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Return trade-offs between environmental and social pillars of ESG scores☆

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ABSTRACT

Our analysis explores the trade-off between environmental and social factors, as we observe that the environmental and social performances of firms are negatively correlated across industries. We find that, from 2013 to 2022, firms with high environmental scores but low social scores outperformed those with low environmental scores but high social scores by an average of 0.39% per month. However, this outperformance diminished when the investment horizon began in 2016. We find that in the period following 2016, public markets began to signal an equal importance for both environmental and social pillars. Therefore, policy frameworks should aim to balance both environmental and social objectives to address the disparities created by regulations that favour one aspect of sustainability over the other.

1. Introduction

Sustainable and Responsible Investment (SRI) strategies that incorporate Environmental, Social, and Governance (ESG) factors have grown significantly, with over $30 trillion in assets managed under these frameworks as of 2022, representing roughly one-fourth of global assets under management, according to Global Sustainable Investment Alliance. While many investors consider ESG criteria collectively, an emerging trend is the emphasis on thematic strategies focusing specifically on environmental (E) or social (S) dimensions. This shift reflects a growing recognition of the need to balance socio-ecological aspects of investments, not only from the perspective of investors but policymakers as well (Sabato and Mandelli, 2024).

It is well documented in the financial literature that the environmental and social performance of firms is associated with their financial performance and valuation (see, for example, Edmans (2011), Matsumura et al. (2014), Pástor et al. (2022), Hsu et al. (2023), Ng and Rezaee (2015)). Furthermore, Liu (2018) suggests that firms performing well on the social dimension could also

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improve their environmental outcomes due to more green innovations and better decision-making by more inclusive, diverse, and highly skilled human capital. However, these dimensions do not always align, and trade-offs can emerge. Environmental initiatives, such as decarbonisation, may impose higher costs or lead to job losses, while social-focused practices, like improving worker conditions, can increase operational expenses that compete with investments in environmental sustainability. Given the strong past focus on the environmental dimension of corporate sustainability by regulators, investors, and academic researchers, it is interesting and important to understand the interactive effects of environmental and social performance. Surprisingly, to the best of our knowledge, so far, this issue has not been addressed in the abundant sustainable finance literature. Prior literature seems to provide very limited guidance on (1) how environmental performance correlates with social performance, (2) the importance of industry differences in these correlations, and (3) how investors price them interactively.

In this paper, we analyse potential trade-offs between prioritising environmental and social aspects of sustainability. We contribute to the ongoing debate and understanding of how these two dimensions of sustainability affect investor perceptions and the market performance of firms. By examining the environmental and social trade-offs we add to the understanding of if and how investment strategies balance climate action with social equity, a core principle of the "just transition" framework.

Existing investment decision tools available to institutional investors rely heavily on ESG ratings, that broadly capture sustainability risk factors. When balancing environmental and social imperatives, investors turn to environmental (herewith E) and social (herewith S) pillar scores as proxies to measure the risk and impact of these factors. Therefore, we rely on MSCI's proprietary ESG ratings to reveal how investors balance their sustainable investment strategies.

Using data on constituents of the MSCI All Country World Index (ACWI), a widely tracked global benchmark, we document several findings, providing some answers to the aforementioned questions. First, our initial data exploration reveals that the correlation between the individual E and S pillar scores is negative with strong industry effects. Some industrial sectors and companies may compensate for their poor performance in the environmental pillar by performing well in the social pillar and vice versa. In addition, some industries have higher exposure to one pillar relative to another pillar. Next, we find that green companies (E leaders) generated positive excess returns over brown (E laggards) companies during the period of analysis, that is between 2013 and 2022. The finding is fully in line with previous studies (see, for example, Pástor et al. (2022) and Ardia et al. (2023)). Furthermore, consistent with theoretical prediction in Pástor et al. (2021), this outperformance diminished post-2016, with return differentials dissipating by the end of the study period. This finding indicates that the opportunities for excess returns from prioritising environmental sustainability have decreased as the market has become more efficient and/or investors have adapted their environmental sentiment/concerns. When it comes to the social pillar, we show that leaders in the S pillar generated negative returns relative to the S pillar laggards over the same period. Interestingly, similar to the green premium, this social discount diminished by 2016 and turned into a social premium in the later part of our sample. When it comes to the interaction between the two sustainability pillars, we find that a portfolio with a long position in E leaders who are at the same time S laggards and a short position in E laggards who are at the same time S leaders generated a positive monthly raw alpha of 0.401% and positive monthly factor adjusted alpha of 0.39% over the same overall period. These excess returns dissipated after 2016, suggesting the market's adjustment to the trade-offs between the E and S pillars.

The findings are relevant to global climate change and social equity debates. This study demonstrates how financial markets currently reflect the trade-offs between ambitious environmental objectives – such as decarbonisation and biodiversity preservation – and their unintended social consequences, by highlighting the negatively correlated E and S scores across industries and providing evidence of the diminishing excess returns for portfolios prioritising one dimension over the other. By situating these results within the context of global sustainability goals, our findings emphasise the need for investment frameworks that simultaneously address climate change and social equity. For regulators, the diminishing return differentials highlight the importance of assuring a regulatory environment that promotes transparency and comprehensive integration of both sustainability dimensions, rather than relying on market forces to address the disparities created by regulations that favour one aspect of sustainability over the other. Specifically, regulatory interventions need to incentivise "win-win" solutions, that is investments that achieve environmental progress while safeguarding social outcomes. The integration of minimum social safeguards, as exemplified by the EU Taxonomy Regulation, and principles such as "Do No Significant Harm" (DNSH), offers a pathway to reconcile these priorities. This paper bridges gaps between theoretical discussions on sustainability and practical investment strategies, contributing to the design of financial systems that promote an equitable and inclusive transition to a low-carbon economy.

The rest of the paper is structured as follows. In Section 2 we provide an overview of the relevant prior literature. We describe the data in Section 3, while in Section 4 we detail the methodological approach to the analysis. Next, in Section 5 we present the results and discuss the return differentials of portfolios formed based on environmental and social factors. Finally, Section 6 concludes.

2. Related literature

Literature has widely investigated the association between firms' environmental and financial (market) performance. Investors assign lower values to firms with poor environmental performance (brown firms) (Matsumura et al., 2014) and require higher ex-ante returns (green premium) from them (El Ghoul et al., 2011; Chava, 2014; Pástor et al., 2022; Ng and Rezaee, 2015). Contrary to the green premium, Hsu et al. (2023) find that high polluters outperform low polluters in realised returns. Findings from the prior literature are therefore not unanimous regarding the link between environmental and financial performance.

Heinkel et al. (2001) suggest a theoretical model where investors focusing on green assets reduce the number of investors to polluting firms, resulting in fewer risk diversification opportunities for non-green investors. Therefore, polluting firms' stock prices drop, and the cost of capital rises. Pástor et al. (2022) explain positive realised excess returns of green firms over brown firms by

unexpected demand shifts towards green assets, driving the increase in the value of those firms. Pástor et al. (2021) argue that the expected returns for brown firms are higher than those for green firms since investors' tastes reward green firms and their potential for providing a hedging opportunity against climate risk. Similarly to Pástor et al. (2022), Ardia et al. (2023) explore the effect of investors' climate concerns on the value of green vs. brown firms and find that climate concerns drive the positive return difference between green and brown firms (green premium). In addition, they find that the green premium is driven by the differences in the discount rate, implying a higher cost of equity for brown firms. Likewise, Van der Beck (2021) derive in a structural model that realised stock returns are lower for green firms due to the large demand for green assets and not reflected in expected returns. In contrast, Bolton and Kacperczyk (2023) show that firms with higher levels and growth rates of carbon emissions have higher stock returns. A similar finding is documented by Hsu et al. (2023), the so-called pollution premium, that cannot be explained by investors' preferences, behavioural biases, corporate governance, political connections, or any other potentially related systematic risks. The differences in findings could potentially be explained by the differences in the sample period covered in the studies. For example, the sample period in Bolton and Kacperczyk (2023) is 2005–2017, in Hsu et al. (2023) 1991–2016, in Pástor et al. (2022) 2012–2020, and in Ardia et al. (2023) 2010–2018. Another potential explanation might be omitted variables that moderate (trade-off) the environmental factor effect. For example, Naffa and Czupy (2024) show that investors require lower returns from firms with low biodiversity risk.

Another stream of literature investigates the impact of different components of the social pillar of ESG on financial performance and, similar to the effect of environmental performance, documents mixed results. According to El Ghoul et al. (2011), investments into employee relations decrease the cost of capital, while positive performance in community relations, diversity, and human rights does not. Ng and Rezaee (2015) show that social sustainability does not affect the cost of capital. Regier and Rouen (2023) demonstrate that the stock market fails to fully capture the value of human capital creation as analysts underestimate earnings for firms with high investment in human capital. Long-short portfolios based on the future value of human capital produce positive economically and statistically significant abnormal returns of high human capital firms vs. low human capital firms. Findings in Edmans (2011) suggest that employee satisfaction is positively associated with shareholder returns and firm value, but the market again undervalues the importance of human capital.

Various literature also suggests that social performance may be associated with environmental performance, as improvements in human capital may ensure necessary innovations and investments in environmental protection. For example, Liu (2018) provides evidence that more women on boards lead to better environmental performance.[1] Cakar et al. (2021) explore the trade-off between human capital and the environment in a cross-country study covering 21 EU countries over the period 1994–2018. They find that the relationship between human capital and environmental performance is country-specific; human capital has a positive effect on carbon emissions when the economic growth rate is low and when financial development is high.

On the other hand, environmental performance may affect the social performance of firms. Environmental sustainability improvements may be detrimental to vulnerable social groups and countries relying on traditional carbon-intensive technologies. The literature on Just Transition discusses the need to ensure that the transition to environmentally friendly technologies does not exacerbate socio-economic inequalities (Wang and Lo, 2021; Abram et al., 2022; Ghorbani et al., 2023). However, there is a lack of empirical studies of social justice of the low carbon transitions to date (Wang and Lo, 2021). Nascent empirical research investigates the impact of low carbon transition on poverty, social injustice, unemployment, and public attitude towards energy transition in Ireland, Germany, and China (Wang and Lo, 2021; Kelly et al., 2020; Hu, 2020). Naffa and Czupy (2024) demonstrate that an investment strategy minimising biodiversity risk produces better environmental, social, and governance scores at the portfolio level.

Finally, notwithstanding the bilateral relationship between environmental and social performance, investors' preferences for these two pillars of ESG differ. For example, retail investors with purely sustainable perspectives prefer the E-Pillar, while investors with a financial perspective prefer the S-Pillar (Benuzzi et al., 2024). Furthermore, portfolio managers should consider the distinct nature of the dimensions of the ESG, as each pillar of the ESG is associated with a different level of co-movement with the market (Gyönyör and Horváth, 2024). The popularity of the topics of the E and S pillar topics in the company reports shifts over time and is affected by regulatory changes and major events like Covid-19 (Ferjančič et al., 2024). The dominance of the individual pillars of the ESG scores varies depending on time horizon (Giese et al., 2021). The literature on corporate social responsibility (Hahn et al., 2010) since 2010 has challenged the traditional "win-win" view according to which environmental, social, and economic aspects can be achieved simultaneously and calls for more research on the trade-offs in corporate sustainability. However, the trade-off between social and environmental aspects in the context of SRI strategies has not yet been researched within finance literature.

While the existing studies address the impact of environmental and social performance on stock returns and firm value, there is a lack of research on the combined effect of environmental and social performance. As the characteristics of the two pillars are related to each other and their relative importance changes over time, there is an increasing need to explore their interactive impact on the market performance of firms. Our study fills the gap in the literature by contributing to the understanding of how the financial markets price the trade-off between the environmental and social performance of companies around the world, taking into account industry-specific sustainability effects.

[1] While the number of women on boards is most commonly considered part of the Governance pillar, it also aligns with Social principles, as it reflects an organisation's commitment to diversity, equity, and inclusion, which are social concerns.

