# ESG Scores and Emissions Across Sectors

An exploratory analysis of company data from 2010–2024

BY: Izzy Khachatryan, Carter Quigley
Andy Werner & Jerry Wu

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# Dataset Overview

30 publicly listed companies · 450 company-year records · 9 countries 2010–2024 · Energy, Utilities, and Industrials · 450 rows & 19 columns

Variables used in our analysis

- Company, ticker, year, sector, and country
- Composite ESG score (0–100)
- Scope 1, 2, and 3 emissions (Mt $CO_2e$)
- Combined Scope 1 + 2 emissions and year-over-year Scope 1 change



Source: Kaggle

# Understanding Emissions Scopes

All emissions are measured in million metric tons of carbon dioxide equivalent (Mt $CO_2e$)

## SCOPE 1

Emissions produced directly by a company's operations

## SCOPE 2

Emissions from generating the energy a company purchases

## SCOPE 3

Other indirect emissions across the company's value chain

# Understanding ESG SCORES

An ESG score is a composite score from 0 to 100 that summarizes a company's performance across three areas:

- Environmental: Environmental practices and impacts
- Social: Treatment of workers, communities, and other people
- Governance: Company leadership, oversight, and accountability



# Motivation + Research Question

**Can a score tell the whole climate story?**



**01** How do ESG scores and Emissions compare across sectors?

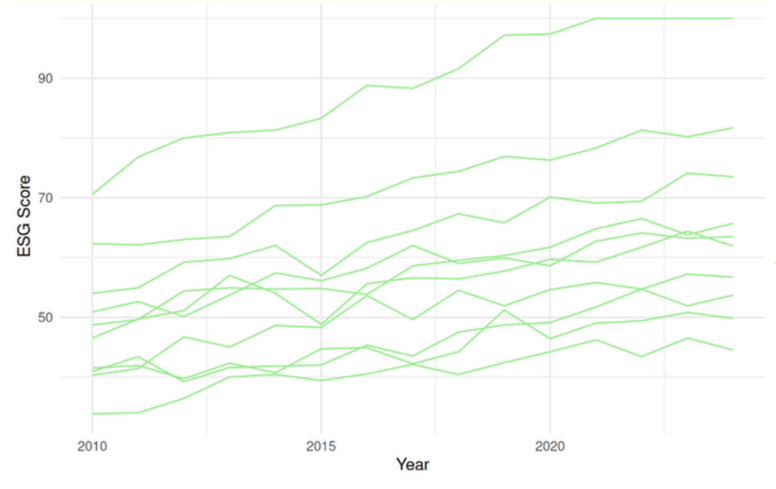
**02** What are the trends of ESG scores and emissions over time?

**03** Are ESG scores associated with emissions?

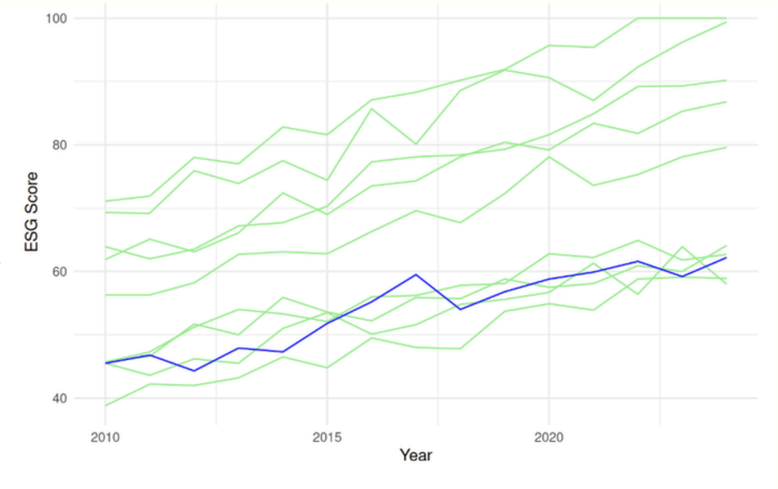
# What are the trends of ESG scores and emissions over time?

