

Green or Greed? Unveiling the Environmental Impact of Market Consolidation on Carbon Emissions

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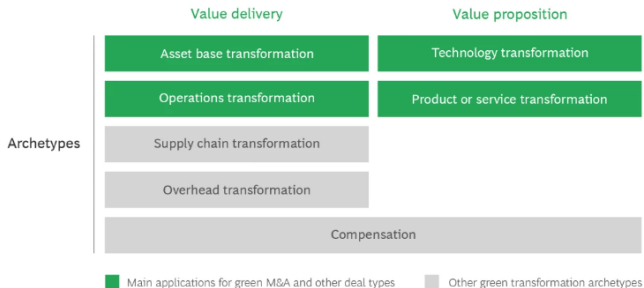
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Decarbonisation and well functioning markets have become key policy objectives

- ▶ **Decarbonisation** has become the priority of several countries with governments announcing and implementing environmental policies aimed at reducing carbon emissions, i.e. the EU ETS
- ▶ **Firms competition** is of paramount importance for a well functioning economy, high prices have negative implications for society welfare, and resource allocation, can decrease the demand for labor and dampens investment in capital (De Loecker et al, 2019)

However very little analysis has been conducted on how competition and environment policies impact each other

Companies are using mergers to fast forward their green transition



Source: BCG analysis.

Chevron and Ford mergers have a different impact on their emissions



Figure 1: Chevron is acquiring smaller oil and gas producers



Figure 2: Ford is investing in Rivian electrical SUV

Research question - Does higher market concentration lead to lower emissions?

- ▶ What is the **impact of mergers**, which are usually scrutinised by competition policies, **on environmental indicators**, such as scope 1 emissions?
- ▶ **Initial intuition**: companies with market power could reduce their production and emit less
- ▶ Important policy implications with respect to consumer welfare, i.e. **policy makers should be aware of the trade-off between market concentration and emissions**
- ▶ **Preliminary results show that after a merger firms reduce their emissions**

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Literature Review

- ▶ **Market concentration**
(Furman and Orszag 2015, Autor et al. 2020, Koltay et al. 2022)
- ▶ **Mergers waves and their impact on the market**
(Ahern and Harford 2014, Nocke and Whinston 2022)
- ▶ **Non-market impact of mergers**
(Phillips and Zhdanov 2013, Kang and Xiao 2023, Martin and Mccrain 2023)
- ▶ **Competition and environmental concerns**
(Aghion et al. 2023)
- ▶ **My contribution** to the existing literature is the extension of mergers' non-market impact to include environmental considerations

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Data Sources

- ▶ **Merger data** - Merger completion dates from S&P capital IQ pro
- ▶ **Emissions data** - Company-level CO2 emissions data from Trucost, which is part of S&P capital IQ pro
- ▶ **Type of emissions**
 - ▶ **Scope 1** emissions are from directly emitting sources that are owned or controlled by a company
 - ▶ **Scope 2** emissions are from the consumption of purchased energy generated upstream from a company's direct operations

Mergers data

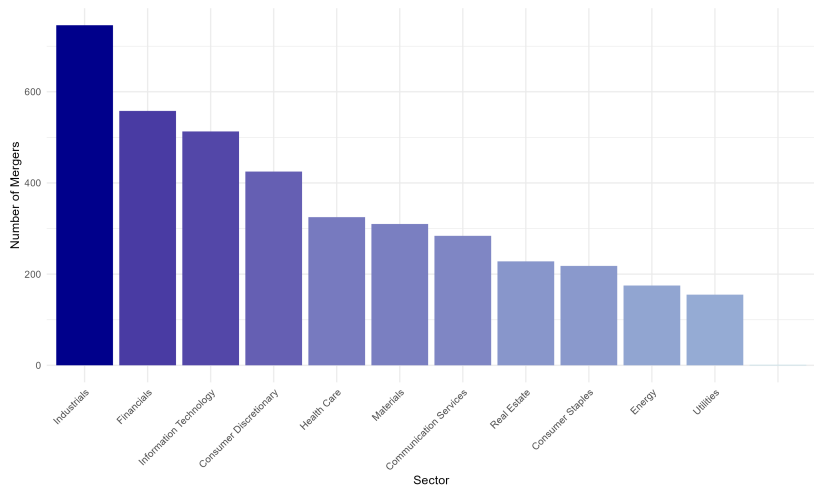


Figure 3: Mergers by sector

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Model Setup and Consumer Preferences