3. Data

3.1. Data sources

Although most studies on environmental and social performance rely heavily on US data, our study sample includes firms from 23 Developed Markets (DM) and 24 Emerging Markets (EM) countries. In particular, our sample covers unique constituents of the MSCI All Country World Index (ACWI), a widely tracked benchmark for global equity investors, between January 2013 and December 2022 (see the end-of-year number of companies in Table 2). The index covers approximately 85% of the global investable stock market (MSCI, Inc., 2024). We consider index rebalancing once a year, on the 1st of January, with some constituents leaving or entering the index.

We calculate monthly log-returns, using daily closing prices and GICS industry classification from the Refinitiv Eikon database for each constituent firm. We extract the price data from Refinitiv Eikon based on several identifiers. First, firms are matched based on their ISIN identifier. Second, we match the remaining firms using their name. Finally, we attempt to match the remaining unmatched firms based on their stock tickers. If none of the three steps is successful, we consider matching failed. Due to matching failures, missing price, or industry information, we lose approximately 2%–3% of the firms in the ACWI sample each month.

Monthly returns are based on dividend-adjusted daily closing prices converted to USD. For each date, we winsorize returns at the 5th and 95th percentile of the returns of the ACWI constituents. In addition, we obtain monthly excess market return, SML, HML, RMW, CMA and momentum factors from K. R. French's website.[2]

To measure the sustainability of the business practices of firms, we use MSCI's proprietary ESG ratings, where we focus on the individual environmental (E) and social (S) pillar scores. The E pillar score is a weighted average score based on exposure and management of risks related to climate change, natural capital, pollution and waste, and environmental opportunities. The S pillar score is based on themes related to human capital, product liability, stakeholder opposition, and social opportunities. Both scores are derived by weighting the significance of each exposure and management factor, adjusted for controversies or real-world incidents, ensuring relevance to the company's industry and operations. Each issuer's exposure to key issues is first determined by a materiality assessment for the given industry of the issuer and is assessed across up to 27 key issues that are either considered as ESG risks or opportunities. For each key issue, an "Exposure Score" (0–10) reflects the issuer's level of risk based on factors such as business lines, geographic locations, and unique company characteristics. MSCI then assesses the issuer's capability to manage this risk exposure through "Management Scores", which evaluate strategic responses, initiatives, and performance metrics to mitigate or leverage these exposures. In the case of key risk-based issues, higher exposure requires more robust management practices to achieve favourable scores, while in key opportunity-based issues, high exposure indicates a competitive edge if well managed. The Environmental and Social pillar scores are calculated as weighted averages of these underlying key issue scores, normalised by their respective pillar weights.[3]

For the baseline analysis we follow Pástor et al. (2022) and apply the best-in-universe approach to adjust MSCI's original environmental score, as well as the social score. The scores based on the best-in-universe approach are comparable across the entire sample of companies, whereas the MSCI's original industry-adjusted ESG scores are comparable across the companies within specific industries. We also analyse the original industry-adjusted scores for a robustness check, as industry-specific weighting of E and S issues might be relevant for financial performance (Giese et al., 2021).

3.2. Sample characteristics

Table 1 presents descriptive statistics such as mean (Panel A), standard deviation (Panel B), and median (Panel C) for sector returns from 2013 to 2022. The table reflects the variation of returns across sectors and the business cycle, particularly highlighting the impact of COVID-19. Information Technology and Healthcare sectors consistently showed strong returns during the COVID-19 crisis, with mean annualised monthly returns in Information Technologies peaking at 33.8%, driven by remote work demand, and the Healthcare returns reaching 17.4% in 2019 amid heightened medical services needs. In contrast, more cyclical sectors like Energy and Materials experienced greater volatility and lower mean returns, especially in 2020, likely due to the impacts of the COVID-19 pandemic. The energy sector was hit hardest, with mean returns dropping to −32.6% in 2020, the lowest among sectors, and high volatility (0.46%, the highest standard deviation among sectors). Similarly, Materials and Financials saw significant volatility in monthly returns during the pandemic. In 2022, all sectors experienced negative returns, reflecting a challenging economic environment characterised by high inflation, rising interest rates, and geopolitical tensions.

Panels D–F of Table 1 shows descriptive statistics of the unadjusted (comparable across industries) E and S scores. Sectors such as Communications Services, Healthcare, and Financials persistently have higher E scores, while having low S scores compared to other industries. In contrast, Energy, Utilities, Materials and Consumer Staples enjoy high S scores while having low E scores over time. The cross-sectional variability of E and S scores has declined over time (Panel E).

As we can see in Table 2 the correlation between the E and S pillar scores, which are not industry-adjusted and comparable across industries, is negative across all companies in the sample.[4] The negative correlations are due to the low number of companies with

[2] Market excess return is based on all NYSE, AMEX, and NASDAQ firms.

[3] For more detailed information on the construction of the E and S scores see MSCI, Inc. (2023).

[4] It should be noted that when the original MSCI E and S scores, which are industry-adjusted (best-in-class approach), are used, the correlations are small but positive, as in Giese et al. (2021).

Table 1
Descriptive statistics.

Panel A: Mean returns

GICS sector	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Communication services	0.140	−0.001	0.011	0.011	0.162	−0.140	0.181	0.149	0.069	−0.396
Consumer discretionary	0.171	−0.009	0.025	0.002	0.215	−0.132	0.207	0.209	0.036	−0.402
Consumer staples	0.089	0.012	0.008	0.001	0.117	−0.139	0.165	0.042	0.071	−0.092
Energy	0.083	−0.119	−0.223	0.160	0.023	−0.161	0.058	−0.326	0.235	0.198
Financials	0.162	−0.003	−0.093	0.070	0.169	−0.202	0.159	−0.079	0.170	−0.130
Health care	0.193	0.094	0.027	−0.050	0.140	−0.008	0.174	0.096	0.114	−0.109
Industrials	0.169	−0.019	−0.065	0.075	0.157	−0.171	0.185	0.065	0.112	−0.178
Information technology	0.151	0.116	−0.036	0.101	0.269	−0.045	0.338	0.319	0.196	−0.369
Materials	−0.040	−0.096	−0.167	0.113	0.183	−0.202	0.127	0.145	0.089	−0.173
Real estate	−0.033	0.044	−0.029	−0.004	0.104	−0.093	0.148	−0.085	0.133	−0.292
Utilities	0.040	0.077	−0.123	0.015	0.100	−0.026	0.155	−0.012	0.060	−0.084

Panel B: Standard deviations of returns

GICS sector	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Communication services	0.074	0.057	0.101	0.085	0.070	0.130	0.110	0.220	0.107	0.219
Consumer discretionary	0.074	0.093	0.114	0.127	0.037	0.147	0.146	0.278	0.091	0.224
Consumer staples	0.074	0.085	0.091	0.078	0.060	0.102	0.071	0.173	0.123	0.146
Energy	0.081	0.133	0.179	0.112	0.099	0.170	0.168	0.462	0.166	0.260
Financials	0.107	0.076	0.149	0.174	0.056	0.146	0.154	0.355	0.143	0.212
Health care	0.082	0.063	0.116	0.107	0.045	0.150	0.099	0.179	0.115	0.172
Industrials	0.082	0.070	0.123	0.101	0.027	0.151	0.139	0.292	0.113	0.242
Information technology	0.083	0.083	0.152	0.142	0.074	0.161	0.160	0.254	0.110	0.280
Materials	0.111	0.089	0.160	0.134	0.066	0.129	0.161	0.300	0.133	0.242
Real estate	0.085	0.082	0.096	0.118	0.034	0.099	0.098	0.257	0.106	0.207
Utilities	0.117	0.086	0.113	0.126	0.083	0.088	0.080	0.198	0.152	0.190

Panel C: Median returns

GICS sector	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Communication services	0.178	0.039	−0.046	−0.102	0.205	−0.026	0.245	0.259	0.119	−0.391
Consumer discretionary	0.188	−0.054	−0.001	−0.024	0.222	−0.070	0.180	0.419	−0.028	−0.507
Consumer staples	0.195	0.133	0.015	−0.025	0.123	−0.114	0.139	0.139	0.070	−0.156
Energy	0.048	−0.097	−0.437	0.104	−0.063	0.027	0.083	−0.209	0.248	0.339
Financials	0.162	0.103	−0.110	0.298	0.212	−0.261	0.271	0.122	0.421	−0.130
Health care	0.290	0.080	0.088	−0.017	0.137	0.104	0.159	0.074	0.242	−0.122
Industrials	0.201	0.063	−0.146	0.091	0.147	−0.084	0.294	0.271	0.231	−0.310
Information technology	0.223	0.165	−0.099	0.063	0.280	−0.041	0.462	0.684	0.214	−0.612
Materials	0.046	−0.068	−0.399	0.155	0.100	−0.128	0.195	0.516	0.300	−0.184
Real estate	−0.052	0.049	−0.015	−0.038	0.089	0.006	0.084	0.072	0.129	−0.440
Utilities	0.135	0.159	−0.083	−0.002	0.142	−0.072	0.205	0.187	0.068	−0.062

Panel D: Mean E and S scores (unadjusted)

GICS sector	Score	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Communication services	E	1.63	1.46	1.35	1.18	1.27	1.22	1.19	1.25	1.03	1.04
	S	−0.76	−0.48	−0.39	−0.33	−0.33	−0.40	−0.38	−0.47	−0.46	−0.38
Consumer discretionary	E	0.31	0.20	0.15	0.05	0.04	0.11	0.20	0.22	0.14	0.12
	S	−0.72	−0.62	−0.51	−0.52	−0.57	−0.64	−0.62	−0.51	−0.28	−0.28
Consumer staples	E	−0.66	−0.47	−0.46	−0.50	−0.46	−0.47	−0.54	−0.67	−0.70	−0.63
	S	−0.61	−0.78	−0.69	−0.47	−0.33	−0.23	−0.27	−0.08	0.19	0.15
Energy	E	−1.33	−1.42	−1.52	−1.59	−1.61	−1.64	−1.59	−1.45	−1.11	−1.04
	S	0.95	1.08	1.17	1.31	1.40	1.42	1.46	1.43	1.04	1.05
Financials	E	0.93	0.89	0.85	1.02	1.02	0.91	0.86	0.82	0.55	0.60
	S	−0.24	−0.39	−0.55	−0.88	−1.03	−0.97	−0.96	−0.98	−0.86	−0.83
Health care	E	1.49	1.35	1.26	1.19	1.15	1.07	1.02	1.06	0.83	0.83
	S	−0.80	−0.52	−0.75	−0.75	−0.52	−0.48	−0.39	−0.43	−0.59	−0.66
Industrials	E	0.30	0.18	0.13	0.11	0.10	0.09	0.18	0.24	0.09	0.04
	S	0.21	0.34	0.48	0.58	0.59	0.60	0.55	0.50	0.40	0.41
Information technology	E	0.42	0.20	0.23	0.20	0.18	0.19	0.18	0.14	0.23	0.23
	S	−0.64	−0.49	−0.37	−0.33	−0.26	−0.29	−0.32	−0.35	−0.21	−0.25
Materials	E	−1.66	−1.71	−1.65	−1.71	−1.83	−1.76	−1.91	−2.05	−1.59	−1.64
	S	0.84	0.92	0.82	0.92	0.97	0.92	0.94	0.96	0.87	0.81
Real estate	E	−0.14	0.31	0.15	−0.17	−0.16	−0.11	0.00	−0.03	−0.12	−0.06
	S	0.58	0.01	0.16	0.40	0.35	0.33	0.36	0.46	0.41	0.51
Utilities	E	−2.26	−2.08	−1.83	−1.65	−1.53	−1.48	−1.50	−1.29	−0.78	−0.59
	S	1.80	1.72	1.57	1.61	1.61	1.53	1.47	1.44	1.36	1.28

(*continued on next page*)

Table 1 (*continued*).