# How have ESG scores changed over time within each of these sectors?

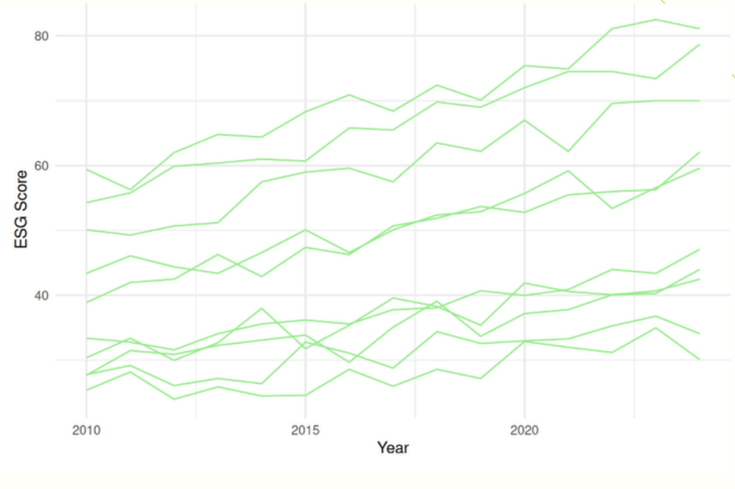
Industrial




Utility



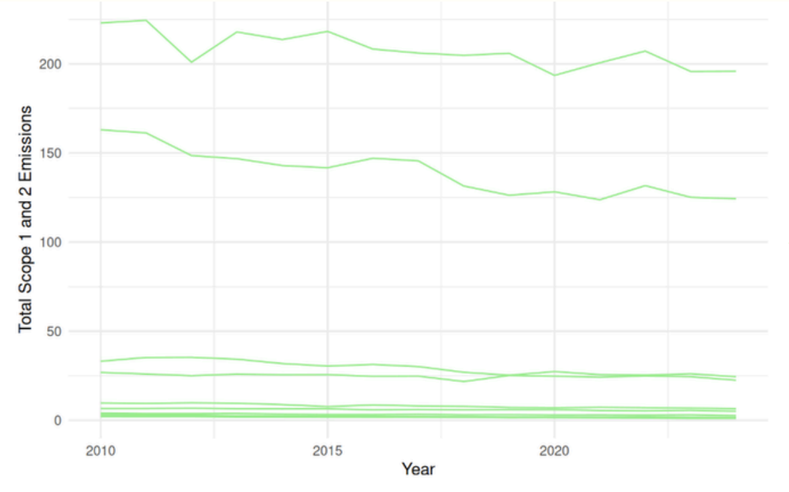

Energy



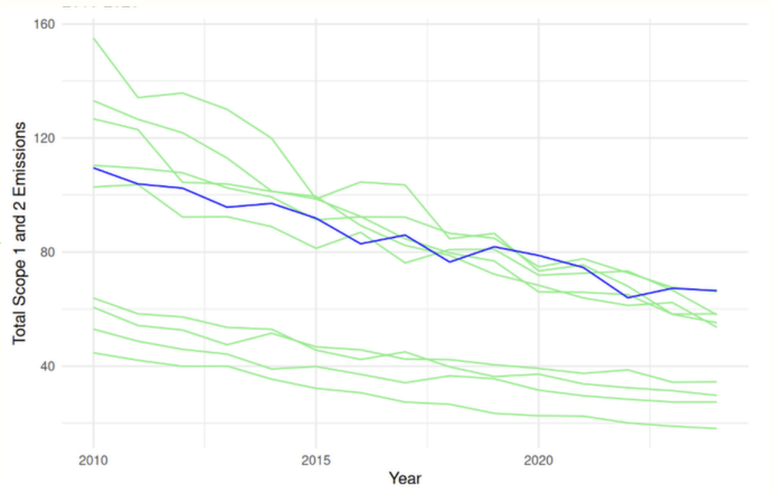

Regardless of sector,  ESG scores have generally increased for all companies

# How have Scope 1 and Scope 2 emissions changed in each of these sectors?

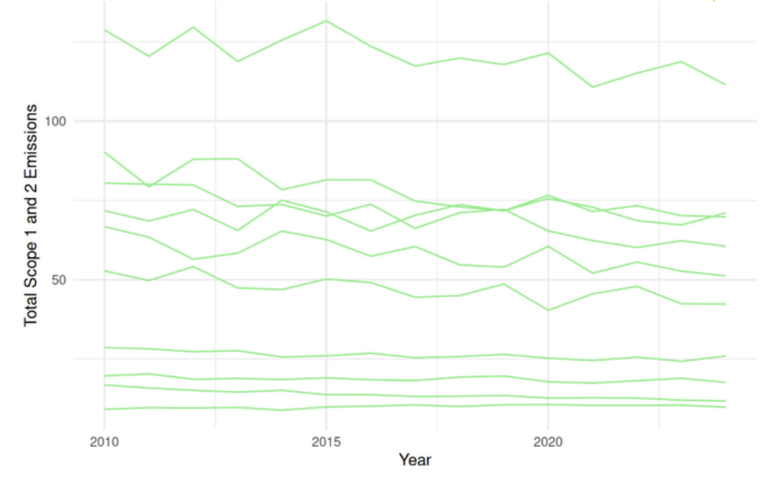
Industrial




Utility



