# Market Concentration and Carbon Emission Reductions: Assessing the Environmental Impact of Corporate Mergers

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**Abstract**

This paper explores the relationship between market concentration and environmental performance, with a particular focus on the aftermath of mergers. Drawing from foundational economic principles, I hypothesize that increased market power, typically associated with reduced output relative to competitive market conditions, could similarly influence a firm's emissions profile, potentially lowering GHG emissions. This hypothesis introduces a complex tension between two pivotal policy objectives: the reduction of emissions and the preservation of competitive market structures. Novel empirical findings suggest that mergers exhibit a comparable positive impact on environmental indicators. This insight paves the way for a broader discussion on the dual objectives of companies in merger scenarios—enhancing market power versus achieving environmental efficiency.

**Keywords**: Market Concentration, Climate Risks, Emissions, Social Welfare

**JEL Codes**: L23, Q56

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# 1 Introduction

Product market competition is of paramount importance for a well functioning economy. It is a well-studied fact that competitors and new entrants push incumbent companies to set prices that reflect costs, which benefit customers. Firms with higher market power can set high prices, which has negative implications for society welfare, and resource allocation, can decrease the demand for labor and dampens investment in capital, it distorts the distribution of economic rents, and it discourages business dynamics and innovation (De Loecker, Jan Eeckhout, and Unger 2019). For this reason functioning of markets and the protection of consumer rights have been a priority for governments in the past decades. Specifically, countries have implemented competition policies aimed at regulating abuse of market power and protecting consumers.

On the other side in recent years another government priority has rapidly appeared, as it has become evident from scientific evidence and the increased frequency of extreme weather events that countries must rapidly decarbonise. To achieve decarbonisation, governments have announced and implemented environmental policies aimed at reducing carbon emissions, most prominently the European Union Emission Trading Scheme.

This study explores the interplay between market concentration and environmental performance, with a particular emphasis on the aftermath of mergers. Given the scrutiny mergers attract from competition authorities due to potential market power implications and consumer harm, this research investigates a nuanced question: do mergers lead to a reduction in greenhouse gas (GHG) emissions for the consolidated entities compared to their pre-merger states?

Drawing on fundamental economic theories, I hypothesized that increased market power, often resulting from mergers, may lead to reduced production levels. This reduction in output, when applied to the domain of environmental emissions, suggests that a more concentrated market could potentially lower GHG emissions. An alternative explanation could be that merged entities have access to better technology or better management, due to economies of scale and/or scope and improve their environmental footprints. This hypothesis introduces a complex dynamic between the objectives of emissions reduction and the maintenance of competitive market structures.

I introduce and employ a Bartik-style instrument, in line with Cowgill, Prat, and Valletti 2021, to assess the exposure of firms to mergers and acquisitions and its subsequent impact on environmental performance metrics. By leveraging variations in merger exposure across firms I aim to address the endogeneity concerns often associated with evaluating the outcomes of mergers, providing a more robust analysis of their impact on environmental indicators. The findings reveal a significant and substantive effect: companies tend to exhibit a reduction in both the absolute magnitude of their GHG emissions and the intensity of these emissions relative to their revenues following a merger. This reduction underscores the potential for corporate consolidation to serve as a lever for environmental improvement, challenging the conventional wisdom that mergers primarily serve economic or financial objectives. Through this analysis, we shed light on the nuanced ways in which market concentration dynamics, induced by mergers and acquisitions, can influence a firm's environmental footprint, thereby contributing to the broader discourse on the intersection of corporate strategy, market structure, and sustainability.

## 2 Literature Review

Market concentration, which is also used as a substitute for competition intensity, can be defined by the extent to which market shares are concentrated between a small number of firms (OECD, 2018). Recent decades have seen a drastic change in market structure and concentration. The latest publications have noted a trend for increased industry concentration in the United States (Furman and Orszag 2015 and Autor, Dorn, Lawrence F. Katz, Patterson, and Reenen 2020). On the contrary, the more current literature has not reached a consensus on the direction of concentration for Europe; Gutierrez and Philippon (2023) found that competition in Europe increased, due to independent regulators and appropriate competition policies, while Koltay, Lorincz, and Valletti (2022) observe a moderate increase in European industry concentration and a trend towards oligopolies.

On mergers, there is existing literature on the importance of mergers for market concentration and industry links (Ahern and Harford 2014). Part of the literature on mergers focuses on their negative impact on consumer choice and whether merger threshold are appropriate, Nocke and Whinston (2022) find that current concentration levels are likely too permissive and could contribute to increase in prices which might harm consumers. If not screened properly mergers could also have other negative impact, i.e. on their own workforce, Berger et al. (2023) suggest that suggest that workers are harmed, on average, under the enforcement of the more lenient 2010 merger guidelines. Another side of the literature focuses on which companies merge, Crouzet and Eberly (2019) have found that companies with a high level of intangibles over their total assets, such as intellectual property and software, tend to have higher market power and increase market concentration over time, and whether mergers could be a positive incentive for innovation (Phillips and Zhdanov 2013).

