

ESG Risk Profiles Among S&P 500 Companies: A Comparative Analysis of Low and High Risk Firms

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Abstract—This study provides a transparent descriptive comparison of Environmental, Social, and Governance (ESG) risk profiles among S&P 500 companies using a publicly available ESG Risk Ratings dataset. The downloaded file contains 503 company observations, of which 430 have a valid Total ESG Risk Score. The analytical sample is constructed mechanically by selecting the 25 firms with the lowest Total ESG Risk Scores and the 25 firms with the highest scores. The two groups are compared on total ESG risk, Environmental, Social, and Governance risk components, controversy measures, and sector composition. The Low-ESG-Risk group has an average Total ESG Risk Score of 10.46, compared with 36.51 for the High-ESG-Risk group. The largest component difference appears in Environmental Risk, while the two groups also differ substantially in sector composition: Real Estate and Technology are prominent in the low-risk group, whereas Energy and Industrials dominate the high-risk group. These findings are descriptive rather than causal and illustrate both the usefulness and the limitations of a simple, reproducible public-data approach to ESG analysis.

Keywords—ESG risk, S&P 500, environmental risk, social risk, governance risk, sector composition, sustainable investing

I. INTRODUCTION

A. Research Motivation

The motivation for this study developed from the author's earlier exposure to portfolio analysis and ESG investing through a previous mentored research project in financial investment analysis. The author also developed StockPulse, a personal financial-market analysis website using public market information to explore stock trends and financial data. These experiences raised a practical question: before examining whether ESG information is related to investment performance, what patterns can be observed directly in publicly available ESG data?

This study therefore focuses on the structure of ESG risk itself. Rather than constructing a historical backtest, it compares firms at the two tails of the observed Total ESG Risk Score distribution and examines how their Environmental, Social, and Governance components, controversy measures, and sector membership differ.

B. Research Questions

RQ1: How do S&P 500 firms in the lowest and highest tails of Total ESG Risk Score differ in their overall and component ESG risk profiles?

RQ2: How does sector composition differ between the Low-ESG-Risk and High-ESG-Risk groups?

RQ3: How do controversy levels differ between the two groups?

II. LITERATURE REVIEW

A. ESG Measurement and Financial Relevance

Research on ESG and financial performance has produced mixed findings. Friede *et al.* (2015) synthesize more than 2000 empirical studies and report that the relationship between ESG and corporate financial performance is often non-negative, but varies across settings and measurement choices. More recent U.S.-market studies likewise show that conclusions depend on how ESG is measured and how outcomes are defined (Escobar-Saldívar *et al.*, 2025; Lunawat *et al.*, 2025).

B. ESG Measurement Disagreement

An important limitation of ESG analysis is that ratings are not universal measurements. Different providers can assign different scores because they use different indicators, weights, and definitions. Ehlers *et al.* (2023) show that ESG-score construction choices can materially affect portfolio classifications and outcomes. Parise and Rubin (2025) document a separate disclosure-related problem at the fund level: mutual funds can time ESG-stock trades around portfolio-disclosure dates, illustrating how reported sustainability characteristics may be influenced by disclosure incentives.

C. Contribution of This Study

Instead of treating a public ESG score as a definitive measure of corporate quality, this study uses it as an observed classification variable. Its contribution is deliberately modest: it documents, with a reproducible rule, what distinguishes the lowest- and highest-risk tails of one public S&P 500 ESG dataset.

III. DATA AND METHODOLOGY

A. Data Source

The analysis uses the public "S&P 500 ESG Risk Ratings" dataset attributed to Pritish Dugar and distributed through Kaggle under a CC0 Public Domain designation. The downloaded CSV contains 503 observations and 15 fields, including Symbol, Name, Sector, Industry, Total ESG Risk score, Environment Risk Score, Governance Risk Score, Social Risk Score, Controversy Level, Controversy Score, ESG Risk Percentile, and ESG Risk Level.

Of the 503 observations, 430 contain a valid Total ESG Risk Score and are eligible for ranking. The study does not assign a historical formation date to the ratings and does not

use the data to explain earlier or later stock returns. It analyzes the downloaded file as a point-in-time public ESG snapshot.

B. Sample Construction

The sample-selection rule is mechanical. First, observations without a valid ticker or Total ESG Risk Score are excluded. Second, the remaining firms are ranked by Total ESG Risk Score. Third, the 25 firms with the lowest scores form the Low-ESG-Risk group, and the 25 firms with the highest scores form the High-ESG-Risk group. Lower scores indicate lower measured ESG risk in this dataset. No company is manually replaced on the basis of subsequent stock-price availability.