- ▶ Oligopolistic competition with two differentiated products and Bertrand competition
- ▶ Consumers are environmentally conscious, influencing demand based on emissions
- ▶ Emissions increase in output
- ▶ Firms can merge or not (exogenous)
- ▶ Before setting prices, firms can pay a cost K to innovate - the innovation reduces marginal emissions per output

Model Results

- ▶ Mergers increase the incentive to innovate - especially if the consumers have high environmental preferences
- ▶ There is a trade-off between market power and emissions control
- ▶ **Mergers can decrease emissions in two ways:**
 1. **Higher incentives to invest in green R&D**
 2. **Increase in market power**

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Event Study Specification: Impact of Mergers on Emissions

Event Study Model:

$$\log(\text{scope1}_{i,t}) = \beta_0 + \sum_{\tau=-k}^k \beta_{\tau} D_{\tau,t} + X'_{i,t} \gamma + \alpha_i + \lambda_t + u_{i,t} \quad (1)$$

β estimates the differential impact of the merger event on the emissions of firms, isolating the effect of the merger from other factors.

Quasi Experiment - Cancelled mergers as control group

- ▶ Isolate the causal effect of merger on emissions I adopt a methodology similar to Seru (2014), Bena and Li (2014), and Gugler et al. (2003).
- ▶ Adopt as **control group mergers that were announced but failed to successfully complete**
- ▶ Mergers could fail to complete after being announced due to regulatory hurdles (Eckbo, 1983), financing issues (Kaplan and Stromberg, 2009), cultural clashes (Weber et al., 1996), economic condition changes (Shleifer and Vishny, 2003), discoveries during due-diligence (Krishnan et al., 2005), and shareholder opposition (Mulherin and Boone, 2000).
- ▶ These factors should be unrelated to emissions of the target.

Quasi Experiment - Cancelled mergers as control group

$$\log(\text{scope1}_{i,t}) = \alpha + \beta_1 \text{After}_{it} + \beta_2 (\text{After}_{it} \times T_i) + X'_{i,t} \gamma + \alpha_i + \lambda_t + u_{i,t} \quad (2)$$

After is an indicator variable that takes a value of one for all the years after the event date and T is an indicator variable that takes a value of one for targets in the treatment group.

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The Event Study shows that merged companies reduce emissions by over 40%