This paper contributes to the more recent literature of the impact of non-market effects of market power and market concentration. With respect to the impact on policies Kang and Xiao (2023) find that a company's actions can significant reduce government pro-competitive policies, while Yue (2023) demonstrates how nascent industry can if organised can nullify local regulations. Other articles have focussed on the impact of market concentration, specifically media, on elections and voters availability of information (Martin and Mccrain 2023).

Finally, on competition and the environment, Aghion et al. (2023) found that when consumers care about their environmental footprint, firms pursue greener products. This paper would extend the existing literature on market power and concentration to environmental considerations. My findings will shed light on how the two fields are linked, and whether policymakers need to be aware of such trade-offs when constructing policies in each field.

## 3 Theoretical Framework

In this study, I propose a simplified model of oligopolistic competition where consumers are environmentally conscious. The model features two firms producing differentiated products, with production processes that result in emissions. A representative consumer purchases both goods, and emissions are considered harmful, leading to a scenario where, all else being equal, the consumer's demand for the two goods increases as their environmental concerns diminish. The firms engage in price competition.

I explore the impact of a merger between these two firms on prices and emissions. It is posited that a merger could yield specific efficiencies from the combined production of the two goods. My analysis demonstrates that if these efficiencies are sufficiently large, the merger could lead to increased output, reduced prices, and heightened emissions. Conversely, in scenarios where the efficiencies are minimal, the merger leads to higher prices but benefits the environment through a reduction in emissions. Thus, our findings underscore a trade-off between prices and emissions in markets characterized by polluting production processes.

My model is intentionally streamlined to underscore this trade-off and to articulate our underlying logic. I make certain assumptions regarding consumer preferences and the number of firms in the market. Nonetheless, these assumptions are not fundamental. The crucial assumptions are twofold: first, that demand decreases as prices increase, and second, that emissions escalate with increased output. Given these conditions, any model of competition would reveal a similar trade-off between pricing strategies and environmental preservation.

Toward the end of this section, I introduce the possibility of an alternative mechanism. Specifically, we argue that a merger could lead to a reduction in emissions not solely by diminishing output due to enhanced market power but also by fostering innovations in green technology.

**Preferences and Technology** There are two products $i \in \{1, 2\}$, and two firms. Each firm produces a different product. A representative consumer buys the two goods. The consumer has a Singh and Vives (1984) utility function:

$$u\left(q_1, q_2\right) = q_1 + q_2 - \frac{1}{2}\left(q_1^2 + q_2^2\right) - \gamma q_1 q_2 - \phi z\left(q_1 + q_2\right) \ , \tag{1}$$

where $q_i$ is the quantity of product $i$, and the parameter $\gamma \in (0, 1)$ captures the degree of product differentiation. When $\gamma = 0$, products are completely unrelated, and firms act as local monopolists. When $\gamma = 1$, products are perfect substitutes, and Bertrand competition brings profits down to zero. We rule out both cases.

The function $z\left(q_1 + q_2\right)$ describes the technology according to which total output $\left(q_1 + q_2\right)$ generates emissions. We assume the following functional form:

$$z(q_1+q_2) = (q_1+q_2)^{\alpha}. \tag{2}$$

When $\alpha > 1$ ($\alpha \leq 1$), emissions are a convex (concave) function of output. For what follows, we assume a linear form: $z(q_1+q_2) = q_1+q_2$.[1] The parameter $\phi \geq 0$ captures the degree of environmental concern for the consumers. When $\phi = 0$, the consumer does not care about emissions, for example, because the cost of pollution is sustained by people located in different locations or by future generations. Then, the utility function can be rewritten as:

$$u(q_1,q_2) = (1-\phi)(q_1+q_2) - \frac{1}{2}\left(q_1^2+q_2^2\right) - \gamma q_1 q_2 . \tag{3}$$

The consumer's utility maximization problem results in the following demand functions:

$$q_i(p_i,p_j) = \frac{1-\phi-p_i+\gamma(p_j+\phi-1)}{1-\gamma^2} . \tag{4}$$

As expected, $q_i(p_i,p_j)$ is increasing in $p_j$ as goods are substitutes and decreasing in $p_i$ as goods are normal. Interestingly, demand is also decreasing in $\phi$. When the degree of environmental concern increases, the consumer reduces their consumption to reduce emissions. We assume that the two firms are equally efficient. Their marginal cost is $c \geq 0$. Profits can then be written as follows:

$$\begin{aligned}\pi_i(q_i,p_i,p_j) &= (p_i-c)\,q_i = \\ &\frac{(p_i-c)(\gamma(p_j+\phi-1)+1-\phi+p_i)}{1-\gamma^2}\end{aligned} \tag{5}$$

I now solve the game for two different states of the world $m \in \{0,1\}$. If the state is $m=0$, the two firms do not merge. If the state is $m=1$, the two firms merge. Then, we will perform a welfare assessment of the merger.