C. Measures and Analytical Approach

The analysis is descriptive. For each group, the study reports the mean and median Total ESG Risk Score and the mean values of the Environmental, Governance, and Social risk components. Sector frequencies and reported controversy levels are also compared. These statistics are calculated directly from the downloaded CSV. No simulated observations, historical return assumptions, or proprietary ESG estimates are introduced.

IV. RESULTS

A. ESG Risk Comparison

Table 1. Descriptive ESG risk statistics

Group	Mean Total	Median Total	Mean E	Mean G	Mean S
Low ESG Risk (25)	10.46	10.90	1.63	4.87	3.95
High ESG Risk (25)	36.51	36.10	15.22	8.30	13.00

The average Total ESG Risk Score is 10.46 in the Low-ESG-Risk group and 36.51 in the High-ESG-Risk group. The difference is expected because the groups are defined from opposite tails of the same score distribution. More informative is the component pattern. Mean Environmental Risk rises from 1.63 in the low-risk group to 15.22 in the high-risk group; mean Social Risk rises from 3.95 to 13.00; and mean Governance Risk rises from 4.87 to 8.30. In this sample, the largest absolute component difference is Environmental Risk.

B. Sector Composition

Table 2. Sector composition of the two ESG-risk groups

Sector	Low ESG Risk	High ESG Risk
Communication Services	2	1
Consumer Cyclical	5	0
Consumer Defensive	0	2
Energy	0	11
Financial Services	0	1
Healthcare	2	0
Industrials	1	8
Real Estate	8	0
Technology	7	1
Utilities	0	1

Sector composition differs sharply between the two groups. Eight of the 25 low-risk firms are classified as Real Estate and seven as Technology, while five are Consumer Cyclical firms. By contrast, 11 of the 25 high-risk firms are in Energy and eight are in Industrials. Together, Energy and Industrials account for 19 of the 25 high-risk observations. This

concentration means that the observed ESG differences cannot be interpreted solely as firm-level effects; industry exposure is an important feature of the sample.

C. Controversy Levels

Table 3. Reported controversy levels

Controversy Level	Low ESG Risk	High ESG Risk
None	5	0
Low	9	3
Moderate	11	10
Significant	0	6
High	0	4
Severe	0	2

The controversy distributions also differ. The low-risk group contains only None, Low, and Moderate controversy observations: five, nine, and eleven firms respectively. The high-risk group contains ten Moderate, six Significant, four High, and two Severe controversy observations, together with three Low observations. Thus, higher reported controversy is more common in the High-ESG-Risk tail of this dataset.

V. DISCUSSION

The descriptive results show that the public ESG score is associated with several visible structural differences across the two tails of the sample. First, Environmental Risk contributes the largest average component gap between the groups. This is consistent with the heavy representation of Energy companies in the High-ESG-Risk group. Second, Social Risk also differs substantially, while the Governance component shows a smaller average gap. Third, controversy levels are more severe among the high-risk firms.

At the same time, the sector results are a warning against overinterpreting the comparison. Because Energy and Industrials dominate the high-risk group while Real Estate and Technology are prominent in the low-risk group, the analysis does not establish that ESG risk alone causes any broader corporate or financial outcome. The scores may partly reflect the underlying environmental and social exposures of different industries.

The study therefore treats ESG ratings as structured information rather than as a universal ranking of corporate quality. The results describe the internal patterns of one public dataset and provide a reproducible basis for more advanced future research.

VI. LIMITATIONS

(1). Point-in-time data. The dataset is treated as a single public ESG snapshot and does not provide a historical panel of ratings for this analysis.

(2). Provider and methodology dependence. ESG scores can differ across rating systems because providers use different indicators, weights, and definitions.

(3). Sector concentration. The low- and high-risk tails have very different sector compositions, so group differences should not be interpreted as causal firm-level ESG effects.

(4). Missing ESG observations. Of 503 company observations in the downloaded file, 430 have a valid Total ESG Risk Score; firms without a valid total score are not ranked.

(5). Descriptive design. The study does not test

stock-return prediction, portfolio performance, or causal effects. Those questions would require additional market data, a verified information-availability date, and a separate research design.

VII. CONCLUSION

This study compares the ESG risk profiles of 50 S&P 500 companies selected mechanically from the two tails of a public ESG Risk Ratings dataset. The analysis finds clear descriptive differences in total ESG risk, Environmental, Social, and Governance components, sector composition, and controversy levels. The Low-ESG-Risk group has an average Total ESG Risk Score of 10.46, while the High-ESG-Risk group averages 36.51. Environmental Risk shows the largest average component difference, and the sector distributions reveal substantial concentration: Real Estate and Technology are prominent among low-risk firms, while Energy and Industrials dominate the high-risk group.