Panel E: Standard Deviation of E and S scores (unadjusted)

GICS_sector	Score	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Communication Services	E	0.60	0.61	0.66	0.60	0.55	0.31	0.44	0.25	0.14	0.16
	S	1.32	1.31	1.25	1.10	0.96	1.06	1.04	1.05	0.83	0.81
Consumer Discretionary	E	0.85	0.91	0.85	0.79	0.68	0.66	0.59	0.62	0.51	0.53
	S	1.12	1.08	1.00	0.96	0.94	0.92	0.91	0.88	0.67	0.70
Consumer Staples	E	1.30	0.92	0.96	0.95	0.93	0.96	0.93	1.10	0.90	0.86
	S	1.35	1.04	1.11	0.96	0.91	0.91	0.97	0.98	0.83	0.83
Energy	E	1.12	1.07	1.05	0.99	0.95	0.82	0.87	0.94	0.76	0.70
	S	0.59	0.61	0.54	0.49	0.48	0.42	0.47	0.51	0.65	0.63
Financials	E	0.76	0.70	0.61	0.52	0.43	0.46	0.48	0.48	0.48	0.47
	S	1.26	1.28	1.22	0.96	0.86	0.84	0.83	0.78	0.62	0.64
Health Care	E	0.34	0.42	0.37	0.31	0.36	0.35	0.34	0.28	0.26	0.27
	S	1.15	1.13	1.06	0.87	0.80	0.75	0.73	0.82	0.79	0.74
Industrials	E	1.06	0.98	0.96	0.80	0.77	0.77	0.72	0.69	0.59	0.63
	S	1.09	1.05	1.04	1.01	1.07	1.04	0.95	0.91	0.83	0.80
Information Technology	E	0.83	0.92	0.88	0.69	0.68	0.71	0.62	0.62	0.48	0.52
	S	1.09	1.14	0.97	0.90	0.95	0.95	0.97	0.89	0.74	0.75
Materials	E	1.32	1.25	1.17	1.09	1.04	0.94	0.91	1.01	0.81	0.88
	S	0.76	0.75	0.64	0.59	0.58	0.57	0.56	0.54	0.58	0.54
Real Estate	E	1.32	0.99	0.85	0.73	0.72	0.70	0.59	0.59	0.55	0.53
	S	0.88	1.02	0.92	0.75	0.78	0.84	0.85	0.74	0.75	0.65
Utilities	E	1.47	1.36	1.26	1.12	1.05	1.00	0.95	0.98	0.91	0.95
	S	0.61	0.60	0.49	0.45	0.45	0.46	0.32	0.34	0.36	0.37

Panel F: Median E and S scores (unadjusted)

GICS_sector	Score	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Communication services	E	1.87	1.80	1.73	1.50	1.42	1.37	1.28	1.32	1.07	1.09
	S	−0.90	−0.64	−0.55	−0.38	−0.36	−0.31	−0.36	−0.38	−0.46	−0.29
Consumer discretionary	E	0.43	0.35	0.19	0.10	0.08	0.04	0.24	0.20	0.14	0.14
	S	−0.63	−0.59	−0.45	−0.41	−0.50	−0.63	−0.71	−0.47	−0.21	−0.24
Consumer staples	E	−0.37	−0.46	−0.29	−0.53	−0.43	−0.43	−0.20	−0.53	−0.60	−0.59
	S	−0.22	−0.58	−0.50	−0.45	−0.32	−0.06	−0.14	0.14	0.42	0.38
Energy	E	−1.38	−1.35	−1.63	−1.68	−1.90	−1.82	−1.72	−1.51	−1.07	−1.05
	S	0.99	0.93	1.22	1.24	1.36	1.41	1.55	1.56	1.10	1.07
Financials	E	0.91	0.87	0.86	1.09	1.17	1.10	0.98	0.93	0.57	0.65
	S	−0.13	−0.01	−0.20	−0.64	−1.00	−0.91	−0.91	−1.02	−0.92	−0.91
Health care	E	1.56	1.46	1.38	1.24	1.30	1.23	0.99	1.11	0.91	0.93
	S	−0.97	−0.41	−0.67	−0.76	−0.59	−0.55	−0.47	−0.58	−0.82	−0.64
Industrials	E	0.48	0.40	0.25	0.15	0.14	0.11	0.18	0.34	0.15	0.10
	S	0.37	0.37	0.64	0.75	0.88	0.82	0.64	0.65	0.53	0.53
Information technology	E	0.59	0.45	0.13	0.25	0.16	0.09	0.13	0.08	0.23	0.27
	S	−0.69	−0.51	−0.42	−0.32	−0.39	−0.30	−0.42	−0.37	−0.33	−0.24
Materials	E	−1.52	−1.76	−1.80	−1.65	−1.84	−1.83	−1.84	−2.08	−1.58	−1.62
	S	0.94	1.04	0.95	0.80	1.05	0.99	0.98	1.04	1.02	0.94
Real estate	E	−0.32	0.31	0.48	−0.09	−0.07	−0.10	0.01	−0.08	−0.17	−0.06
	S	1.09	−0.17	0.01	0.40	0.36	0.39	0.38	0.45	0.55	0.48
Utilities	E	−2.18	−2.15	−1.82	−1.70	−1.50	−1.43	−1.36	−1.29	−0.64	−0.48
	S	1.97	1.97	1.76	1.68	1.74	1.63	1.55	1.42	1.41	1.33

This table shows the descriptive statistics of the industry portfolio returns, and E and S scores. The return statistics are calculated from industry portfolios' monthly annualised log-returns. The industry portfolios are formed by selecting stocks from the MSCI ACWI index's constituent list. The portfolio returns are weighted using MSCI ACWI index's weights. E and S denote Environmental and Social Pillar scores respectively. The E and S scores statistics are calculated across the end-of-year scores of the stocks in the industry portfolios.

high exposure as well as good management of both the S and E pillars at the same time.[5]

However, there are important differences between various industries. For example, while the negative correlation dominates most industries, the "Healthcare" and "Energy" sectors seem to stand out with the positive correlation, which is not statistically significant in some years, between the scores of the two pillars. This is consistent with Giese et al. (2021), where authors demonstrate that these two sectors have high exposures to the themes, albeit different ones, of both the E and the S pillars. For example, from the E pillar, carbon emission performance is important for both sectors, while from the S pillar, health and safety are important for

[5] For example, from the Consumer Staples sector, Treasury Wine Estates (TWE) excels in social (S) metrics due to strong employee practices, health and safety standards, and active community engagement. However, its environmental (E) performance is lower, reflecting challenges in managing water usage, carbon emissions, and energy-intensive wine production processes. In contrast, another company from consumer staples, Carrefour has a high Environmental (E) score from MSCI due to its significant efforts to reduce greenhouse gas emissions, increase sustainable product offerings, and improve waste management, aligning with global environmental goals. However, its Social (S) score is lower, reflecting challenges in managing labour practices and supply chain issues, particularly in regions with high labour risks and concerns over transparency and worker welfare.

Table 2
Correlation between E and S scores.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of companies	2431	2434	2470	2491	2486	2499	2758	3051	2982	2964
All companies	−0.44**	−0.40**	−0.44**	−0.49**	−0.54**	−0.56**	−0.54**	−0.53**	−0.53**	−0.50**
Communication services	−0.07	−0.12	−0.14	−0.03	0.02	−0.03	0.00	0.16*	0.20**	0.18*
Consumer discretionary	−0.08	−0.22**	−0.24***	−0.30***	−0.28***	−0.27***	−0.32***	−0.30***	−0.16*	−0.15*
Consumer staples	−0.47***	−0.15*	−0.23**	−0.21**	−0.24**	−0.34***	−0.40***	−0.47***	−0.56***	−0.52***
Energy	0.23**	0.29**	0.32***	0.30**	0.15	0.12	0.16	0.12	0.18	0.20
Financials	−0.41***	−0.38***	−0.38***	−0.27***	−0.09*	−0.10*	−0.16**	−0.18***	−0.09*	−0.09
Healthcare	0.20*	0.04	−0.04*	0.16*	0.12	0.13	0.34***	0.45***	0.41***	0.40***
Industrials	−0.15**	−0.13*	−0.24***	−0.33***	−0.39***	−0.42***	−0.32***	−0.31***	−0.43***	−0.40***
Information technology	−0.17*	−0.11	−0.23**	−0.31***	−0.51***	−0.58***	−0.56***	−0.56***	−0.45***	−0.40***
Materials	0.02	−0.13*	−0.06**	−0.15**	−0.11*	−0.19**	−0.05*	−0.13	−0.08*	−0.04
Real estate	0.12	0.04	0.11	−0.09	−0.12	−0.25***	−0.23***	−0.21***	−0.10*	0.01
Utilities	−0.05	−0.10	−0.08	−0.02	−0.07	−0.10	0.14***	0.17***	0.03*	0.05

This table shows the correlations between E and S scores (not industry adjusted) within the full sample of all constituent companies of MSCI All Country World Index and sub-portfolios of companies from each industrial sector. End-of-year scores are used for the estimation of correlations. *** denote 1% significance, ** denote 5% significance, and * denotes 10% significance

the energy sectors, and product safety and quality are important for the healthcare sector.

Another interesting observation is based on looking at the evolution of the correlations over time. Not only are there cross-sectional differences between industries, but there also seem to be important time-variance of correlations. These findings further confirm the importance of exploring and understanding the trade-offs between the two sustainability pillars, as well as strong industry effects that are often not accounted for in sustainability research.

4. Methodology

4.1. Sorted portfolio returns

As the first step of the analysis, we compare the market returns of leaders and laggards based on the environmental (E) and social (S) pillars' scores of MSCI's ESG rating. As was mentioned in Data section in the baseline analysis we use industry unadjusted E and S scores which are comparable across industries. However, the returns of portfolios formed based on absolute differences in the E and S performance may be affected by interindustry factors. Therefore, in an additional analysis, we use industry-adjusted scores, which are comparable within industries. Portfolios formed on these scores are not affected by industry differences, therefore their returns are affected by firm-specific differences in environmental and social performance,

To form the leaders and laggards portfolios, at the end of each month t we apply independent sorting of companies based on their E and S scores. We define E (S) laggards as the bottom third and the E (S) leaders as the top third of the distribution of the E (S) pillar score. Throughout the paper, we will use the terms E (S) leaders, top E (S) performers, and TE (TS) performers interchangeably. In a similar vein, we will use the terms the E (S) laggards, bottom E (S) performers, and BE (BS) interchangeably.

In the second step of our analysis, we focus on the following sub-portfolios formed based on end-of-month independent sorting (see Fig. 1):

(1) TETS (Top E, Bottom S): firms with top scores in both E and S pillars;

(2) TEBS (Top E, Bottom S): firms with top scores in the E pillar but bottom scores in the S pillar

(3) BETS (Bottom E, Top S): firms with bottom scores in the E pillar but top scores in the S pillar

We compare the stock returns of firms with top scores in one pillar and bottom scores in another pillar. In particular, we form hedging portfolios (i) TETS minus TEBS (long position in TETS and short position in TEBS) and (ii) TETS minus TEBS (long position in TETS and short position in BETS). TETS minus TEBS return reflects the return differential between S leaders and S laggards within the group of E leaders. TETS minus BETS return reflects the return differential between E leaders and E laggards within the group of S leaders. These hedging portfolio returns represent the performance of the investment strategy of improving in one pillar while concentrating investments within the group of firms leading in another pillar. This performance would reflect whether investors promoting environmental (social) characteristics of their investments can also improve the social (environmental) characteristics without the consequences of lower returns.

Furthermore, we compare the stock returns of environmental leaders who are, at the same time, social laggards to those of social leaders who are environmental laggards. The return differential between TEBS and BETS reflects the returns on the trading strategy of a long position on TEBS and a short position on BETS. This hedging portfolio indicates how much excess return the market assigns to companies that achieve a top E score by sacrificing the S pillar over the companies sacrificing their E pillar to a stellar performance in the S pillar.