**Market Equilibrium** Let us start from $m=0$. Firms do not merge. Then, they set prices simultaneously and independently. The FOC for each firm implies:

$$p_i^*(p_j) = \frac{1}{2}(c+\gamma(p_j+\phi-1)+1-\phi) \tag{6}$$

[1] Our results are qualitatively robust to changes in the parameter $\alpha$. In particular, the quadratic case ($\alpha = 2$) is substantially equivalent to the linear case $\alpha = 1$. We stick to linearity for the sake of simplicity.

Intersecting the best responses, we obtain Nash Equilibrium (equilibrium henceforth) prices:

$$p_i^* = \frac{\gamma\phi + c - \gamma + 1 - \phi}{2 - \gamma} \tag{7}$$

Total emissions are:

$$z\left(q_1^*, q_2^*\right) = \frac{2(1 - c - \phi)}{(2 - \gamma)(\gamma + 1)} \tag{8}$$

Let us now turn to the case of $m = 1$. After a merger, firms set prices cooperatively. In particular, the merged entity chooses prices to maximize the joint sum of profits, that is,

$$\begin{aligned}&\Pi\left(q_i, q_j, p_i, p_j\right) = \left(p_i - \mu c\right) q_i + \left(p_j - \mu c\right) q_j = \\ &\sum_i \frac{(p_i - c)(\gamma(p_j + \phi - 1) + 1 - \phi + p_i)}{1 - \gamma^2} \,.\end{aligned} \tag{9}$$

In this case, equilibrium prices are:

$$p_i^m = \frac{1}{2}(c\mu + 1 - \phi) \,. \tag{10}$$

Total emissions are:[2]

$$z\left(q_1^m + q_2^m\right) = \frac{1 - c\mu - \phi}{\gamma + 1} \,. \tag{11}$$

It is interesting to see that as $\phi$ increases, prices decrease for all $m$. As the degree of environmental concern increases, demand shrinks, and firms need to set lower prices.

**Merger, Prices and Emissions** We are now ready to state our main prediction. The merger decreases prices if and only if

$$\mu < \frac{\gamma\phi + 2c - \gamma}{c(2 - \gamma)} := \hat{\mu} \,. \tag{12}$$

However, whenever $\mu < \hat{\mu}$, the merger increases emissions. The threshold $\hat{\mu}$ is increasing in $\phi$ and decreasing in $\gamma$. As in standard competition models, a merger presents a trade-off. On one hand, the merger increases market power, potentially leading to higher prices. On the other hand, the merger can generate efficiencies, allowing cost savings to be partially passed through to consumers. Thus, a merger results in higher prices if, and only if, the efficiencies are insufficiently large. Our model suggests a potential environmental "benefit" associated with price increases, as a reduction in output implies a reduction in emissions. Conversely, should the merger generate significant efficiencies, the merged entities may increase output (as production becomes more cost-effective), leading to higher emissions.

[2]We assume that $\phi < 1 - c$ so that output and prices are always positive for all $m$.

The threshold $\hat{\mu}$ increases with $\phi$. The more environmentally concerned the consumer, the less likely it is that the merger will decrease emissions. This counterintuitive outcome arises because an increase in $\phi$ diminishes the consumer's willingness to pay, reducing firms' market power and making a pro-competitive outcome more probable. Conversely, the threshold $\hat{\mu}$ decreases with $\gamma$. A higher degree of product differentiation enhances the merger's ability to create market power, thereby reducing the likelihood of the merger being pro-competitive.

**Green Innovation** In this section, we explore how a merger can reduce emissions not only by decreasing output, which inevitably leads to higher prices, but also by encouraging investments in green innovations. We propose a modification to our model for this analysis.

Suppose that before engaging in the Bertrand competition, each firm has the option to invest a cost of $K > 0$ in green technology. This technology, conceptualized as an emission abatement mechanism, enables firms to produce with minimal pollution. Given the consumer's environmental concerns, such innovation is likely to boost demand.[3] Firms will invest in innovation only if the anticipated increase in revenue outweighs the technology's cost, $K$. We examine how a merger influences firms' incentives to innovate.

We specifically focus on equilibria where both firms choose to innovate.[4] Let $\Delta\pi(m)$ be the benefits for a single firm from the innovation as a function of market structure $m$ (given that both firms innovate). To obtain these expressions, we compute firms' profits in the case of $\phi = 0$, and we compare them with the profits that firms gain when $\phi > 0$. Then,

$$\begin{aligned} \Delta\pi(0) &= \frac{(\gamma-1)\phi(2c+\phi-2)}{(\gamma-2)^2(\gamma+1)} > 0 \\ \Delta\pi(1) &= -\frac{\phi(2c\mu+\phi-2)}{4(\gamma+1)} > 0 \end{aligned} \tag{13}$$

[3] In scenarios where consumers are indifferent to environmental impact ($\phi = 0$), firms lack the incentive to invest in green technology. In the real world, the cost of emissions and the financial benefits derived from investments in abatement technologies often lead to cost reductions. The logic behind this alternative scenario parallels that of our initial model.

