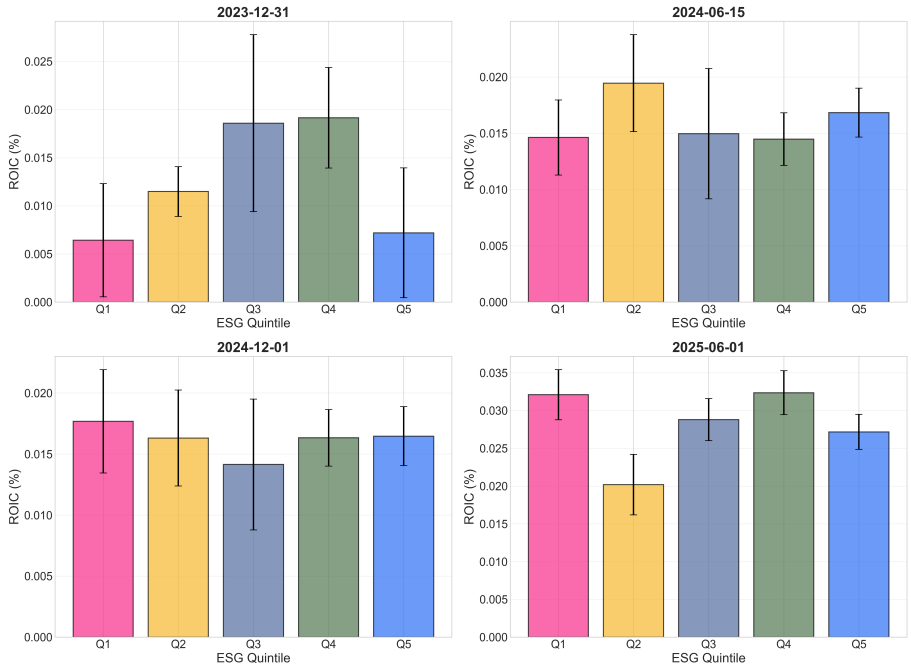
These distributional patterns reinforce the main findings: ESG integration associates with operational efficiency (operating margin, shown in main text Section 5.3.4) but not with profitability, cost structures, or market valuations once we control for legal structure, size, and leverage heterogeneity.

Figure B1: Return on Equity by ESG Score Quintile



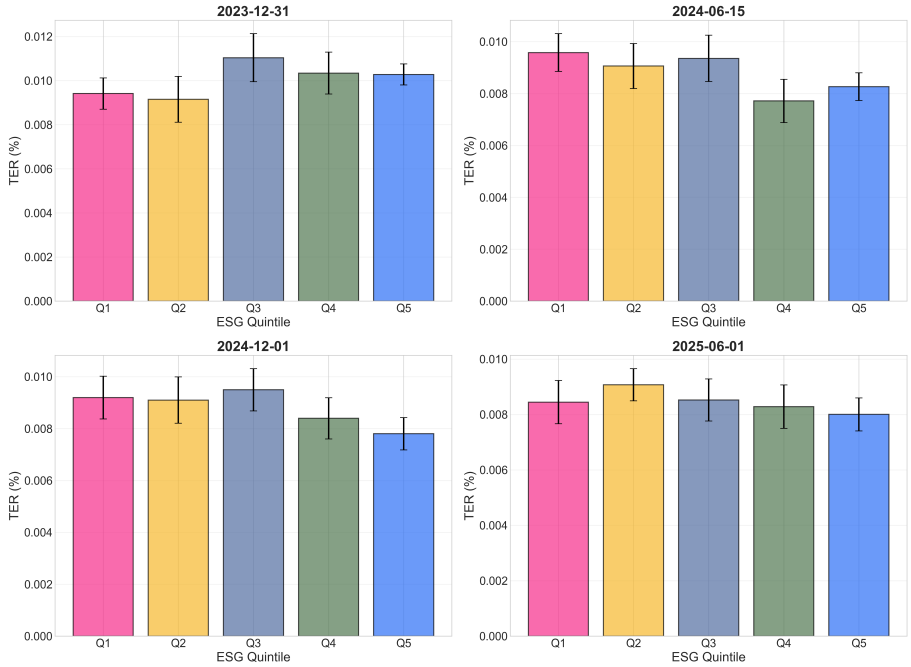
Notes: Each bar shows mean ROE within ESG quintiles (Q1=lowest, Q5=highest). Error bars represent 95% confidence intervals. No clear gradient emerges, consistent with null regression effect.