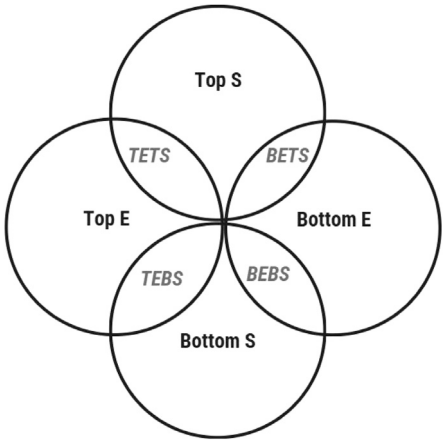


Fig. 1. Portfolios based on environmental and social pillar performance.
This figure illustrates sub-portfolios created through independent sorting of companies based on their environmental (E) and social (S) scores. The key categories include: TETS (Top E, Top S): Firms that score in the top tier for both environmental and social pillars; TEBS (Top E, Bottom S): Companies excelling in environmental performance (top E scores) but performing poorly in social metrics (bottom S scores); BETS (Bottom E, Top S): Firms with weak environmental performance (bottom E scores) but strong social scores (top S scores); BEBS (Bottom E, Bottom S): Companies that rank poorly in both E and S scores.

4.2. Factor-adjusted return differentials

We explore whether the returns of the hedging portfolios can be explained by the exposures to existing and well established risk factors.

We use monthly portfolio return differentials as dependent variables to find whether the return differentials are different from zero when we control for the "standard" asset pricing factors (Fama–French five-factor model expended with the momentum factor to capture investor sentiment).

We estimate monthly time-series regressions with the following specification:

$$R_t = \alpha + \beta^{market} \times [r_{m_t} - r_{f_t}] + \beta^{SMB} \times SMB_t + \beta^{HML} \times HML_t + \beta^{MOM} \times MOM_t + \\ + \beta^{RMW} \times RMW_t + \beta^{CMA} \times CMA_t + \varepsilon_t \quad (1)$$

where, R_t is the long-short hedging portfolio return, α is constant, $[r_{m_t} - r_{f_t}]$ is the excess market index return, HML_t is the value factor, SMB_t is the size factor, MOM_t is the momentum factor of Carhart (1997), RMW_t and CMA_t are the profitability and investment factors of Fama and French (2015), and ε_{it} is the regression residual (idiosyncratic portfolio risk).

We estimate the coefficients for the full sample 2013–2022 and the subsample period starting after the Paris Agreement, December 2015. In addition, we estimate rolling window alphas from the Fama–French five factors model. The length of our estimation period is 60 months.

4.3. Time varying factor-based return differentials

To estimate the alphas of the long-short hedging portfolios dynamically, we employ a rolling window approach using a 60-month period. Each month, a regression is run using the previous 60 months of data, where the long-short hedging portfolio returns are regressed against the five factors in the Fama–French 5-factor model: market excess return (Mkt-RF), size (SMB), value (HML), profitability (RMW), and investment (CMA). The 60-month period is updated monthly, shifting forward by one period at a time. This rolling window estimation allows for the analysis of the change in excess returns and controls any changes in the portfolios' exposures to the fundamental factors over time.

5. Results

5.1. Unadjusted score sorting

5.1.1. Unadjusted score sorted return differentials

When the starting point of the initial investment in the E leaders and laggards portfolios is January 2013, the return differential between the E leaders and laggards widens till 2015 and remains positive and large till the end of 2022, peaking at approx. 70% cumulatively or around 7% annually (Fig. 2, Panel A, left). However, the cumulative return differential is close to zero by the end

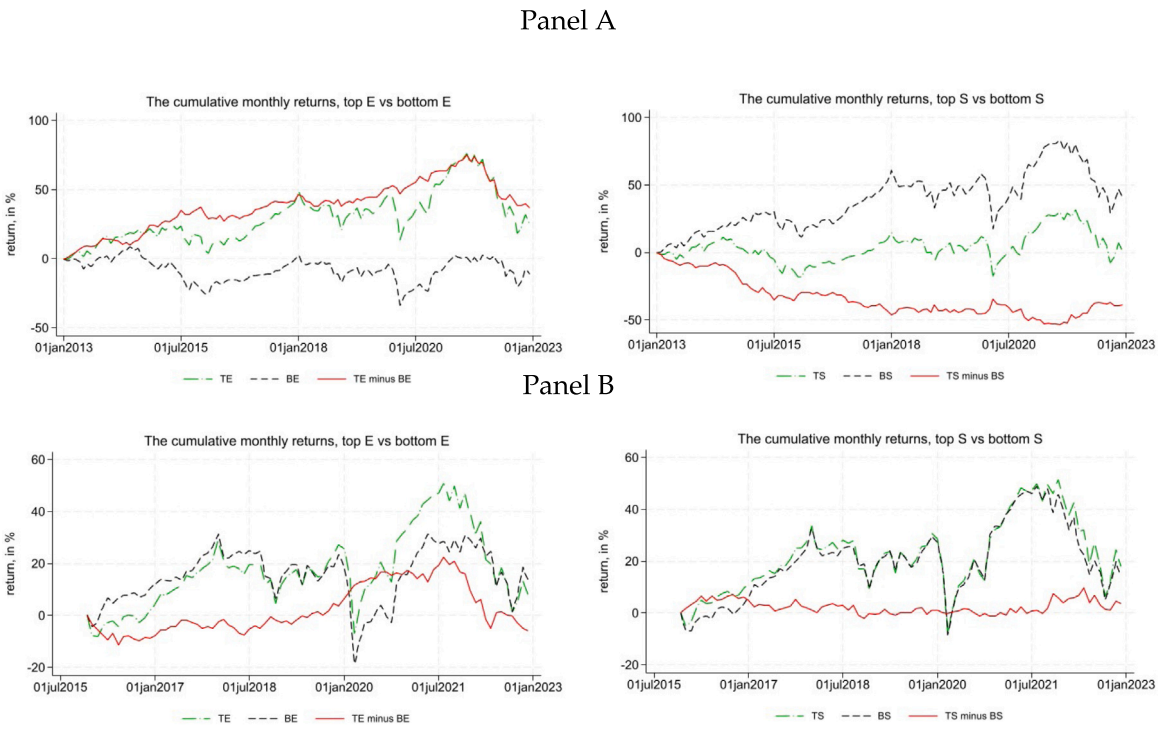


Fig. 2. Top versus bottom E and S score portfolios.
This figure illustrates the cumulative monthly MSCI (ACWI) index weighted monthly cumulative returns of the Top and Bottom portfolios based on E and S scores. TE denotes the portfolio of stocks with top E pillar scores; BE denotes the portfolio of stocks with bottom E pillar scores; TS denotes the portfolio of stocks with top S pillar scores; BS denotes the portfolio of stocks with bottom S pillar scores.

of the sample period in 2023 (Fig. 2, Panel B, left) when the initial investment date is January 1st, 2016. The only exception is the COVID-19 period, during which the cumulative return differential peaked at around 20% by mid-2021. Consistent with the green premium hypothesis and findings in Pástor et al. (2022), the strong historical outperformance of top E (green) over bottom E(brown) stocks disappears over time.

As already mentioned, another interesting insight from Fig. 2 is the outperformance of the top E stocks during the COVID-19 crisis years. This outperformance reflects an unanticipated shift in the demand from brown assets towards green assets, as the COVID-19 crisis unfolded. The industrial distribution of portfolios confirms the shift is due to a higher proportion of the industries unexpectedly negatively hit by the COVID-19 crisis in the E laggards (brown) portfolio. Table 3 shows that top E-scoring firms are concentrated in the communications, information technology, and healthcare sectors, which saw an increase in demand due to lockdowns and work from home policies. In contrast, a large share of bottom E-scoring firms are in sectors more exposed and hit by a negative demand shock, such as the energy and materials sectors.

In contrast to the positive cumulative return differentials of the E leaders and laggards, the monthly cumulative returns of the S leaders versus laggards in Fig. 2 are negative for the investments with a starting date of January 2013. However, similar to the return differential of E leaders and laggards, in the case of the portfolio investments with the starting date of January 2016, the return differential between S leaders and laggards is close to zero (Fig. 2, Panel B, right).

Initial data analysis suggests that many industries and firms that are leaders in the environmental pillar are at the same time laggards in the social pillar and vice versa. The industrial composition of the bottom S portfolio is similar to the industrial composition of the Top E portfolio, with the financials and healthcare industries' average shares from 2012 to 2022 being over 26.5% and 20.4%, respectively in Table 3 (29.6% and 21% respectively in 2019). The correlations of S and E scores are deeply negative for the sample of all firms in Table 2. However, for some industries the correlations are positive. Moreover, many industries with high representation in the top E pillar (high E score) have high representation in the bottom S pillar (low S score), with "Communication Services", "Financials", and "Healthcare" standing out (see Table 3).

Therefore, in the second step of our analysis, we compare the stock returns of environmental leaders who are, at the same time, social laggards (TEBS) to those of social leaders who are environmental laggards (BETS). Fig. 3 shows that the return difference between TEBS and BETS portfolios has similar dynamics as the return difference between Top E and Bottom E portfolios. Moreover, the cumulative return difference between TETS and BETS is similar to the return difference between TEBS and BETS, at the level

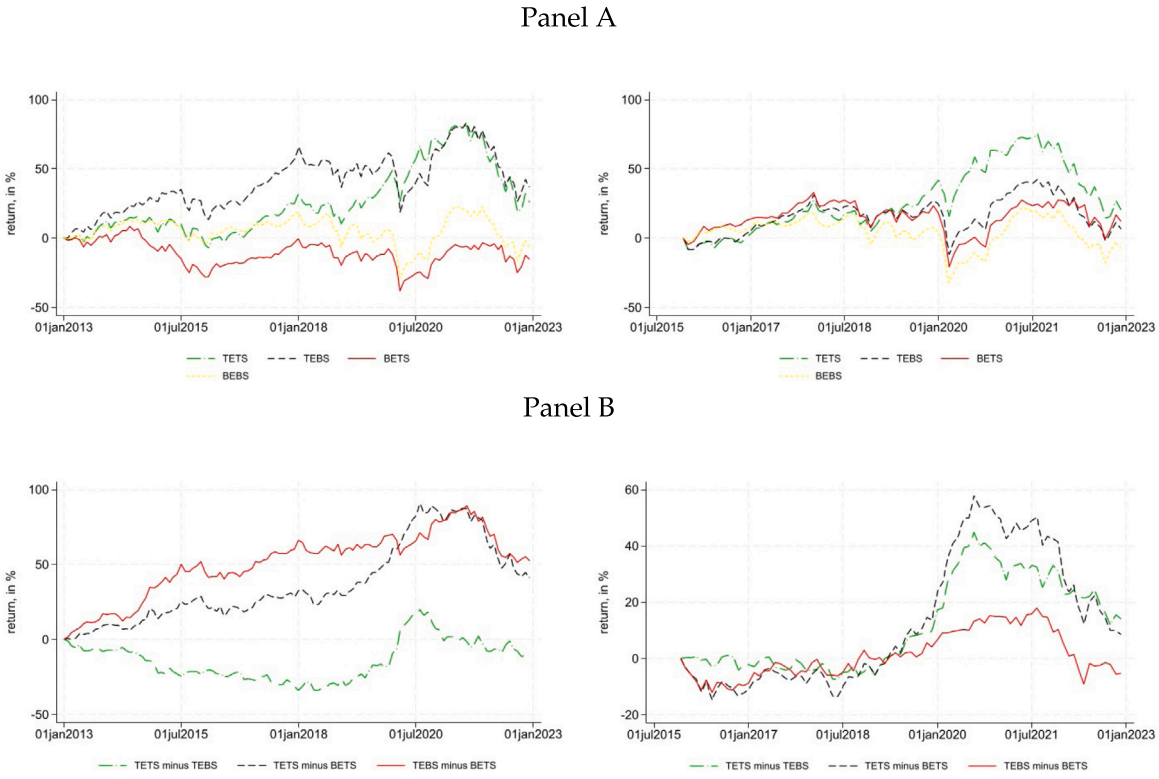


Fig. 3. Cumulative returns of sub-portfolios created by independent sorting of E and S scores.
This figure illustrates the monthly cumulative MSCI (ACWI) index weighted returns of sub-portfolios constructed using independent sorting of companies based on their environmental (E) and social (S) scores. TETS (Top E, Top S): Firms that score in the top tier for both environmental and social pillars; TEBS (Top E, Bottom S): Companies excelling in environmental performance (top E scores) but performing poorly in social metrics (bottom S scores); BETS (Bottom E, Top S): Firms with weak environmental performance (bottom E scores) but strong social scores (top S scores).

of around 50%, over the period of 2012–2022. All the figures in Fig. 3 suggest that before 2016 investors focused predominantly on environmental pillar performance. By 2016 markets adjusted and the excess green and social returns were around zero till the Covid-19 crisis, after which both S and E pillars gained investors' attention.