[4] In the absence of a merger ($m = 0$), it is possible to find equilibria where only one firm innovates, leading to higher emissions compared to scenarios where both firms innovate (resulting in zero emissions). Our analysis concentrates on situations where both firms innovate, assessing whether a merger can amplify incentives for green innovation.

For all $m$, both firms invest in the green technology if and only if the cost $K$ is low enough.

$$\begin{aligned} \Delta\pi(0) \geq K \Rightarrow K \leq \overline{K}_0 \\ \Delta\pi(1) \geq K \Rightarrow K \leq \overline{K}_1 \ . \end{aligned} \tag{14}$$

The merger increases the incentives to innovate as $\overline{K}_1 > \overline{K}_0$.

If $K \in (\overline{K}_0, \overline{K}_1]$, both firms invest in the green technology if and only if the merger occurs ($m = 1$). The rationale behind this is straightforward. A merger enhances firms' incentives to innovate by increasing the returns on such investments. Innovation, particularly those that increase consumer demand through environmental benefits, becomes more financially appealing as it can elevate firms' profits. In the absence of a merger, however, competitive pressures may erode these additional profits. A merger mitigates this competition, enabling firms to allocate more resources towards innovation.

A merger can lead to a reduction in emissions through two distinct pathways. Firstly, by potentially reducing output, a merger might inadvertently raise prices, a scenario generally unfavorable to consumers. Secondly, and more constructively, it can encourage investments in green technologies. This dual-faceted outcome highlights the complex impact mergers can have on both market dynamics and environmental sustainability.

# 4 Data

I use data from S&P Capital IQ on private and publicly listed firms in Europe and Northern America. Specifically, I have collected revenues, cost of goods sold, mergers completion dates. I exclude from my sample companies for which I do not have emission data, so the merger figure might look smaller with respect to other papers that use the entirety universe of merger. Figure 1 shows that majority of the mergers in my sample are happening in North America, with a significant proportion in the US, and the United Kingdom, this is in line with recent concentration literature (Gutierrez and Philippon (2023)) showing that European regulators have enforced competition more strongly than any individual country. Figure 2 shows that mergers seems to be more prevalent in the manufacturing and ICT industry, this reflects findings (Autor, Dorn, Lawrence F. Katz, Patterson, and Van Reenen 2017) that manufacturing has his-