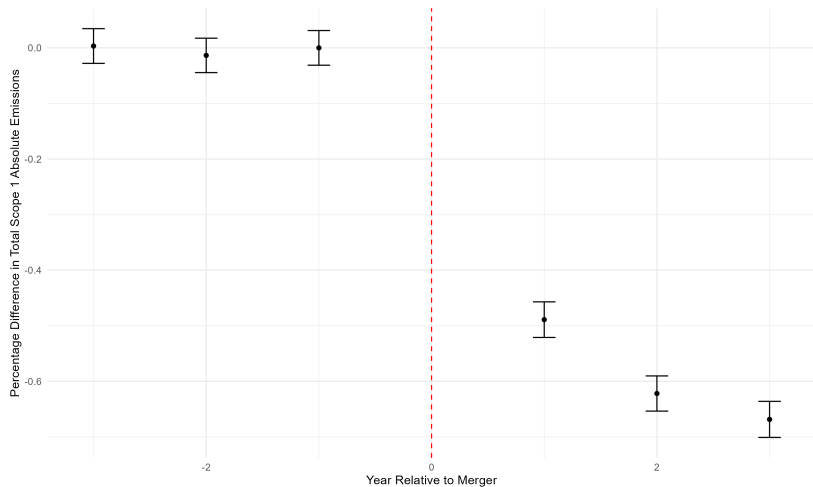


Figure 4: Percentage change in scope 1 absolute emissions following a merger

The effect is comparable for horizontal mergers

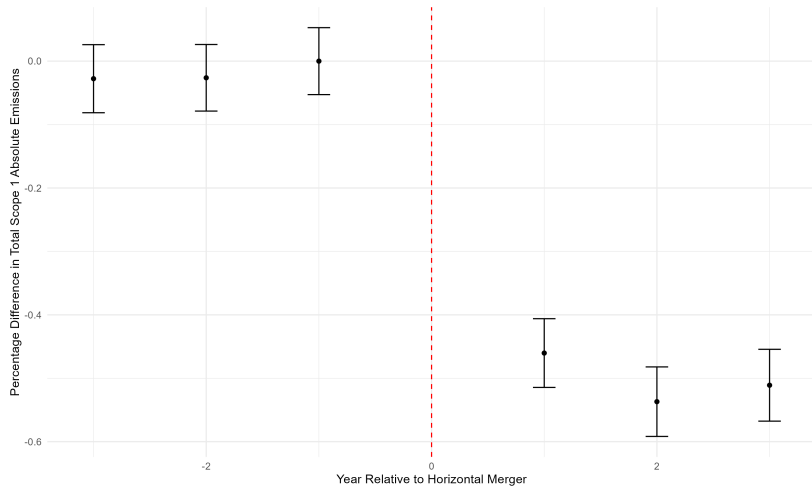


Figure 5: Percentage change in scope 1 absolute emissions following an horizontal merger

Emissions decrease under all specifications

Table: Results of the Event Study for Scope 1 Absolute Emissions

	log(Scope 1 Absolute Emissions)				
	(1)	(2)	(3)	(4)	(5)
Post-Event	-0.589*** (0.013)	-0.592*** (0.013)	-0.587*** (0.010)	-0.195*** (0.011)	-0.200*** (0.011)
Sector FE	N	Y	Y	Y	Y
Country FE	N	N	Y	Y	Y
Year FE	N	N	N	Y	Y
Firm-level controls	N	N	N	N	Y
R^2	0.012	0.385	0.467	0.483	0.485
Adj. R^2	0.012	0.384	0.467	0.483	0.485
N	216,784	216,784	216,784	216,784	216,384

Note: The regression reports the combined companies total emissions from the year of the merger to three years after. The controls are revenues, assets and, liabilities. The fixed effects are SIC sector fixed effects, emission year, and companies' country. The decrease in the number of observations is because some companies are missing at least one control variable. The standard errors are clustered at firm level (regression without clustering leads to similar results).

Emissions decrease under all specifications - Horizontal Mergers

Table: Results of the Event Study for Scope 1 Absolute Emissions - Horizontal Mergers

	log(Scope 1 Absolute Emissions)				
	(1)	(2)	(3)	(4)	(5)
Post-Event	-0.485*** (0.022)	-0.481*** (0.017)	-0.065*** (0.015)	-0.195*** (0.017)	-0.0712*** (0.017)
Sector FE	N	Y	Y	Y	Y
Country FE	N	N	Y	Y	Y
Year FE	N	N	N	Y	Y
Firm-level controls	N	N	N	N	Y
R^2	0.008	0.433	0.554	0.575	0.577
Adj. R^2	0.008	0.433	0.554	0.574	0.576
N	84,036	84,036	84,036	84,036	83,818

Note: The regression reports the combined companies total emissions from the year of the merger to three years after. The controls are revenues, assets and, liabilities. The fixed effects are SIC sector fixed effects, emission year, and companies' country. The decrease in the number of observations is because some companies are missing at least one control variable. The standard errors are clustered at firm level (regression without clustering leads to similar results).

Quasi-Experiment - Merged companies reduce emissions by over 40% compared to cancelled mergers