5.1.2. Factor analysis of unadjusted score sorted return differentials

The univariate analysis of the top and bottom-performing portfolios based on E and S scores suggests that the raw return differentials between leaders and laggards disappear over time and are, in particular, concentrated in the period between 2013 and 2015. To confirm our results, we use regression analysis to test whether the observed return differentials can be explained by the exposures to well-established risk factors. Results in Table 4, where we use the total sample period of 2013–2022, confirm that the return differentials are statistically different from zero even after controlling for the market, size, value, momentum, profitability and investment factors. In particular, the constant term in the regressions in Table 4 suggests that green companies (E leaders) generated positive excess returns over brown (E laggards) companies. Looking at the full specification (controlling for various factor exposure differences) in column (6) of Table 4, Panel A the E pillar leaders yielded positive monthly excess returns of 0.305% (around 3.7% annually) over the E pillar laggards over 2013–2022.

On the other hand, leaders in the S pillar generated negative returns relative to the S pillar laggards. Full specification in column (12) of Table 4, Panel A yields the negative monthly return difference between S leaders and S laggards of −0.273% (around −3.3% annually) over the period between 2013 and 2022.

Nevertheless, if we restrict the investment horizon to 2016–2022, the excess returns for both social and environmental pillars disappear (Table 4, Panel B).

Next, we explore the factor-adjusted returns of the following sub-portfolios: (i) TETS minus TEBS (long position in TETS and short position in TEBS); (ii) TETS minus TEBS (long position in TETS and short position in BETS) and *iii* TEBS minus BETS. The constant term in Table 5 shows the factor-adjusted return difference of top S and bottom S firms within the top E scoring firms group (TETS-TEBS). The constant term in Table 6 shows the factor-adjusted return difference of top E and bottom E firms within the top S scoring firms group (TETS-BETS). Alphas are not significantly different from zero in Tables 5–6. The results suggest that investors

Table 3
Industry composition.

	TE	BE	TS	BS	TEBS	BETS	ACWI
Communication services	15.14	0.07	4.1	10.93	14.61	0	8.63
Consumer discretionary	7.71	5.98	2.06	15.65	9.16	0.9	10.53
Consumer staples	3.65	12.79	5.37	9.43	3.64	5.34	8.67
Energy	0.06	25.56	19.51	0.02	0.01	34.33	6.51
Financials	30.43	4.19	6.56	26.47	31.7	2.08	17.31
Health care	22.36	0.01	1.6	20.39	27.4	0.01	11.47
Industrials	6.55	9.04	17.02	5.94	4.14	10	10.36
Information technology	12.34	6.02	15.33	10.18	8.73	4.78	14.68
Materials	0.2	20.86	13.19	0.11	0.04	23.57	5.40
Real estate	1.35	3.45	4.27	0.77	0.45	2.55	2.98
Utilities	0.16	12.02	10.95	0	0	16.41	3.22
Other	0.06	0.01	0.03	0.1	0.13	0.02	0.24

This table shows the average industry composition of the portfolios over the sample period of 2012–2022, in percentages. TE denotes the portfolio of stocks with top E pillar scores; BE denotes the portfolio of stocks with bottom E pillar scores; TS denotes the portfolio of stocks with top S pillar scores; BS denotes the portfolio of stocks with bottom S pillar scores; TEBS denotes the portfolio of stocks with top E pillar and bottom S pillar scores; and BETS denotes the portfolio of stocks with bottom E pillar and top S pillar scores.

focusing on one pillar of ESG are indifferent to the variation in another pillar. Although Fig. 3 suggests that the COVID-19 crisis has put the spotlight on the social pillar along with the environmental pillar, after controlling for factor exposures the social premium within environmental leaders and environmental premium among the social leaders disappears. Nevertheless, the environmental premium seems to exhibit a stronger effect than the social premium (larger values of alphas in Table 6 compared to alphas in Table 5, albeit not statistically significant).

Furthermore, a portfolio with a long position in E leaders who are at the same time S laggards and a short position in E laggards who are at the same time S leaders generated a positive monthly raw alpha at 0.401% and positive monthly factor adjusted alpha, at 0.39% (around 4.7% annually) for 2013–2022 (Table 7, columns (1) and (6), respectively.

Nevertheless, if we restrict the investment horizon to 2016–2022, the excess returns disappear (Table 7, Panel B). Altogether, the results in Tables 4–7 suggest that returns are different for top and bottom-scoring firms within each of the E and S pillars for 2013–2022. Furthermore, over the investment horizon of 2013–2022, investors promoting environmental (social) characteristics of their investments could improve the social (environmental) characteristics without the consequences of lower returns.

5.2. Industry-adjusted score sorting

5.2.1. Industry-adjusted score sorted return differentials

In the analysis so far, we assumed that investors differentiate companies based on their absolute environmental and social performance (best-in-universe). Given strong industry effects when it comes to E and S ranking based on absolute values of E and S pillars (as shown in Table 3), results might be driven by specific industry effects, not only in terms of sustainability but also in terms of industry rotation over the business cycle, investor sentiment and preference driven demand, etc. In order to address this issue, that is to account for industry effects of E and S performance, we continue by re-sorting companies based on industry-adjusted E and S scores (best-in-class).

First, in Fig. 4 we can still observe positive cumulative excess returns of environmental leaders versus laggards for a long-short portfolio starting in January 2013 (Panel A, left), although to a lesser extent. Furthermore, in line with our results based on absolute E and S sorting, the excess returns disappear when the investment horizon starts in 2016. Thus, both investment strategies – the one aiming to improve E pillar performance across industries and the one aiming at the E pillar improvement within an industry – perform similarly over time direction-wise. The cumulative differential in excess returns of S pillar leaders versus laggards, is, as before, close to zero. However, comparing Fig. 4 (right side figures) to Fig. 2 suggests that industry effects for the social pillar performance are much more pronounced and differ from industry effects of the environmental pillar.

The comparison of the evolution of unadjusted (Fig. 3) and industry-adjusted (Fig. 5) long-short portfolio return differentials between TETS (Top E, Top S) and BETS (Bottom E, Top S) highlights the increasing dominance of environmental (E) factors in driving returns, particularly post-2016. However, post-2016, positive industry effects related to environmental performance became more pronounced, amplifying the outperformance of portfolios with high environmental scores (TEBS and TETS) over those with weaker environmental scores (BETS). In contrast, firm-specific social (S) performance had a limited incremental impact on returns when environmental performance was already strong, as evidenced by the negligible differential between TETS and TEBS. This emphasises the growing importance of industry-wide environmental effects in shaping ESG-related returns over time, with industry-specific contributions becoming more pronounced after 2018, as already argued previously.

Table 4
Regressions of Top E minus Bottom E (GMB) and Top S minus Bottom S portfolio returns.

Panel A: 2013–2022												
	(1) gmb	(2) gmb	(3) gmb	(4) gmb	(5) gmb	(6) gmb	(7) tsmbs	(8) tsmbs	(9) tsmbs	(10) tsmbs	(11) tsmbs	(12) tsmbs
mktrf		0.017	0.032	0.046	0.029	0.042		0.021	0.027	0.002	0.019	0.000
		(0.051)	(0.036)	(0.038)	(0.034)	(0.036)		(0.026)	(0.028)	(0.031)	(0.030)	(0.031)
smb			−0.028	−0.018	−0.131*	−0.116			−0.044	−0.060	0.019	−0.003
			(0.068)	(0.069)	(0.078)	(0.080)			(0.056)	(0.058)	(0.068)	(0.070)
hml			−0.265***	−0.247***	−0.122**	−0.096			0.086**	0.055	0.027	−0.010
			(0.039)	(0.043)	(0.056)	(0.060)			(0.035)	(0.037)	(0.049)	(0.051)
mom				0.054		0.061				−0.089*		−0.088*
				(0.050)		(0.048)				(0.046)		(0.048)
rmw					−0.191**	−0.176**					0.136*	0.114
					(0.078)	(0.079)					(0.078)	(0.079)
cma					−0.259***	−0.276***					0.082	0.106
					(0.090)	(0.091)					(0.082)	(0.083)
_cons	0.289*	0.272	0.247	0.217	0.337**	0.305**	−0.252*	−0.273**	−0.279**	−0.229*	−0.320**	−0.273**
	(0.171)	(0.197)	(0.160)	(0.161)	(0.148)	(0.149)	(0.132)	(0.138)	(0.134)	(0.136)	(0.132)	(0.133)
Adj.R^2	0	−0.007	0.2	0.2	0.3	0.3	0	−0.004	0.02	0.05	0.04	0.07
Obs	120	120	120	120	120	120	120	120	120	120	120	120

Panel B: 2016–2022												
	(1) gmb	(2) gmb	(3) gmb	(4) gmb	(5) gmb	(6) gmb	(7) tsmbs	(8) tsmbs	(9) tsmbs	(10) tsmbs	(11) tsmbs	(12) tsmbs
mktrf		0.017	0.032	0.024	0.024	0.021		0.016	0.022	0.025	0.009	0.013
		(0.058)	(0.040)	(0.041)	(0.038)	(0.041)		(0.028)	(0.031)	(0.034)	(0.035)	(0.038)
smb			−0.028	−0.036	−0.128	−0.134			−0.041	−0.038	0.043	0.051
			(0.076)	(0.083)	(0.087)	(0.098)			(0.053)	(0.057)	(0.061)	(0.065)
hml			−0.249***	−0.256***	−0.100	−0.105*			0.042	0.045	−0.033	−0.026
			(0.041)	(0.044)	(0.061)	(0.062)			(0.032)	(0.033)	(0.038)	(0.040)
mom				−0.027		−0.016				0.011		0.019
				(0.057)		(0.058)				(0.042)		(0.044)
rmw					−0.175**	−0.179**					0.178**	0.183**
					(0.084)	(0.087)					(0.080)	(0.082)
cma					−0.279***	−0.275***					0.102	0.097
					(0.095)	(0.094)					(0.077)	(0.078)
_cons	−0.069	−0.084	−0.082	−0.072	0.074	0.079	0.042	0.028	0.019	0.014	−0.073	−0.080
	(0.201)	(0.232)	(0.185)	(0.185)	(0.165)	(0.165)	(0.133)	(0.139)	(0.139)	(0.143)	(0.135)	(0.137)
Adj.R^2	0	−0.01	0.3	0.3	0.4	0.4	0	−0.008	−0.01	−0.02	0.07	0.06
Obs	84	84	84	84	84	84	84	84	84	84	84	84

This table shows the results of regressions of the returns of the Top E minus Bottom E (Green Minus Brown — GMB) and Top S minus Bottom S (TSBS) hedging portfolios on factors: Mkt-RF is the excess market return, SMB and HML are the size and value factors of Fama and French (1993), MOM is the momentum factor of Carhart (1997), RMW and CMA are the profitability and investment factors of Fama and French (2015). Portfolio returns are monthly index-weighted percentage returns. The sample covers the period of 2013–2022 in Panel A and 2016–2022 in Panel B. Standard errors are in parenthesis. *** denote 1% significance, ** denote 5% significance, and * denotes 10% significance.

5.2.2. Factor analysis of industry-adjusted score sorted return differentials

The comparison between unadjusted and industry-adjusted results over the full sample period (2013–2022) and the shorter period (2016–2022) underscores the evolving importance of industry effects in ESG portfolio returns.

For the environmental pillar, the unadjusted results in Panel A of Table 4 show a substantial green premium, with GMB (Top E minus Bottom E) portfolios delivering a significant monthly return differential (alpha) of 0.305% (approximately 3.7% annually) over the full sample, as already shown. In contrast, the industry-adjusted results in Panel A of Table 8 (full model specification in column 6) show a much smaller and statistically insignificant differential of 0.140% per month (1.7% annually). This indicates that a substantial portion of the premium based on unadjusted score-sorted portfolios can be attributed to positive industry effects. When focusing on the shorter period (2016–2022), the unadjusted GMB differential in Panel B of Table 4 becomes statistically and economically insignificant, and the industry-adjusted results in Panel B of Table 8 show a complete dissipation of the green premium. This suggests that industry effects dominated the earlier period but diminished in importance as the market efficiently priced in environmental factors after 2016.