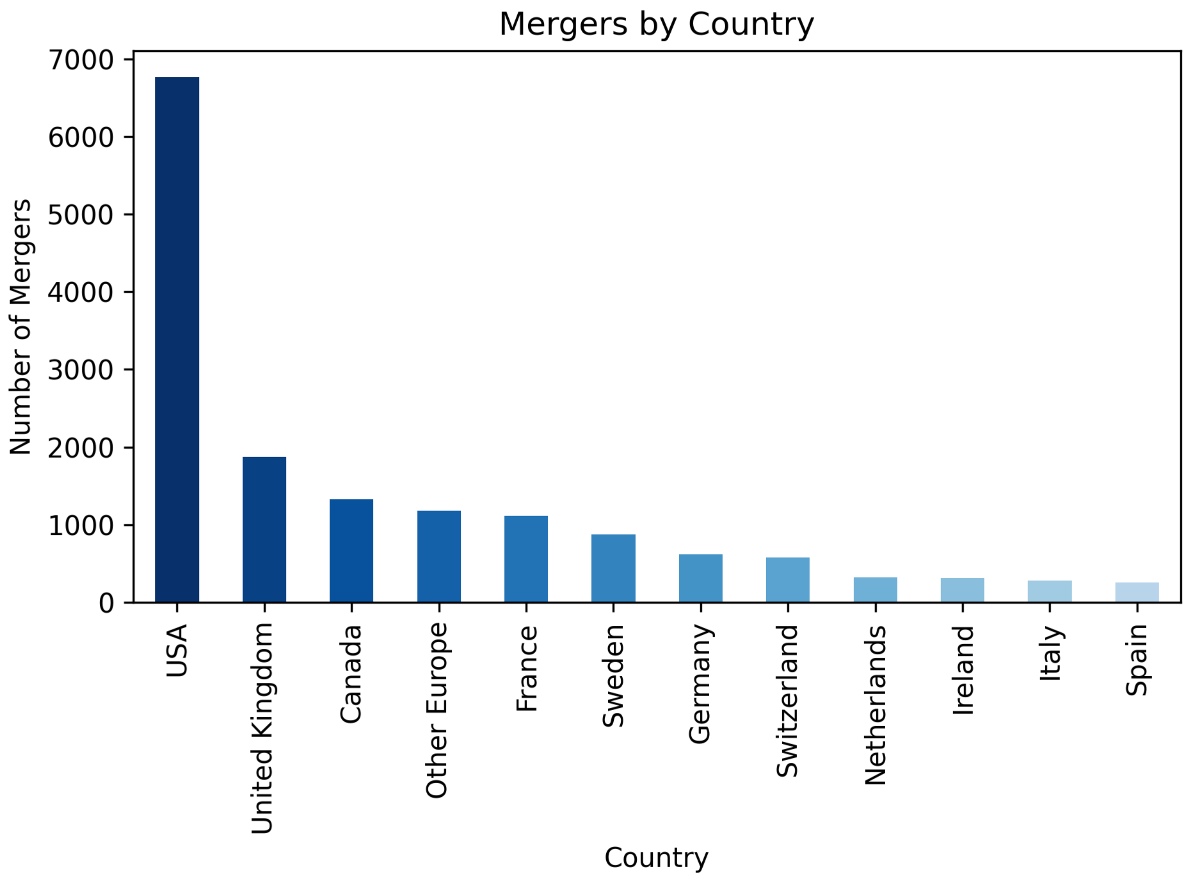


**Figure 1:** Mergers by country

torically being a concentrated industry. Figure 3 shows mergers over my sample period, the literature on mergers has often focussed on merger waves, i.e. industry-level economic shocks that could lead to industry merger waves or policy or economic shocks could lead to both within and cross industry merger waves (Ahern and Harford 2014), at a first glance merger waves do not seem to be happening in the sample at least at an aggregated country level but I will discuss more in details in the next session on how factors causing merger waves are not driving my results.

The next step is to collate data firm-level carbon emission data from S&P Capital IQ. Specifically I use GHG scope 1 emissions (emissions from directly emitting sources that are owned or controlled by a company) and GHG scope 2 emissions (emissions from the consumption of purchased energy generated upstream from a company's direct operations).

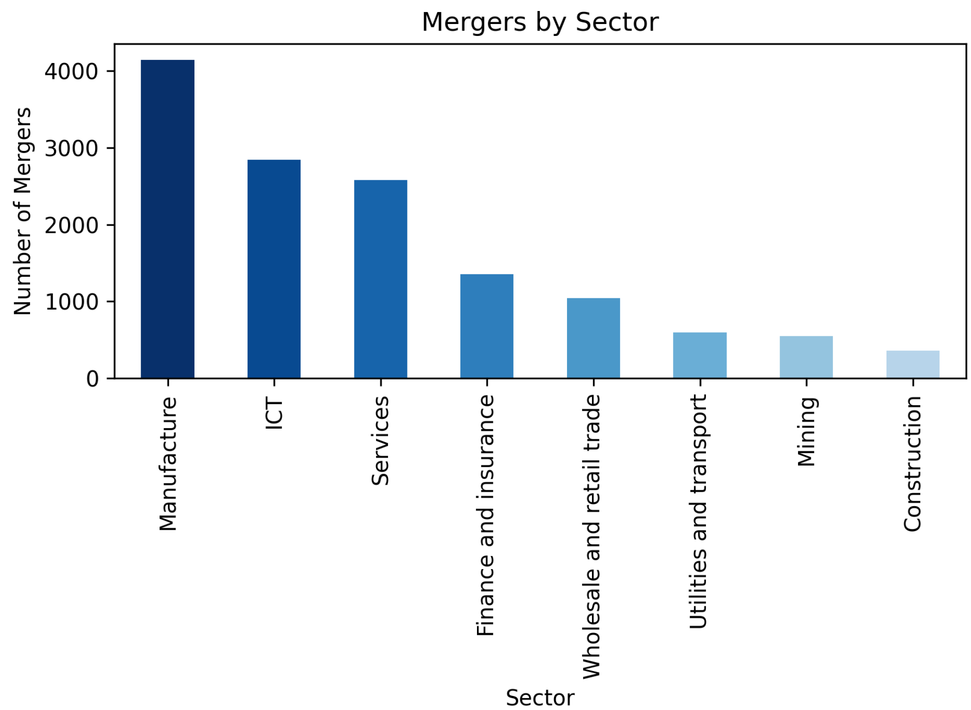


**Figure 2:** Mergers by sector

Figure 4 and 5 show the absolute scope 1 emissions per sector. Figure 4 shows total number of emissions, while figure 5 focuses on the average emissions per firm. While manufacturing is among the most polluting sectors, reflecting the sample observations of mergers, services and ICT firms are less polluting while utilities and transport are more polluting, notwitstanding the first two sectors have more observation in the sample and viceversa for the latter. This shows the importance of using sector level fixed effect, and for next steps to perform an in-depth sector analysis with potentially selecting certain sectors for a more detailed case-study.