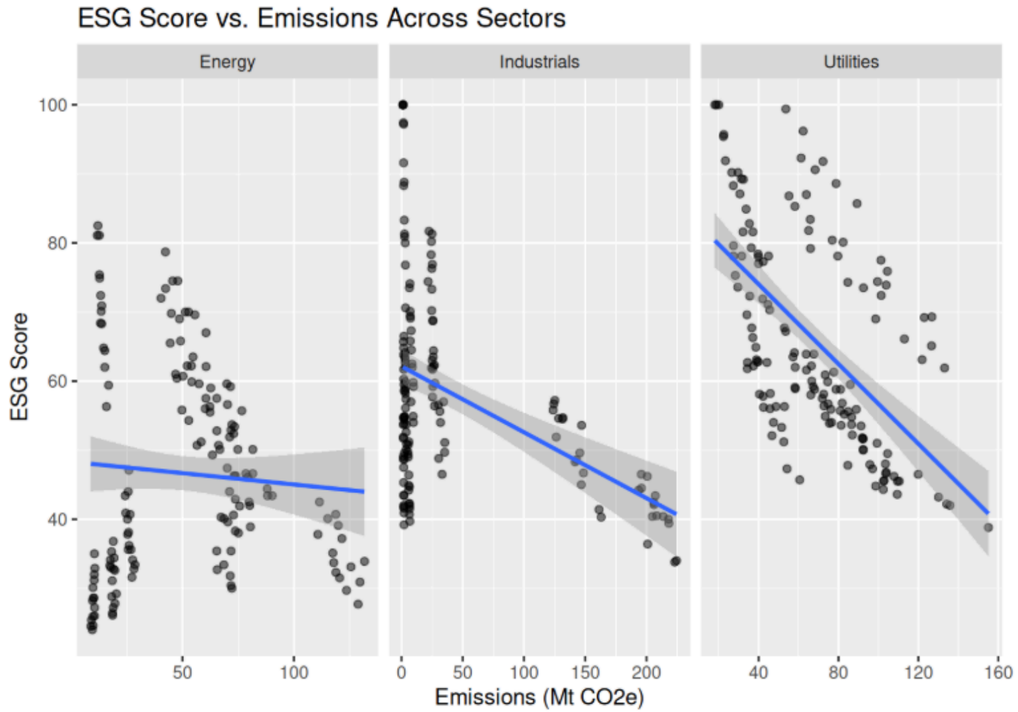

Energy




Regardless of sector, emissions have generally decreased for all companies

# Are ESG scores associated with emissions, and does the relationship differ by sector or emissions scope?

# Linear Regression Modeling by Sector




```
# A tibble: 3 × 3
  sector             r r_squared
  <chr>          <dbl>     <dbl>
1 Energy       -0.0724   0.00524
2 Industrials  -0.440    0.193
3 Utilities    -0.572    0.327
```