Figure B2: Return on Invested Capital by ESG Score Quintile



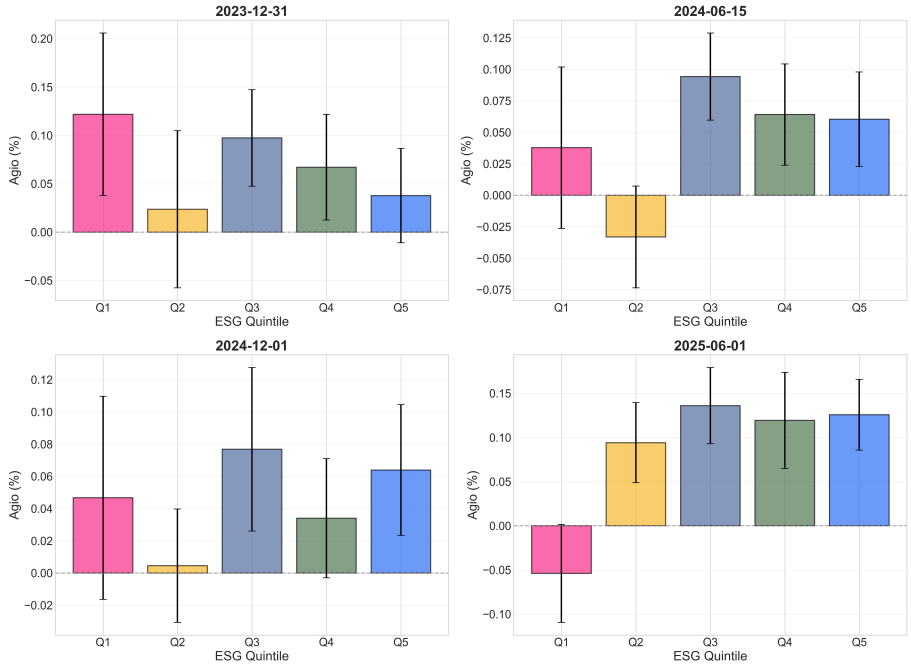
Notes: Each bar shows mean ROIC within ESG quintiles (Q1=lowest, Q5=highest). Error bars represent 95% confidence intervals. No systematic pattern visible across quintiles.

Figure B3: Total Expense Ratio by ESG Score Quintile



Notes: Each bar shows mean TER within ESG quintiles (Q1=lowest, Q5=highest). Error bars represent 95% confidence intervals. ESG integration does not systematically affect TER.

Figure B4: Market Valuation (Agio) by ESG Score Quintile



Notes: Each bar shows mean agio (market price / NAV - 1) within ESG quintiles (Q1=lowest, Q5=highest). Error bars represent 95% confidence intervals. No consistent ESG-valuation relationship emerges in distributional analysis.

C Robustness Checks

C.1 Alternative Time Horizons

Table C1 tests whether ESG-market performance relationships vary across prediction horizons. The main specification uses 6-month forward returns and 180-day volatility, aligning with semi-annual reporting cycles. We test robustness using 3-month and 1-year horizons.

Return coefficients increase monotonically: 0.4% at 3 months (not significant, $p = 0.224$), 1.3% at 6 months (significant, $p = 0.016$), and 2.2% at 1 year (marginally significant, $p = 0.090$). This pattern suggests compounding value creation, with statistical power peaking at the 6-month reporting cycle despite the 3-month horizon having the largest sample ($N = 278$ at 3-month, $N = 198$ at 6-month, $N = 120$ at 1-year).

Volatility effects remain insignificant at all horizons, ruling out risk reduction interpretations.

Table C1: Robustness Check: Alternative Time Horizons for Market Metrics

	Forward Returns			Volatility		
Horizon	ESG Coef	p-value	N	ESG Coef	p-value	N
3-Month	0.004	0.224	278	-0.037	0.138	242
6-Month (Main)	0.013*	0.016	198	-0.014	0.532	175
1-Year	0.022	0.090	120	-0.001	0.973	108

Notes: Tests whether ESG-market performance relationships vary with prediction horizon. Main specification uses 6-month forward returns and 180-day volatility. 3-month horizon uses 3-month forward returns and 90-day volatility. 1-year horizon uses 1-year forward returns and 250-day volatility. Horizons are matched forward relative to PRESS releases, so the market metric corresponds to the window following each PRESS release. ESG coefficients and significance levels reported for both return and volatility models. All models include legal structure dummies, log(AuM), debt ratio, and period fixed effects. HC3 robust standard errors. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

C.2 Clustered Standard Errors

Our main specifications use HC3 robust standard errors, which address heteroskedasticity but assume observations are independent. Panel data violate this assumption: the same fund appears multiple times across periods. We re-estimate all models with standard errors clustered at the fund level (ISIN). Table C2 shows results.

Inference is unchanged. The operating margin ESG coefficient remains highly significant with clustered errors (coefficient = 0.020, $p = 0.003$). Profitability metrics remain insignificant. Temporal correlation within funds does not affect our conclusions.

Table C2: Robustness Check: Clustered Standard Errors (Entity-Level)

	Operating Margin		ROIC		TER	
	HC3	Clustered	HC3	Clustered	HC3	Clustered
ESG Coefficient	0.020***	0.020**	0.001	0.001	0.000	0.000

Notes: HC3 column uses heteroskedasticity-consistent standard errors. Clustered column uses standard errors clustered at fund level (ISIN) to account for temporal correlation within entities. ESG coefficients and significance levels reported. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

C.3 Forward-Looking Analysis

Our main analysis matches PRESS scores with prior financial data (backward alignment). This prevents look-ahead bias but raises a question: does ESG relate to past performance or predict future performance? We test predictive power using forward alignment, matching PRESS scores with subsequent financial reports.