Table 5
Regressions of Top E TOP S minus TOP E Bottom S portfolio returns.

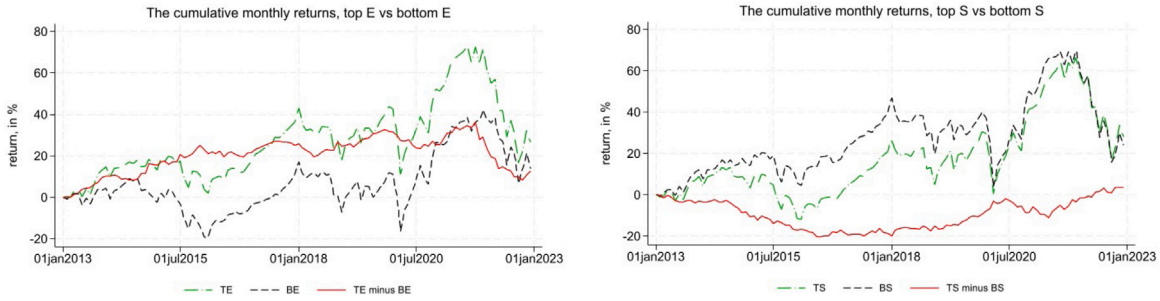
Panel A: 2013–2022						
	(1) tets_minus_tebs	(2) tets_minus_tebs	(3) tets_minus_tebs	(4) tets_minus_tebs	(5) tets_minus_tebs	(6) tets_minus_tebs
mktrf		−0.063	−0.009	−0.034	−0.035	−0.051
		(0.068)	(0.042)	(0.043)	(0.042)	(0.042)
smb			−0.260***	−0.276***	−0.210**	−0.229**
			(0.075)	(0.076)	(0.087)	(0.090)
hml			−0.183***	−0.215***	−0.164	−0.195*
			(0.062)	(0.062)	(0.103)	(0.106)
mom				−0.092		−0.075
				(0.059)		(0.064)
rmw					0.148	0.129
					(0.097)	(0.102)
cma					−0.105	−0.084
					(0.134)	(0.139)
_cons	−0.068	−0.004	−0.080	−0.030	−0.083	−0.043
	(0.196)	(0.221)	(0.186)	(0.187)	(0.186)	(0.188)
Adj.R^2	0	0.009	0.2	0.2	0.2	0.2
Obs	120	120	120	120	120	120
Panel B: 2016–2022						
	(1) tets_minus_tebs	(2) tets_minus_tebs	(3) tets_minus_tebs	(4) tets_minus_tebs	(5) tets_minus_tebs	(6) tets_minus_tebs
mktrf		−0.099	−0.035	−0.040	−0.085**	−0.082**
		(0.074)	(0.041)	(0.042)	(0.038)	(0.040)
smb			−0.280***	−0.286***	−0.183**	−0.176*
			(0.088)	(0.094)	(0.091)	(0.100)
hml			−0.236***	−0.241***	−0.231**	−0.225**
			(0.056)	(0.055)	(0.090)	(0.095)
mom				−0.020		0.018
				(0.064)		(0.064)
rmw					0.259***	0.264***
					(0.088)	(0.089)
cma					−0.118	−0.123
					(0.124)	(0.129)
_cons	0.124	0.215	0.169	0.176	0.133	0.127
	(0.247)	(0.265)	(0.204)	(0.205)	(0.205)	(0.206)
Adj.R^2	0	0.03	0.4	0.4	0.4	0.4
Obs	84	84	84	84	84	84

This table shows the results of regressions of the Top E TOP S minus TOP E Bottom S and TOP E Top S minus Bottom E Top S hedging portfolio returns on factors: Mkt-RF is the excess market return, SMB and HML are the size and value factors of Fama and French (1993), MOM is the momentum factor of Carhart (1997), RMW and CMA are the profitability and investment factors of Fama and French (2015). Portfolio returns are monthly index-weighted percentage returns. The sample covers the period of 2013–2022 in Panel A and 2016–2022 in Panel B. Standard errors are in parenthesis. *** denote 1% significance, ** denote 5% significance, and * denotes 10% significance.

For the social pillar, we already established that the return differentials based on unadjusted sorting in Panel A of Table 4 show a significant negative return differential for TSMS (Top S minus Bottom S) portfolios over the full sample, with a monthly differential of −0.273% (−3.3% annually). The industry-adjusted score sorted results in Panel A of Table 8 show a negative and statistically insignificant return differential of 0.024% per month (approx. 0.3% annually), suggesting that industry effects contributed to the social discount previously observed when looking at unadjusted score-based returns. Over the shorter period (2016–2022) results between unadjusted and industry-adjusted score sorted portfolios show that the TSMS differential return results diverge. While the results in Panel B of Table 4 show that the unadjusted TSMS return differential becomes statistically insignificant, Panel B of Table 8 (column 12) reveals a marginally significant positive alpha of 0.201% per month (2.4% annually) for the industry-adjusted TSMS portfolio. This reversal suggests that post-2016, industry effects became less influential, and firm-specific social factors became the driving force behind the turn from the social discount to the social premium. The comparison between unadjusted and industry-adjusted score-sorted portfolios and across time periods demonstrates that industry effects played a pivotal role in shaping return differentials early on but became less pronounced after 2016, particularly for the social pillar, where firm-specific differences started to gain in importance and investor attention.

The shift from a social discount to a social premium in the later part of the sample provides important context for interpreting the trade-off between environmental (E) and social (S) pillar performance.

Panel A



Panel B

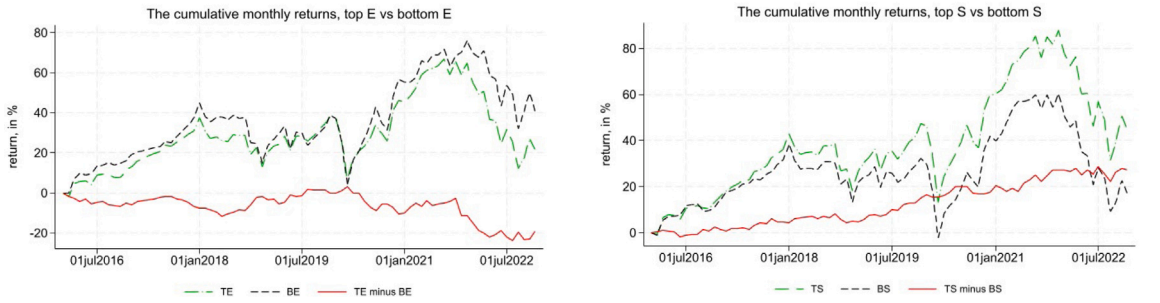


Fig. 4. Top versus Bottom E and S score portfolios, industry-adjusted.
This figure illustrates the cumulative monthly MSCI index weighted monthly cumulative returns of the Top and Bottom portfolios based on E and S scores. E and S scores are industry-adjusted.

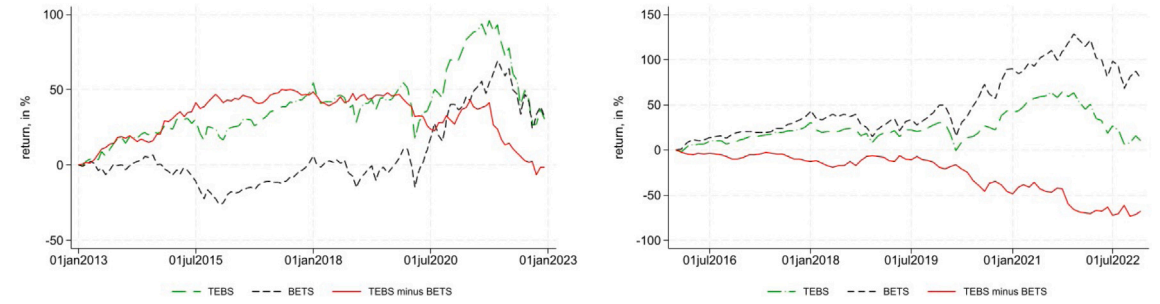


Fig. 5. Top E Bottom S and Bottom E Top S portfolios, industry — adjusted scores.
This figure illustrates the monthly cumulative MSCI index weighted returns for portfolios sorted based on industry-adjusted E and S scores.

In the earlier period (2013–2016), the unadjusted results in Panel A of Table 7 show that portfolios prioritising environmental performance (Top E Bottom S) over social performance (Bottom E Top S) generated positive return differentials (0.390% per month, statistically significant at the 5% level). This reflects the market's earlier focus on environmental factors, where positive industry effects for environmentally strong sectors amplified returns. In contrast, social factors were undervalued or penalised, leading to a social discount. The industry-adjusted score sorted results in Panel A of Table 9 further confirm that much of the observed differential in this period was driven by industry effects, as the adjusted return differential is much smaller (0.081% per month) and statistically insignificant, indicating that firm-specific effects played a minor role during this period.

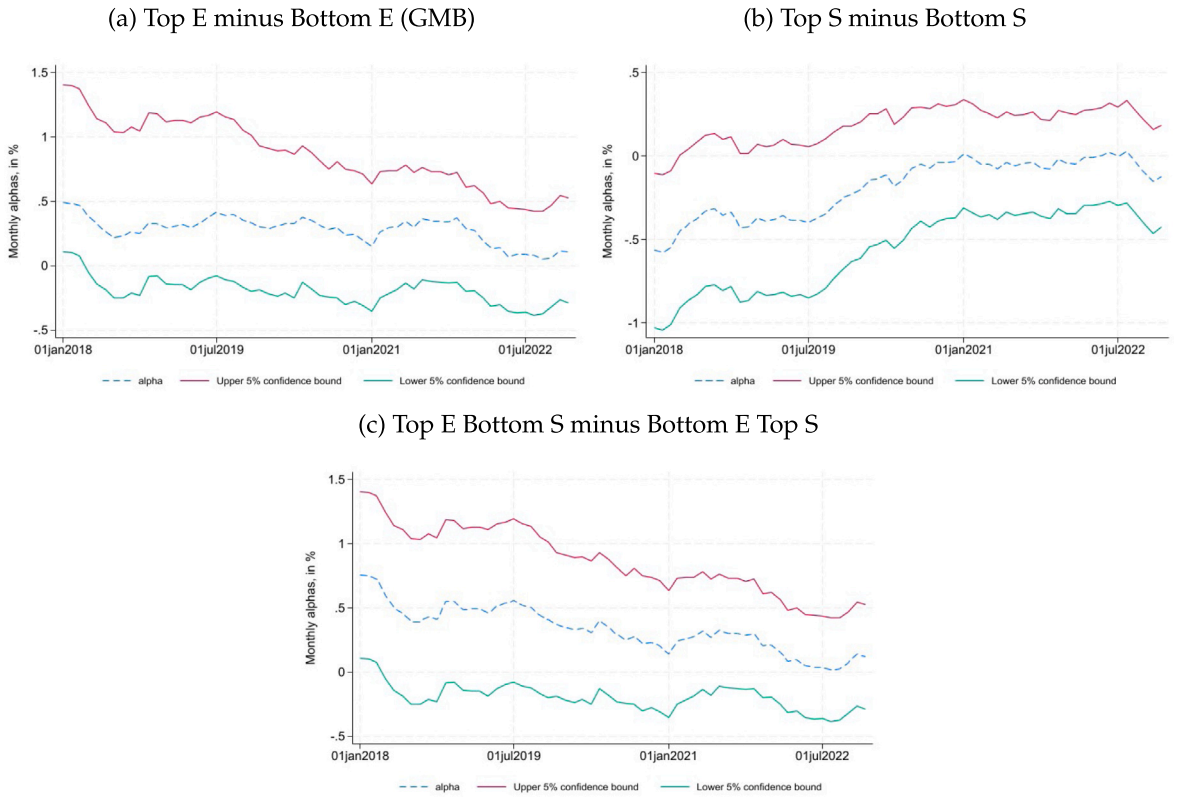


Fig. 6. Time varying excess returns.
This figure illustrates the monthly excess returns over the Fama French 5-factor model. Alphas are estimated based on rolling windows of 60 months. Portfolios are formed based on the best-in universe (not industry-adjusted) E and S scores.