## Energy

```
# A tibble: 2 × 5
  term        estimate std.error statistic  p.value
  <chr>          <dbl>     <dbl>     <dbl>    <dbl>
1 (Intercept)  48.3       2.28      21.1   1.40e-46
2 total_s1_s2  -0.0329    0.0372    -0.883 3.79e- 1
```

$$\widehat{ESGScore} = 48.3 - .0329 \times Emissions$$

## Industrials

```
# A tibble: 2 × 5
  term        estimate std.error statistic  p.value
  <chr>          <dbl>     <dbl>     <dbl>    <dbl>
1 (Intercept)  62.1       1.29      48.3   1.50e-92
2 total_s1_s2  -0.0954    0.0160    -5.96  1.80e- 8
```

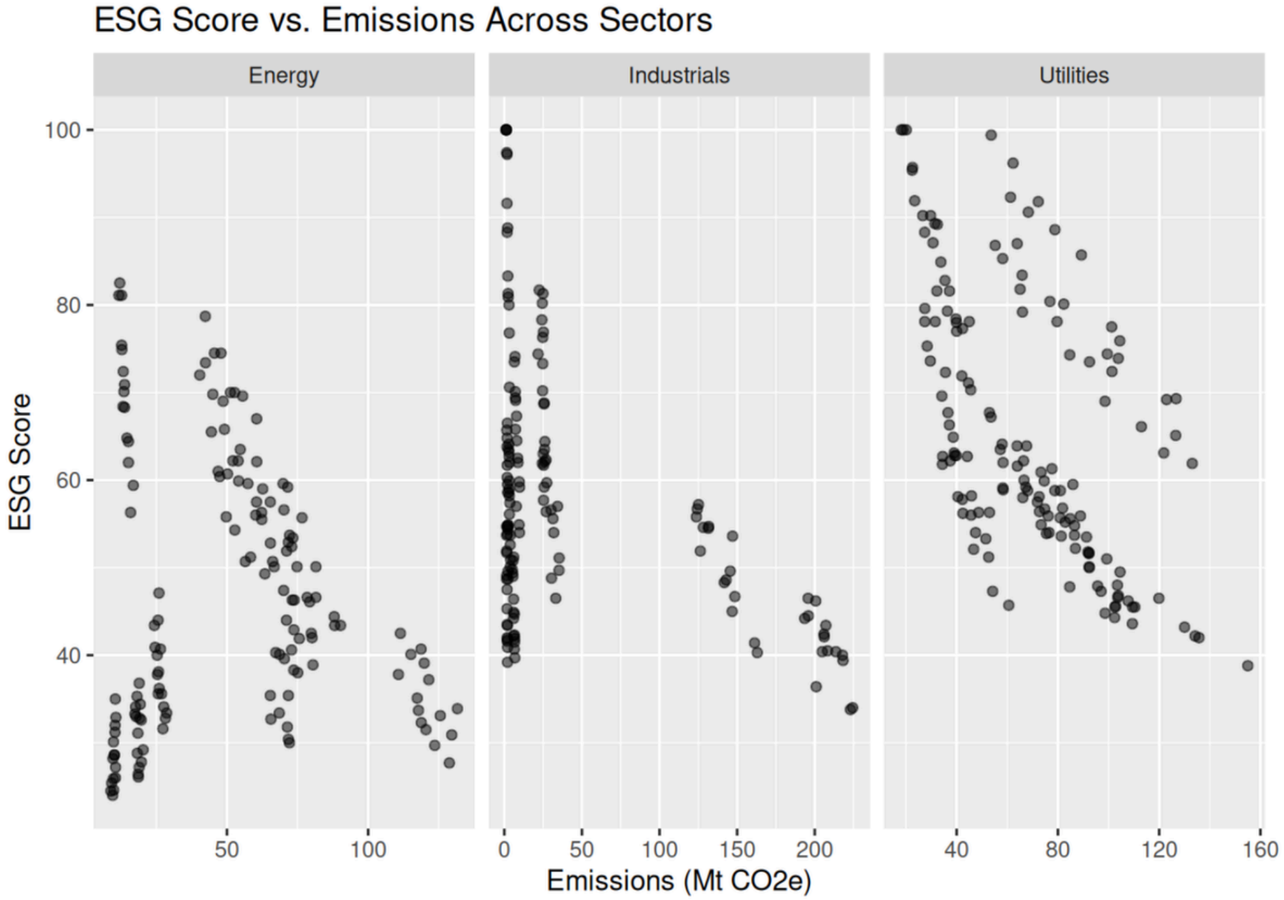
$$\widehat{ESGScore} = 62.1 - .0954 \times Emissions$$