The main value of the study is transparency rather than complexity. Every company selection and reported statistic can be traced directly to the same public CSV. The results should not be interpreted as evidence that ESG risk causes stock-market performance. Instead, they provide a clear empirical description of how ESG risk is distributed across a selected S&P 500 sample and identify sector composition and measurement methodology as important considerations for future research.

APPENDIX

The 50-company sample is constructed mechanically from the downloaded public ESG file. The 25 firms with the lowest valid Total ESG Risk Scores form the Low-ESG-Risk group, and the 25 firms with the highest valid scores form the High-ESG-Risk group. No market-price-based replacement rule is used.

Table A1. ESG sample composition

Group	Rank	Ticker	Company	Sector	Total ESG Risk
Low	1	HAS	Hasbro, Inc.	Consumer Cyclical	7.1
Low	2	KEYS	Keysight Technologies, Inc.	Technology	7.6
Low	3	CBRE	Cbre Group, Inc.	Real Estate	8.0
Low	4	CDW	Cdw Corporation	Technology	9.2
Low	5	AVB	Avalonbay Communities, Inc.	Real Estate	9.8
Low	6	ACN	Accenture Plc	Technology	9.8
Low	7	CCI	Crown Castle Inc.	Real Estate	10.1
Low	8	IPG	The Interpublic Group of Companies, Inc.	Communication Services	10.3
Low	9	PLD	Prologis, Inc.	Real Estate	10.3
Low	10	STX	Seagate Technology Holdings Plcs	Technology	10.7
Low	11	HPE	Hewlett Packard Enterprise Company	Technology	10.7
Low	12	APTIV	Aptiv Plc	Consumer Cyclical	10.7
Low	13	RHI	Robert Half Inc.	Industrials	10.9
Low	14	KIM	Kimco Realty Corp.	Real Estate	10.9
Low	15	AMT	American Tower Corporation	Real Estate	10.9
Low	16	AZO	Autozone, Inc.	Consumer Cyclical	11.0
Low	17	LKQ	Lkq Corporation	Consumer Cyclical	11.1
Low	18	HPQ	Hp Inc.	Technology	11.3
Low	19	WDC	Western Digital Corp.	Technology	11.4
Low	20	ELV	Elevance Health, Inc.	Healthcare	11.4
Low	21	NWSA	News Corporation Class A	Communication Services	11.5
Low	22	CI	The Cigna Group	Healthcare	11.6
Low	23	SBAC	Sba Communications Corp	Real Estate	11.6
Low	24	REG	Regency Centers Corporation	Real Estate	11.7
Low	25	LOW	Lowe's Companies Inc.	Consumer Cyclical	11.8
High	1	OXY	Occidental Petroleum Corporation	Energy	41.7
High	2	XOM	Exxon Mobil Corporation	Energy	41.6
High	3	GE	General Electric Company	Industrials	40.5
High	4	BA	Boeing Company	Industrials	39.6
High	5	APA	Apa Corporation	Energy	38.8
High	6	TDG	Transdigm Group Incorporated	Industrials	38.7
High	7	MRO	Marathon Oil Corporation	Energy	37.7
High	8	MMM	3m Company	Industrials	37.3
High	9	PWR	Quanta Services, Inc.	Industrials	36.9
High	10	CVX	Chevron Corporation	Energy	36.6
High	11	WFC	Wells Fargo & Co.	Financial Services	36.2
High	12	CAT	Caterpillar Inc.	Industrials	36.2
High	13	CTRA	Coterra Energy Inc.	Energy	36.1
High	14	TSN	Tyson Foods, Inc.	Consumer Defensive	35.9
High	15	EQT	Eqt Corp	Energy	35.7
High	16	PSX	Phillips 66	Energy	35.4
High	17	GD	General Dynamics Corporation	Industrials	35.2
High	18	FTV	Fortive Corporation	Technology	34.8
High	19	ATO	Atmos Energy Corporation	Utilities	34.6
High	20	EOG	Eog Resources, Inc.	Energy	34.2
High	21	META	Meta Platforms, Inc. Class A	Communication Services	34.1
High	22	COP	Conocophillips	Energy	33.9
High	23	DVN	Devon Energy Corporation	Energy	33.8
High	24	KHC	The Kraft Heinz Company	Consumer Defensive	33.7
High	25	TXT	Textron, Inc.	Industrials	33.6

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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