In the later period (2016–2022), as markets began to price ESG factors more efficiently, social factors gained prominence, and the earlier social discount turned into a social premium. This shift is reflected in the unadjusted results in Panel B of Table 7, where the return differential between Top E Bottom S and Bottom E Top S portfolios declines to 0.081% per month (statistically insignificant), reflecting the diminishing preference for environmental performance relative to social performance. In the industry-adjusted score based framework in Panel B of Table 9, the return differential turns negative (−0.324% per month) but remains statistically insignificant, suggesting that firm-specific social factors began to contribute positively to returns, while the earlier dominance of environmental factors and industry effects weakened. Although this return differential alpha is statistically insignificant, the negative sign hints at a shift in market focus toward rewarding social performance at a firm industry-adjusted level. The trade-off between E and S pillar performance thus reflects the evolving market preferences. Environmental factors dominated returns earlier, supported by strong industry effects, while social factors were undervalued. Later, as social factors gained investor attention and industry effects for environmental factors diminished, the emphasis shifted, leading to a more balanced evaluation of ESG pillars and the emergence of a social premium.

5.3. Time varying factor-based return differentials

Up to this point, we have compared two time horizons, 2013–2022 and 2016–2022, focusing on static regressions. To provide additional insights into how the return differentials based on the firm E and S pillar performance, as well as the trade-offs between the two, evolve over time, we estimate rolling window alphas based on the Fama–French five-factor model, with a 60-month estimation period. The results, presented in Fig. 6 for unadjusted scores, confirm the earlier findings that the return differential between environmental (E) leaders and laggards diminishes over time. Panel (a) shows that the alpha of the Top E minus Bottom E (GMB) portfolio declines steadily, reaching near-zero levels by the end of the sample. The early 2018 alphas are positive and statistically significant, while they become statistically insignificant in later periods. The confidence interval for the GMB alpha narrows toward the later periods with the distribution becoming more symmetric as well, suggesting less dispersion of environmental factor and

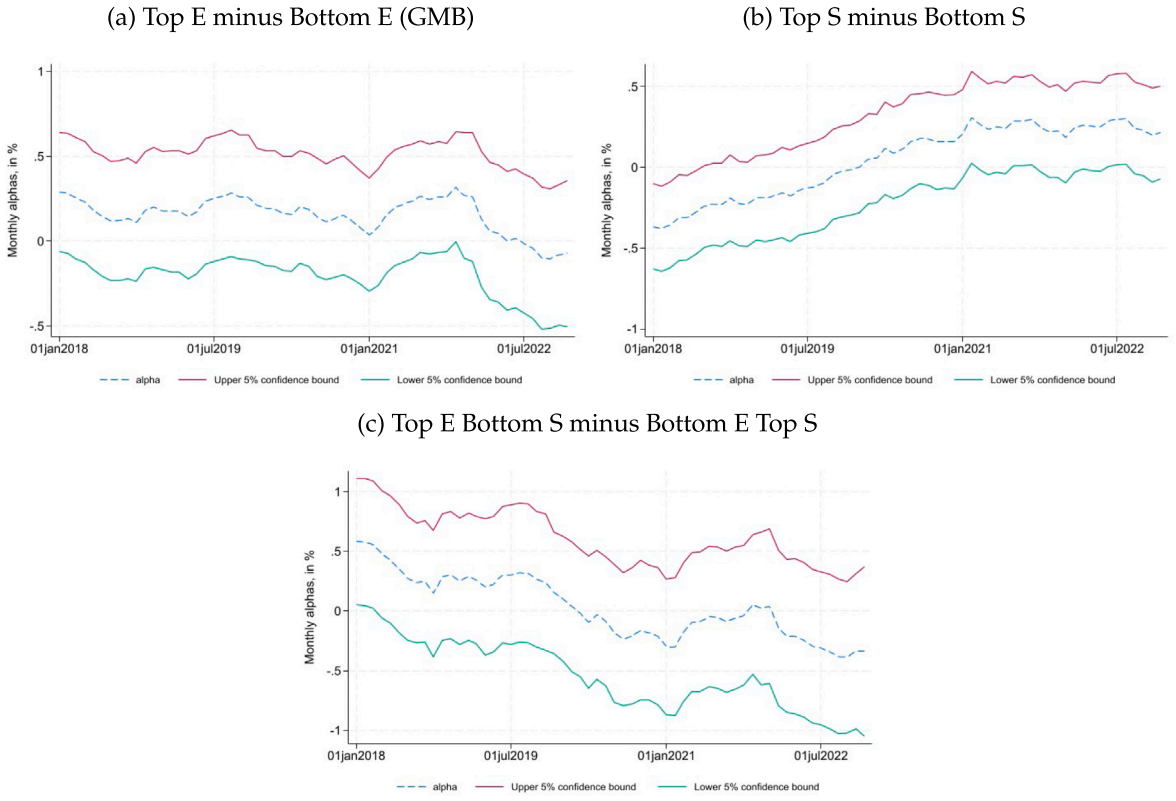


Fig. 7. Time varying excess returns, industry-adjusted scores.
This figure illustrates the monthly excess returns over the Fama French 5-factor model. Alphas are estimated based on rolling windows of 60 months. Portfolios are formed based on the best-in-class (industry-adjusted) E and S scores.

more balanced return performance. In contrast, Panel (b) highlights a clear upward trend in the alphas for the Top S minus Bottom S portfolio, with confidence intervals narrowing over time as well. The early 2018 alphas are negative and statistically significant while statistically not different from zero in later periods. This suggests a persistent transition from a social discount to a social premium.

Panel (c) of Fig. 6 examines the TEBS-BETS portfolio return differential (long Top E Bottom S, short Bottom E Top S), which represents the trade-off between environmental and social pillars. The alphas start significantly positive in the earliest period only, driven by the strong performance of environmentally focused sectors relative to those emphasising social performance. However, the alphas decline and approach zero over time, with the confidence intervals narrowing similarly to those of E and S pillars. In our opinion, this reflects a diminishing uncertainty around the trade-off between E and S pillars, in particular, as we argued before, due to increased importance of industry effects of E and S pillars.

To evaluate the role of industry effects, Fig. 7 presents the rolling alphas for portfolios formed based on the industry-adjusted scores, focusing on the firm-specific variation of the E and S scores within each industry. Panel (a) shows that after industry adjustment, there is no evidence of a green premium even in early 2018, as the alpha becomes insignificant over the entire period under consideration and trends close to or below zero. This supports the interpretation that the earliest environmental premium was driven mainly by industry effects, as firm-specific contributions to environmental performance played a more important role in the mid-period. In contrast to the green premium in Panel (a), Panel (b) for the Top S minus Bottom S portfolio shows an upward trend in adjusted alphas. The social performance's negative alpha remained statistically significant even after the industry-adjusted score sorting was applied. The comparison of Panel (b) in Figs. 6 and 7 suggests that industry effects of social premium are more prominent compared to environmental premium. Nevertheless, similar to the alphas in Panel (b) of Fig. 6, alphas for social premium in Panel (b) of Fig. 7 are statistically insignificant after 2018 (apart from few exceptions in early 2021). Panel (c) of Fig. 7 examines the TEBS-BETS portfolio in the industry-adjusted framework. The alphas begin positive and statistically significant but decline more steeply than in the unadjusted results, turning negative mid sample (albeit not statistically significant).

Together, the evidence based on unadjusted and adjusted E and S pillar score portfolios confirms our previous findings regarding the important industry effects, most likely based on time-varying investor sentiment and preferences regarding the environmental

Table 6
Regressions of Top E TOP S minus Bottom E Top S portfolio returns.

Panel A: 2013–2022						
	(1) tets_minus_bets	(2) tets_minus_bets	(3) tets_minus_bets	(4) tets_minus_bets	(5) tets_minus_bets	(6) tets_minus_bets
mktrf		−0.046	0.015	0.020	−0.019	−0.008
		(0.093)	(0.049)	(0.053)	(0.050)	(0.053)
smb			−0.241***	−0.238**	−0.284***	−0.271**
			(0.092)	(0.093)	(0.102)	(0.108)
hml			−0.448***	−0.441***	−0.287**	−0.265**
			(0.069)	(0.071)	(0.116)	(0.123)
mom				0.021		0.051
				(0.066)		(0.065)
rmw					−0.013	−0.000
					(0.121)	(0.124)
cma					−0.374**	−0.388**
					(0.155)	(0.158)
_cons	0.332	0.378	0.289	0.277	0.374*	0.347
	(0.265)	(0.312)	(0.225)	(0.230)	(0.216)	(0.222)
Adj.R^2	0	−0.004	0.4	0.4	0.4	0.4
Obs	120	120	120	120	120	120
Panel B: 2016–2022						
	(1) tets_minus_bets	(2) tets_minus_bets	(3) tets_minus_bets	(4) tets_minus_bets	(5) tets_minus_bets	(6) tets_minus_bets
mktrf		−0.074	−0.003	−0.013	−0.066	−0.063
		(0.106)	(0.055)	(0.059)	(0.051)	(0.057)
smb			−0.271**	−0.283**	−0.269**	−0.262*
			(0.116)	(0.123)	(0.127)	(0.144)
hml			−0.453***	−0.463***	−0.294**	−0.287**
			(0.072)	(0.071)	(0.119)	(0.123)
mom				−0.036		0.017
				(0.085)		(0.087)
rmw					0.102	0.106
					(0.123)	(0.126)
cma					−0.417**	−0.422**
					(0.163)	(0.163)
_cons	0.061	0.130	0.092	0.105	0.214	0.208
	(0.348)	(0.397)	(0.279)	(0.280)	(0.266)	(0.269)
Adj.R^2	0	0.0009	0.4	0.4	0.5	0.5
Obs	84	84	84	84	84	84

This table shows the results of regressions of the TOP E Top S minus Bottom E Top S hedging portfolio returns on factors: Mkt-RF is the excess market return, SMB and HML are the size and value factors of Fama and French (1993), MOM is the momentum factor of Carhart (1997), RMW and CMA are the profitability and investment factors of Fama and French (2015). Portfolio returns are monthly index-weighted percentage returns. The sample covers the period of 2013–2022 in Panel A and 2016–2022 in Panel B. Standard errors are in parenthesis. *** denote 1% significance, ** denote 5% significance, and * denotes 10% significance.

performance, social performance and the trade-offs between the two.[6]

6. Conclusion

We analyse the trade-offs between the environmental (E) and social (S) pillars of ESG scores and their implications for equity market performance using data from the MSCI All Country World Index (ACWI) over the period from 2013 to 2022. We find a persistent negative correlation between the E and S scores across most industries. For example, the correlation between E and S scores for the overall sample reached as low as −0.56 in 2018, indicating a significant inverse relationship where firms that excel in environmental performance often lag in social performance and vice versa.

Return differentials show that portfolios comprising environmental leaders outperformed environmental laggards during the full sample period of 2013–2022. However, this outperformance diminished post-2016, with return differentials dissipating by the

[6] To explore if our findings are driven by a particular selection of financial market and portfolio formation criteria, we perform two sets of robustness tests. First, we investigate whether our main findings are robust to the selection of financial markets. Given that most of the prior research focused on the US market, we redo the analysis for the US market only and conclude that the results do not seem to be driven by the US market. Secondly, we check whether the portfolio formation cut-off criteria affect the results. We redo the analysis by selecting the top and the bottom quintile (80th and 20th percentile) threshold as an alternative to the original top/bottom third threshold for determining the leaders and laggards. Results again confirm our main findings. While we do not report these robustness tests due to many additional tables with results, they are available upon request.

Table 7
Regressions of Top E Bottom S minus Bottom E Top S portfolio returns.