## Utilities

```
# A tibble: 2 × 5
  term        estimate std.error statistic  p.value
  <chr>          <dbl>     <dbl>     <dbl>    <dbl>
1 (Intercept)   85.6       2.55      33.5   4.73e-71
2 total_s1_s2   -0.289     0.0341    -8.48  2.09e-14
```

$$\widehat{ESGScore} = 85.59 - 0.2889 \times Emissions$$

# Results

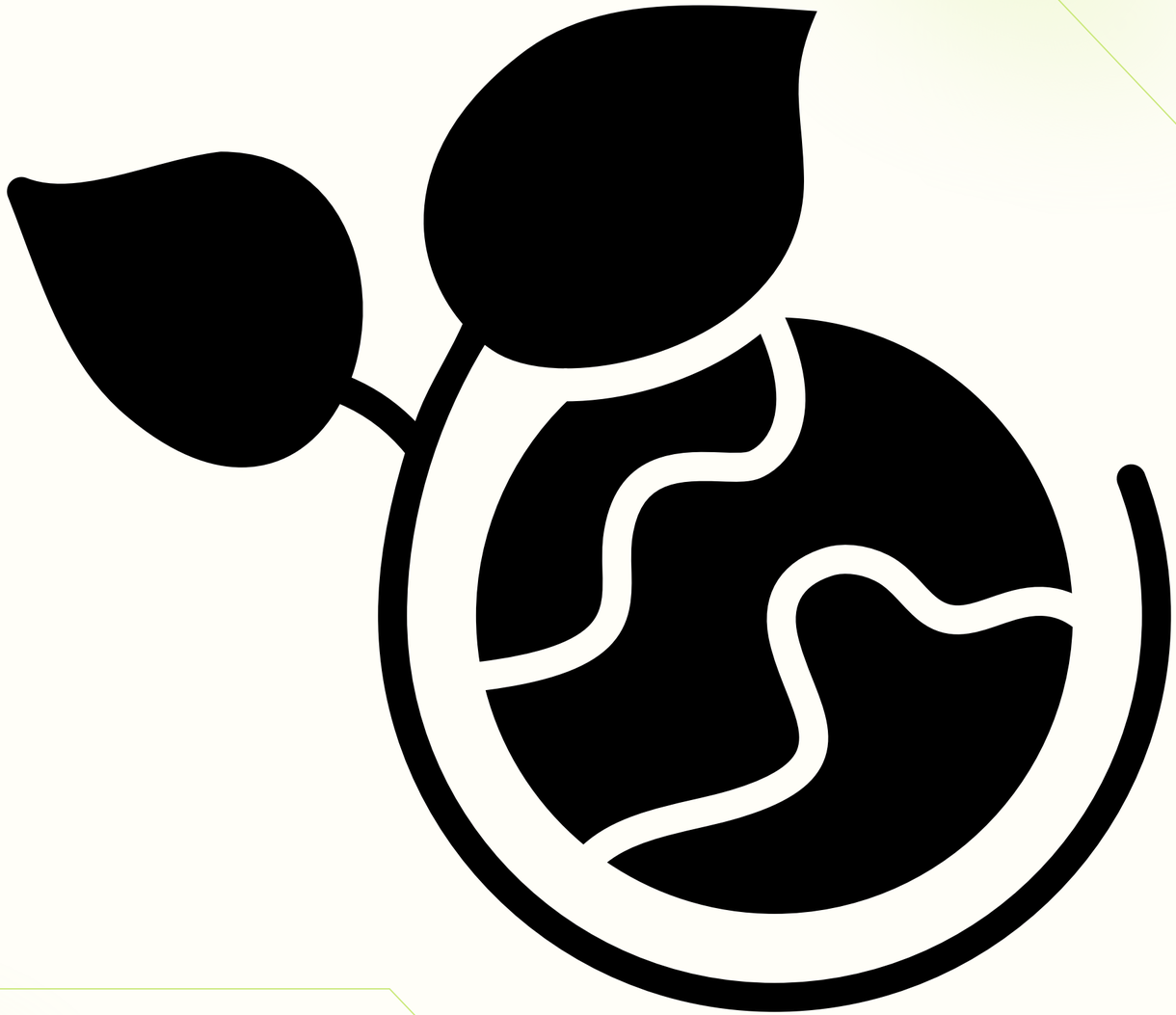



★ **Negative**

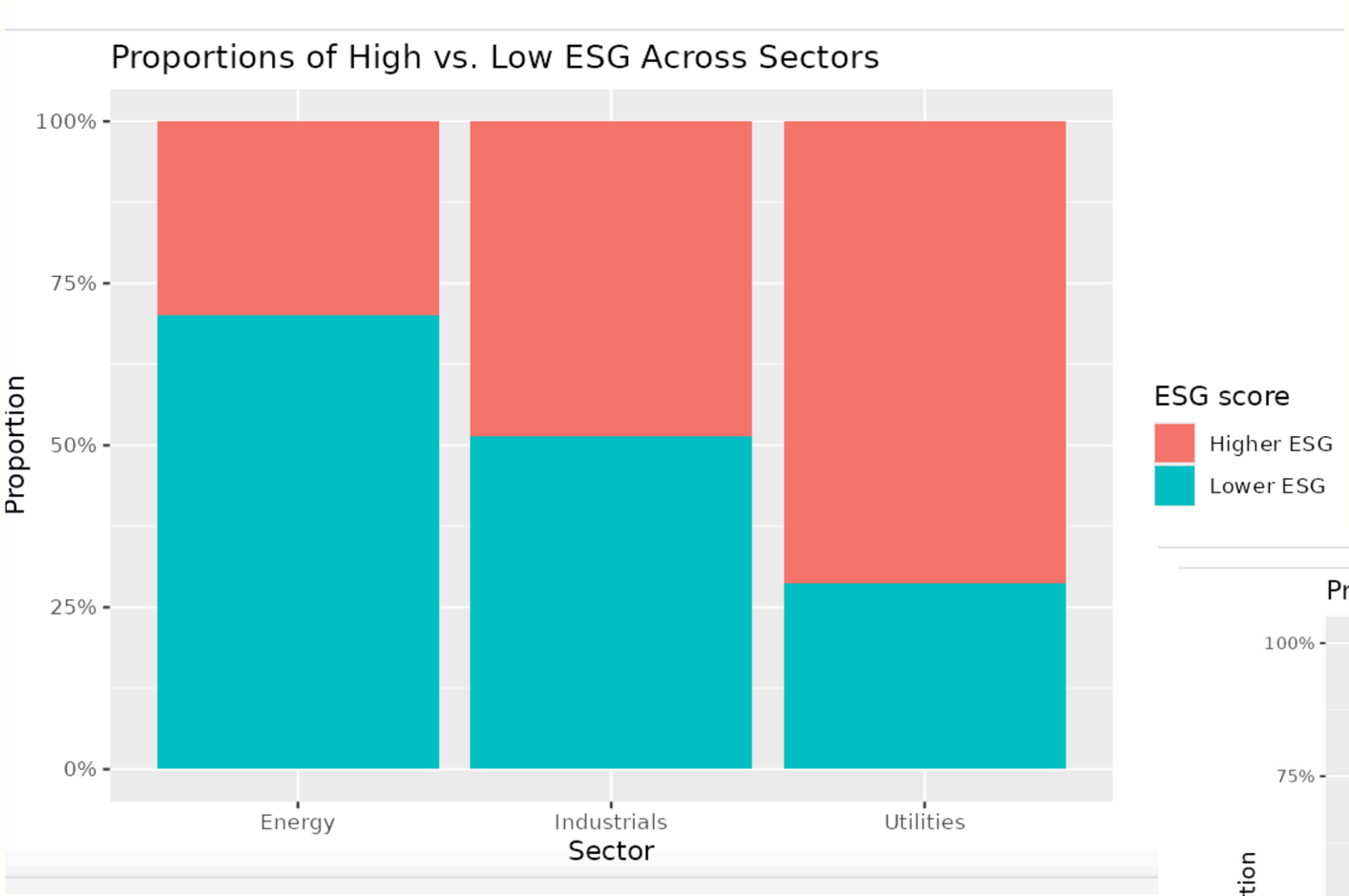
★ **But not linear**

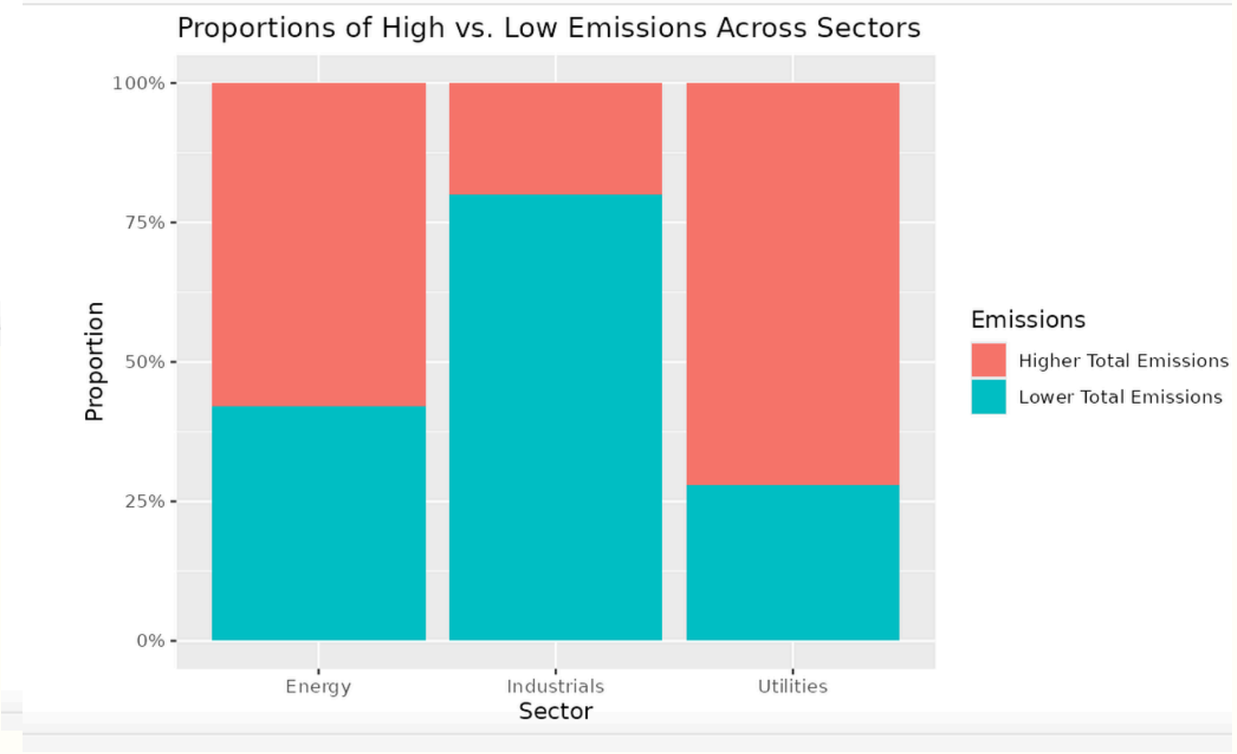
# Takeaways + Limitations

# Thank You!



# How do ESG scores and Emissions compare across sectors?


Proportions of High vs. Low ESG Across Sectors
100%
75%
50%
25%
0%
Proportion
Energy
Industrials
Utilities
Sector
ESG score
Higher ESG
Lower ESG


Proportions of High vs. Low Emissions Across Sectors
100%
75%
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25%
0%
Proportion
Energy
Industrials
Utilities
Sector
Emissions
Higher Total Emissions
Lower Total Emissions