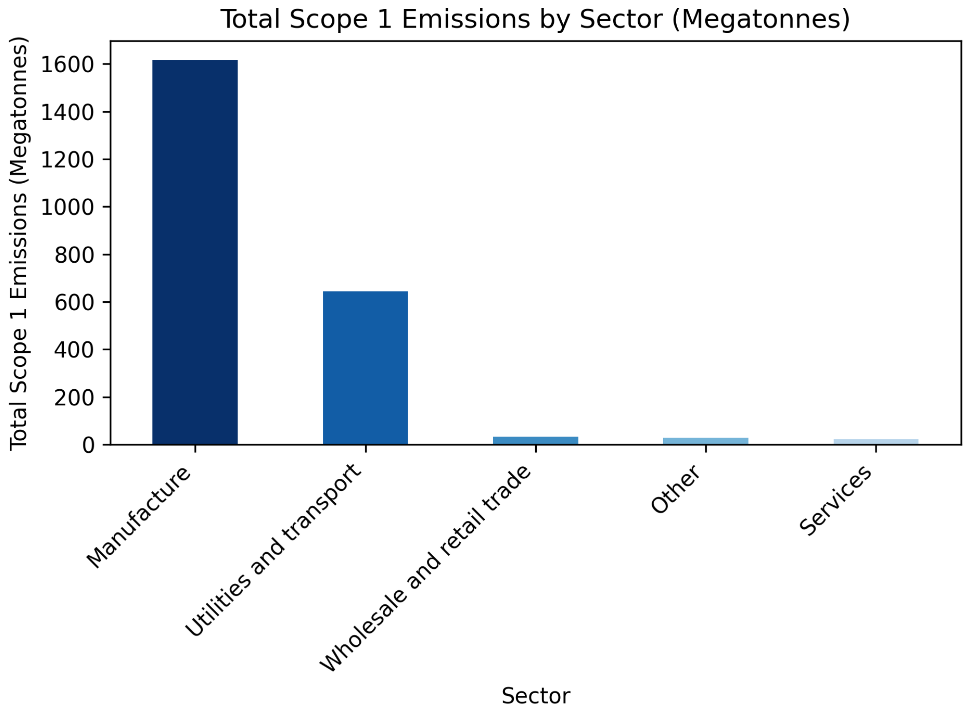


**Figure 3:** Emissions by sector

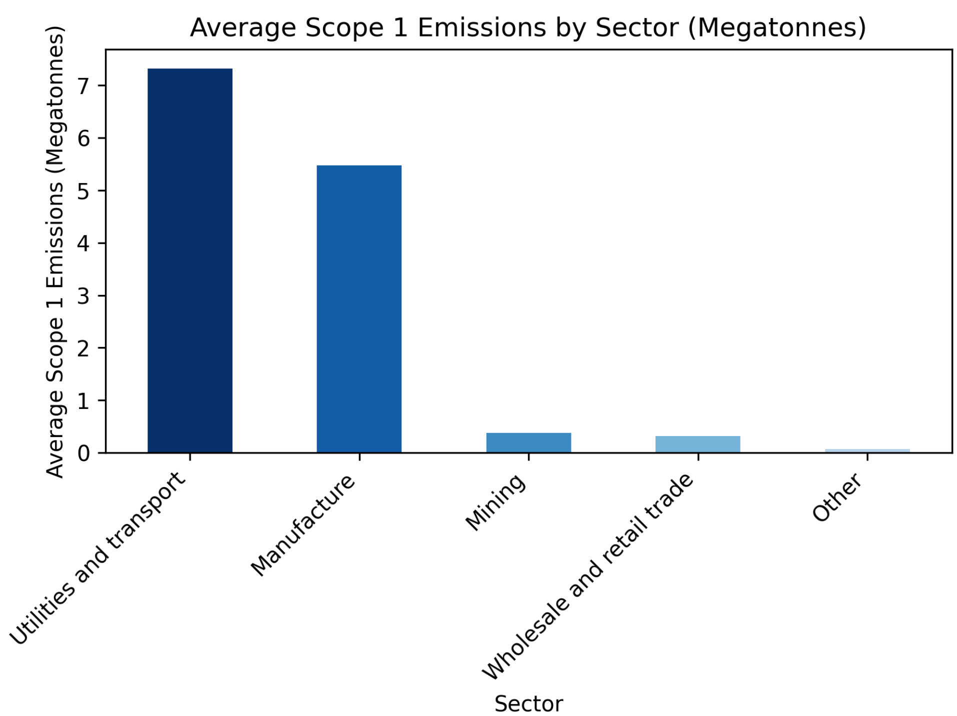


**Figure 4:** Average firm level emissions by sector

# 5 Empirical Methodology

The first empirical step of this paper is to compare the emissions of firms that merge with firms that never merge with a simple event study design.

$$log(scope1_{it}) = \beta_0 + \beta_1 Merge + \beta_2 X_{it} + \tau_t + \epsilon_{it} \quad (15)$$

The dependent variable is the logarithm of the absolute scope 1 emissions and $\beta_1$ is the coefficient for firms that do merge, while $X_{it}$ are firm level-fixed effects and $\tau_t$ are year-level fixed effects. Table 1 below shows the results of the event study with and without fixed effects, under all specifications companies that merge tend to emit more than companies that do not merge, however this specification cannot circumvent endogeneity concerns as companies self-select into mergers, even when considering hostile takeover half of my resulting unit has elected to be merged.