Panel A: 2013–2022						
	(1) tebs_minus_bets	(2) tebs_minus_bets	(3) tebs_minus_bets	(4) tebs_minus_bets	(5) tebs_minus_bets	(6) tebs_minus_bets
mktrf		0.018	0.023	0.054	0.016	0.044
		(0.047)	(0.041)	(0.045)	(0.040)	(0.043)
smb			0.018	0.038	−0.074	−0.042
			(0.078)	(0.079)	(0.092)	(0.093)
hml			−0.265***	−0.226***	−0.123**	−0.070
			(0.043)	(0.048)	(0.060)	(0.063)
mom				0.113*		0.125**
				(0.061)		(0.063)
rmw					−0.161*	−0.130
					(0.088)	(0.088)
cma					−0.268***	−0.304***
					(0.100)	(0.100)
_cons	0.401**	0.383*	0.370**	0.307	0.457**	0.390**
	(0.196)	(0.215)	(0.186)	(0.191)	(0.177)	(0.181)
Adj.R^2	0	−0.007	0.2	0.2	0.2	0.2
Obs	120	120	120	120	120	120
Panel B: 2016–2022						
	(1) tebs_minus_bets	(2) tebs_minus_bets	(3) tebs_minus_bets	(4) tebs_minus_bets	(5) tebs_minus_bets	(6) tebs_minus_bets
mktrf		0.025	0.031	0.027	0.019	0.019
		(0.053)	(0.045)	(0.050)	(0.046)	(0.051)
smb			0.009	0.004	−0.086	−0.087
			(0.077)	(0.082)	(0.090)	(0.098)
hml			−0.218***	−0.222***	−0.062	−0.063
			(0.043)	(0.046)	(0.055)	(0.058)
mom				−0.016		−0.000
				(0.058)		(0.063)
rmw					−0.158*	−0.158
					(0.091)	(0.095)
cma					−0.299***	−0.299***
					(0.100)	(0.100)
_cons	−0.063	−0.086	−0.077	−0.071	0.081	0.081
	(0.211)	(0.233)	(0.203)	(0.208)	(0.189)	(0.193)
Adj.R^2	0	−0.008	0.2	0.2	0.3	0.3
Obs	84	84	84	84	84	84

This table shows the results of regressions of the Top E Bottom S (TEBS) minus Bottom E Top S (BETS) portfolio returns on factors: Mkt-RF is the excess market return, SMB and HML are the size and value factors of Fama and French (1993), MOM is the momentum factor of Carhart (1997), RMW and CMA are the profitability and investment factors of Fama and French (2015). Portfolio returns are monthly index-weighted percentage returns. The sample covers the period of 2013–2022 in Panel A and 2016–2022 in Panel B. Standard errors are in parenthesis. *** denote 1% significance, ** denote 5% significance, and * denotes 10% significance.

end of the study period. This suggests that the market has become increasingly efficient in pricing environmental sustainability as investor awareness of climate issues has grown and become more widespread. In contrast, portfolios focusing on social sustainability displayed negative return differentials during the same period, with S leaders underperforming relative to S laggards from 2013 to 2022. Like the environmental pillar, these differentials also diminished by 2016, reflecting a delayed but growing integration of social factors into market pricing.

Furthermore, our analysis of a portfolio strategy, which involved taking long positions in environmental leaders who are social laggards and short positions in environmental laggards who are social leaders, yielded positive factor-adjusted returns for the period 2013–2022. The alpha generated by this strategy after controlling for the asset pricing factors of the Fama–French 5-factor model with momentum factor was significant, at 0.39%, indicating that investors rewarded firms with strong environmental performance despite their weaker social performance. However, consistent with theoretical prediction in Pástor et al. (2021), these excess returns also dissipated after 2016, underscoring the market's signalling of equal importance for both environmental and social pillars.

The trade-off between E and S pillar performance reflects the evolving market preferences. Environmental factors dominated returns earlier, supported by strong industry effects, while social factors were undervalued. Later, as social factors gained investor attention and industry effects for environmental factors diminished, the emphasis shifted, leading to a more balanced evaluation of ESG pillars and the emergence of a social premium.

Table 8
Regressions of Top E minus Bottom E (GMB) and Top S minus Bottom S portfolio returns, industry-adjusted scores.

Panel A: 2013–2022												
	(1) gmb	(2) gmb	(3) gmb	(4) gmb	(5) gmb	(6) gmb	(7) tsmbs	(8) tsmbs	(9) tsmbs	(10) tsmbs	(11) tsmbs	(12) tsmbs
mktrf		−0.064**	−0.051*	−0.034	−0.059*	−0.043		−0.004	0.007	0.006	0.011	0.009
		(0.030)	(0.030)	(0.033)	(0.030)	(0.032)		(0.024)	(0.022)	(0.026)	(0.023)	(0.026)
smb			−0.059	−0.048	−0.117*	−0.099			−0.063	−0.064	−0.068	−0.070
			(0.053)	(0.053)	(0.068)	(0.068)			(0.043)	(0.044)	(0.049)	(0.052)
hml			−0.042	−0.020	0.057	0.088			0.004	0.002	−0.002	−0.006
			(0.044)	(0.046)	(0.062)	(0.062)			(0.034)	(0.039)	(0.049)	(0.053)
mom				0.063		0.073				−0.007		−0.010
				(0.047)		(0.045)				(0.042)		(0.043)
rmw					−0.095	−0.076					−0.016	−0.019
					(0.114)	(0.117)					(0.057)	(0.060)
cma					−0.194**	−0.214**					0.021	0.024
					(0.081)	(0.083)					(0.076)	(0.077)
_cons	0.072	0.137	0.119	0.085	0.179	0.140	0.032	0.036	0.021	0.024	0.019	0.024
	(0.136)	(0.142)	(0.138)	(0.137)	(0.127)	(0.126)	(0.098)	(0.103)	(0.101)	(0.100)	(0.100)	(0.100)
Adj.R^2	0	0.03	0.04	0.05	0.08	0.09	0	−0.008	−0.003	−0.01	−0.02	−0.03
Obs	120	120	120	120	120	120	120	120	120	120	120	120
Panel B: 2016–2022												
	(1) gmb	(2) gmb	(3) gmb	(4) gmb	(5) gmb	(6) gmb	(7) tsmbs	(8) tsmbs	(9) tsmbs	(10) tsmbs	(11) tsmbs	(12) tsmbs
mktrf		−0.075**	−0.061*	−0.065*	−0.076**	−0.077**		−0.014	−0.001	0.017	0.000	0.014
		(0.033)	(0.033)	(0.033)	(0.036)	(0.035)		(0.026)	(0.024)	(0.027)	(0.025)	(0.027)
smb			−0.072	−0.077	−0.119	−0.120			−0.059	−0.038	−0.059	−0.032
			(0.058)	(0.062)	(0.077)	(0.085)			(0.047)	(0.048)	(0.051)	(0.056)
hml			−0.010	−0.014	0.092	0.092			−0.026	−0.008	−0.030	−0.006
			(0.049)	(0.048)	(0.067)	(0.065)			(0.033)	(0.035)	(0.046)	(0.048)
mom				−0.018		−0.002				0.067		0.069
				(0.050)		(0.051)				(0.045)		(0.046)
rmw					−0.063	−0.064					−0.002	0.016
					(0.133)	(0.136)					(0.061)	(0.062)
cma					−0.214**	−0.213**					0.012	−0.009
					(0.082)	(0.082)					(0.075)	(0.067)
_cons	−0.199	−0.130	−0.143	−0.137	−0.046	−0.045	0.226**	0.239**	0.228**	0.204*	0.225*	0.201*
	(0.164)	(0.169)	(0.167)	(0.167)	(0.148)	(0.148)	(0.113)	(0.117)	(0.114)	(0.111)	(0.113)	(0.112)
Adj.R^2	0	0.05	0.04	0.03	0.10	0.09	0	−0.008	0.01	0.04	−0.01	0.01
Obs	84	84	84	84	84	84	84	84	84	84	84	84

This table shows the results of regressions of the returns of the Top E minus Bottom E (Green Minus Brown — GMB) and Top S minus Bottom S hedging portfolios on factors: Mkt-RF is the excess market return, SMB and HML are the size and value factors of Fama and French (1993), MOM is the momentum factor of Carhart (1997), RMW and CMA are the profitability and investment factors of Fama and French (2015). Portfolio returns are monthly index-weighted percentage returns. The sample covers the period of 2013–2022. Portfolios are formed based on industry-adjusted E and S scores. Standard errors are in parenthesis. *** denote 1% significance, ** denote 5% significance, and * denotes 10% significance.

Our findings provide important implications for various stakeholders. Investors should be aware that the opportunities for excess returns from prioritising environmental sustainability have decreased as the market has become more efficient. This suggests a need for a more balanced approach that integrates both environmental and social considerations in ESG-focused portfolios. For regulators, the diminishing return differentials highlight the importance of assuring a regulatory environment that promotes transparency and comprehensive integration of both sustainability dimensions rather than relying on market forces to address the disparities created by regulations that favour one aspect of sustainability over the other.

CRediT authorship contribution statement

Leyla Yusifzada: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization. **Igor Lončarski:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization. **Gergely Czupy:** Writing – review & editing, Software, Data curation. **Helena Naffa:** Writing – review & editing, Methodology, Funding acquisition, Conceptualization.

Data availability

The data that has been used is confidential.

Table 9
Regressions of Top E Bottom S minus Bottom E Top S portfolio returns, industry-adjusted scores.

Panel A: 2013–2022						
	(1) tebs_minus_bets	(2) tebs_minus_bets	(3) tebs_minus_bets	(4) tebs_minus_bets	(5) tebs_minus_bets	(6) tebs_minus_bets
mktrf		−0.072	−0.064	−0.042	−0.078	−0.057
		(0.045)	(0.047)	(0.059)	(0.051)	(0.057)
smb			−0.029	−0.015	−0.131	−0.107
			(0.086)	(0.087)	(0.104)	(0.104)
hml			−0.080	−0.052	0.098	0.139
			(0.076)	(0.088)	(0.100)	(0.103)
mom				0.081		0.098
				(0.091)		(0.084)
rmw					−0.167	−0.142
					(0.178)	(0.181)
cma					−0.350**	−0.377**
					(0.149)	(0.153)
_cons	−0.033	0.040	0.027	−0.017	0.133	0.081
	(0.227)	(0.228)	(0.225)	(0.226)	(0.207)	(0.207)
Adj.R^2	0	0.008	0.007	0.008	0.06	0.07
Obs	120	120	120	120	120	120
Panel B: 2016–2022						
	(1) tebs_minus_bets	(2) tebs_minus_bets	(3) tebs_minus_bets	(4) tebs_minus_bets	(5) tebs_minus_bets	(6) tebs_minus_bets
mktrf		−0.093*	−0.084*	−0.106*	−0.108*	−0.120**
		(0.047)	(0.049)	(0.057)	(0.058)	(0.057)
smb			−0.040	−0.066	−0.138	−0.162
			(0.091)	(0.093)	(0.108)	(0.117)
hml			−0.012	−0.034	0.176*	0.156
			(0.078)	(0.082)	(0.097)	(0.098)
mom				−0.082		−0.059
				(0.094)		(0.088)
rmw					−0.144	−0.160
					(0.201)	(0.203)
cma					−0.384**	−0.366**
					(0.146)	(0.145)
_cons	−0.608**	−0.522**	−0.529**	−0.499*	−0.344	−0.324
	(0.260)	(0.259)	(0.260)	(0.264)	(0.231)	(0.234)
Adj.R^2	0	0.02	0.003	0.002	0.08	0.08
Obs	84	84	84	84	84	84

This table shows the results of regressions of the returns of the Top E Bottom S minus Bottom E Top S portfolio on factors: Mkt-RF is the excess market return, SMB and HML are the size and value factors of Fama and French (1993), RMW and CMA are the profitability and investment factors of Fama and French (2015). Portfolio returns are monthly index-weighted percentage returns. The sample covers the period of 2013–2022 in Panel A and 2016–2022 in Panel B. Portfolios are formed based on industry-adjusted E and S scores. Standard errors are in parenthesis. *** denote 1% significance, ** denote 5% significance, and * denotes 10% significance.

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