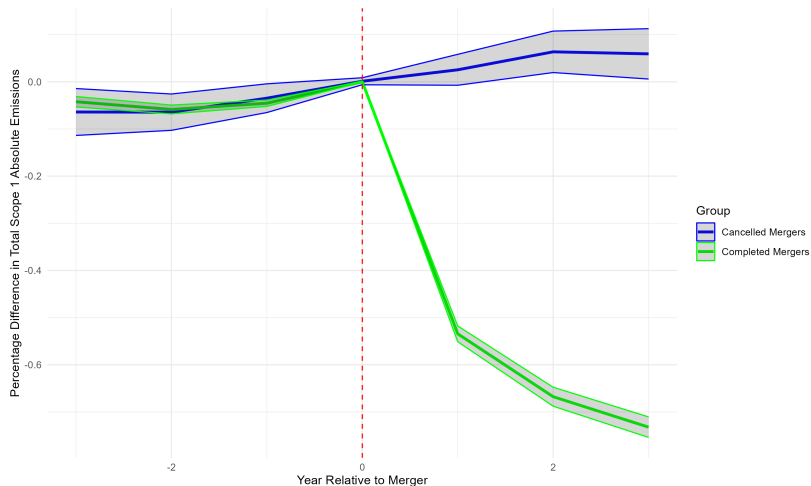


Figure 6: Difference in percentage change in scope 1 absolute emissions between cancelled and completed mergers

Companies in completed mergers reduce their emissions compared to their cancelled counterparts

Table: Results of the DD Specification for Scope 1 Absolute Emissions

	log(Scope 1 Absolute Emissions)				
	(1)	(2)	(3)	(4)	(5)
Post	0.086 (0.060)	0.087* (0.048)	0.489*** (0.046)	0.447*** (0.043)	0.439*** (0.044)
Post*Treated	-0.417*** (0.061)	-0.411*** (0.048)	-0.427*** (0.047)	-0.425*** (0.044)	-0.420*** (0.044)
Sector FE	N	Y	Y	Y	Y
Year FE	N	N	Y	Y	Y
Country FE	N	N	N	Y	Y
Firm-level controls	N	N	N	N	Y
R^2	0.005	0.377	0.411	0.478	0.480
Adj. R^2	0.005	0.377	0.411	0.479	0.479
N	225,177	225,177	225,177	225,177	224,838

Note: The regression reports the combined companies total emissions from the year of the merger to three years after. The controls are revenues and assets. The fixed effects are SIC sector fixed effects, emission year, and companies' country. The decrease in the number of observations is because some companies are missing at least one control variable. The standard errors are clustered at firm level (regression without clustering leads to similar results).

Companies in completed mergers reduce their emissions compared to their cancelled counterparts - Horizontal Mergers

Table: Results of the DD Specification for Scope 1 Absolute Emissions - Horizontal Mergers

	log(Scope 1 Absolute Emissions)				
	(1)	(2)	(3)	(4)	(5)
Post	0.072 (0.077)	0.078 (0.058)	0.552*** (0.056)	0.452*** (0.051)	0.430*** (0.051)
Post*Treated	-0.324*** (0.080)	-0.327*** (0.060)	-0.331*** (0.058)	-0.339*** (0.052)	-0.318*** (0.053)
Sector FE	N	Y	Y	Y	Y
Year FE	N	N	Y	Y	Y
Country FE	N	N	N	Y	Y
Firm-level controls	N	N	N	N	Y
R^2	0.002	0.433	0.483	0.572	0.575
Adj. R^2	0.002	0.433	0.483	0.571	0.574
N	89,710	89,710	89,710	89,710	89,544

Note: The regression reports the combined companies total emissions from the year of the merger to three years after. The controls are revenues, assets and, liabilities. The fixed effects are SIC sector fixed effects, emission year, and companies' country. The decrease in the number of observations is because some companies are missing at least one control variable. The standard errors are clustered at firm level (regression without clustering leads to similar results).

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Potential Mechanisms - Market Power or Efficiencies?

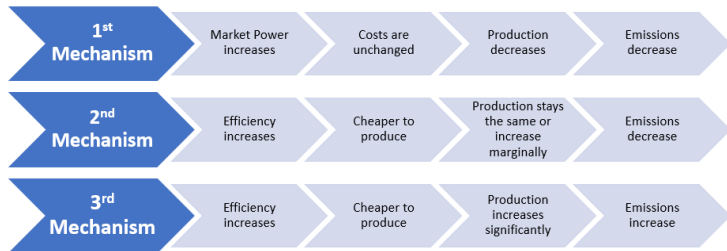


Figure 7: Potential mechanisms

Key Takeaways

- ▶ **Following a merger emissions decrease** no matter the size of the firm or its sector
- ▶ Understanding the leading mechanism would be essential for gauging the trade-off issue

If the leading mechanism is a story of market power the trade-off for policymakers will be tricky to balance

Thank You!

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