**Table 1:** The impact of mergers on absolute emissions using an event study design

| Dependent Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| log(scope 1 absolute) | 0.7386*** | 0.6941*** | 0.3134*** | 1.138*** |
| | (0.034) | (0.034) | (0.026) | (0.272) |
| Observations | 35926 | 35926 | 35926 | 35926 |
| $R^2$ | 0.013 | 0.023 | 0.489 | 0.805 |
| F Statistic | 477.4 | 52.16 | 310.7 | 24.09 |
| Year fixed effect | | X | X | X |
| Sector fixed effect | | | X | |
| Composite-firm fixed effect | | | | X |

The merger literature has widely documented mergers have a wave like behaviour which could be caused by several factors, including economic-wide Rhodes-Kropf and Viswanathan (2004), regulatory Harford (2005) and even corporate-level shocks Haleblian et al. (2012). Furthermore companies that merge are inclined to do so multiple times over the sample. For this reason the unit of interest in my empirical specification, i, will be a composite firm. Figure 6 illustrates how composite firms are constructed, each composite firm is constructed with all the firms that

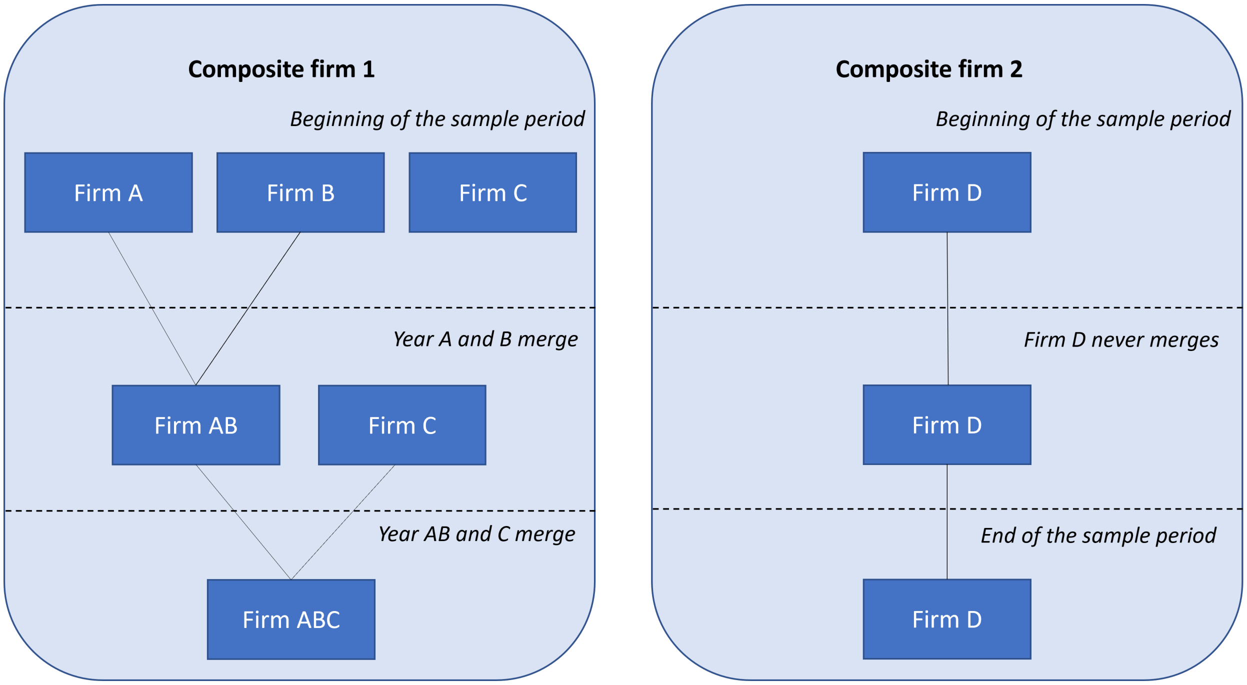


**Figure 5:** How to construct composite firms

by the end of the sample are merged, this allows the author to compare the emissions of the firm prior and after the merger as if the firms were already a single unit.

In order to solve the address the issue of this mergers' behaviour this paper implement a differential exposure design similar to Cowgill, Prat, and Valletti (2021). The key concept is that each individual (composite-firm in this case) is impacted by a specific shock with a different exposure, in this case the specific shock are the mergers. In their paper the authors use a Bartik or shift-share instrument Bartik (1991) this instrument captures the more exogenous component of the treatment that derives from the differential impact of common time-varying shocks (shifts) have on the units depending on their ex-ante exposure to the treatment (shares). The Bartik instrument was popularised by Blanchard and Lawrence F Katz (1992) to study employment-wage dynamics, exploiting different industry concentrations across locations (shares) and different aggregate growth rates (shifts) across industries.