Table C3 presents results. The operating margin ESG relationship strengthens in the forward specification (coefficient = 0.024, $p < 0.001$ vs backward 0.020, $p < 0.001$). This shows that ESG scores are associated with future operational efficiency, consistent with (though not proving) a causal interpretation. High-ESG vehicles show margin improvements going forward, not just historically.

Profitability metrics (ROIC, ROE) and costs (TER) remain insignificant in forward alignment. Market valuation (agio) shows weaker negative effects in the forward specification, becoming fully insignificant. The pattern holds: ESG integration does not systematically predict future profitability differences.

C.4 Winsorization

To address potential outlier influence, we winsorize all financial metrics at 1st and 99th percentiles. Extreme values are capped at these thresholds rather than excluded. Results are substantively unchanged. ESG coefficients remain insignificant for ROIC and TER with winsorized data. Outliers do not drive our null profitability findings.

Table C3: Robustness Check: Forward-Looking Analysis (ESG Predicts Future Performance)

	Backward Alignment (PRESS → Past Performance)		Forward Alignment (PRESS → Future Performance)	
Metric	ESG Coef	N	ESG Coef	N
Operating Margin	0.020***	329	0.024***	339
ROIC	0.001	334	0.000	342
ROE	0.001	335	0.001	351
TER	0.000	337	0.000	345
Agio	-0.028	233	-0.008	253

Notes: Backward alignment matches PRESS scores with prior financial data (standard approach, prevents look-ahead bias). Forward alignment matches PRESS scores with subsequent financial reports (tests whether ESG predicts future performance). ESG coefficients reported for all five metrics. Operating margin shows stronger effect in forward specification, suggesting ESG drives future efficiency improvements. HC3 robust standard errors. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

C.5 Maintenance Intensity Controls

A potential concern is omitted variable bias from capital expenditure patterns. High-ESG vehicles might invest more in renovations and upgrades. This could confound the ESG-performance relationship. We test this using maintenance spending intensity as a proxy for capital expenditure.

We estimate two specifications. The first adds extraordinary maintenance intensity (major renovations and capital improvements divided by total market value). The second adds total maintenance intensity (routine plus extraordinary expenses divided by total market value). Table C4 presents detailed results.

The ESG coefficient strengthens rather than attenuates. Operating margins show coefficients of 0.022 ($p = 0.002$) with extraordinary maintenance controls and 0.025 ($p < 0.001$) with total maintenance controls. Both exceed the baseline coefficient of 0.020. This pattern suggests ESG captures operational efficiency beyond capital deployment patterns. Maintenance spending reduces margins as expected. But controlling for this spending does not eliminate the ESG effect.

Table C4: Robustness Check: Maintenance-Controlled Analysis

	Operating Margin	ROIC	TER
Main (no control)	0.020***	0.001	0.000
+ Extraordinary Maint.	0.022**	0.000	0.000
+ Total Maint.	0.025***	0.002	0.000

Notes: Tests whether ESG-performance relationships survive after controlling for maintenance spending intensity. Main specification includes no maintenance controls. Extraordinary maintenance (major renovations and capital improvements) serves as CAPEX proxy. Total maintenance includes both routine and extraordinary maintenance expenses. Maintenance intensity = maintenance expenses / total market value. All models include legal structure dummies, log(AuM), debt ratio (where relevant), and period fixed effects. HC3 robust standard errors. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

C.6 Synthesis

Table C5 presents detailed results for all robustness checks summarized in Section 5.3.

Table C5: Robustness Check Summary: ESG Coefficients Across Specifications

Specification	Operating Margin	ROIC	TER
Main (HC3 robust)	0.020***	0.001	0.000
Component (E score)	0.014***	0.001	0.000
Clustered SE (ISIN)	0.020**	0.001	0.000
Forward-looking	0.024***	0.000	0.000
Winsorized (1/99 pct)	–	0.001	0.000
Extraordinary Maint. Control	0.022**	0.000	0.000
Total Maint. Control	0.025***	0.002	0.000

Notes: This table reports ESG coefficients across multiple robustness specifications. All models include legal structure dummies, log(AuM), debt ratio (where relevant), and period fixed effects. HC3 robust standard errors except clustered specification (clustered at ISIN level). Component specification uses E, S, G separately; reported coefficient is for Environmental score. Extraordinary/Total Maintenance Control specifications add maintenance intensity as control variable. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Across seven robustness specifications, the pattern is consistent: ESG integration relates positively to operational efficiency (operating margin) but shows no systematic relationship with profitability (ROIC, ROE), costs (TER), or valuations (agio). The operating margin effect survives all robustness checks and strengthens in predictive (forward-looking) specifications. Controlling for maintenance

intensity strengthens rather than eliminates the effect. This suggests that ESG captures operational efficiency beyond capital expenditure patterns. The interpretation that costs offset benefits at the profitability level appears robust to alternative specifications, temporal correlation adjustments, outlier treatment, and capital expenditure controls.

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