Prior to explaining the instrument used is important to introduce how MergerIndex, which is used in the instrument and is the independent variable of the second stage, has been constructed. Figure 7 illustrates how MergerIndex a time 0 is equal to the total number of individ-

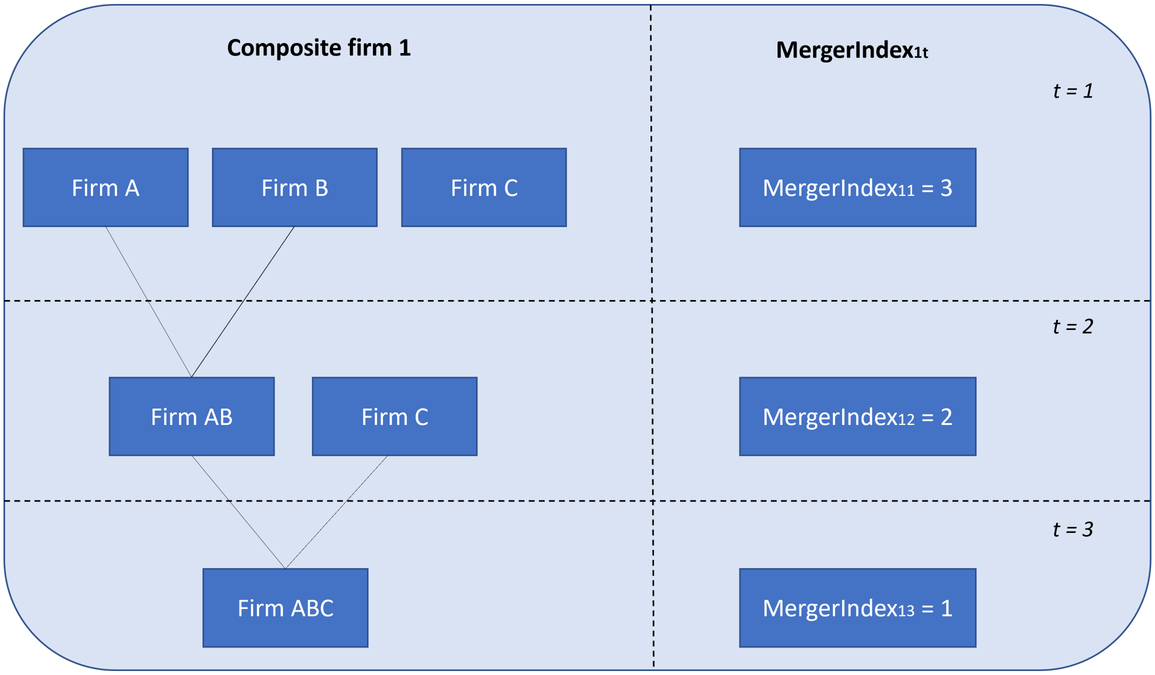


**Figure 6:** How to construct MergerIndex

ual firms which make up the composite and then each time there is a merger MergerIndex will decrease to reflect the new number of individual firms within the composite.

In my empirical specification I adopt the same Bartik instrument from Cowgill, Prat, and Valletti (2021), which in their paper assess the impact of mergers on political lobbying. The instrument is constructed as follows

$$Z_{it} = W_{it} * K_{i0}$$

More specifically:

- $W_{it}$ - **Time varying aggregate shocks** (shifts) a Merger Wave Term, it is the average MergerIndex (count of the number of independent firms within each composite firm i at time t) for other composite firms in the same period but in other sectors, this term can be written as:

$$W_{it} = \frac{\Sigma_{j:S_j \neq S_i} MergerIndex_{j,t}}{N_{S_i \neq S_j}} \quad (17)$$

in easier terms $W_{it}$ measures how many mergers are happening in other sectors and ensure that only mergers happening outside of merger waves are considered.

- $K_{i0}$ - **Shares** measure how much each composite is exposed to mergers at the beginning of the sample , I use two specification of $K_{i0}$ firstly I use the number of individual firms that are part of composite i at the beginning of the sample, in figure 7 this will be 3, the higher the number the more likely is the unit to be vulnerable to shocks, secondly I use an average of mergers happening in the sector of composite i, which gives me an indication of how much a sector is exposed to mergers.

After having calculated my instrument the **first stage** is:

$$MergerIndex_{it} = \lambda_0 + \lambda_1 Z_{it} + \lambda_2 X_{it} + \tau_t + \epsilon_{it} \tag{18}$$

where the dependent variable is $MergerIndex_{it}$ and the independent variable is the instrument, I also have composite-firm level fixed effect and time fixed effects. This stage is conducted to get the predicted values for $MergerIndex_{it}$, which are purged of endogeneity because they are solely based on the variation in $MergerIndex_{it}$ that is explained by the instrument.
After we compute the coefficients from the first stage we can plug them into the **second stage** below:

$$log(scope1_{it}) = \beta_0 + \beta_1 PredictedMergerIndex_{it} + \beta_2 X_{it} + \tau_t + \eta_{it} \tag{19}$$

The idea here is that $PredictedMergerIndex$ is now free from endogeneity, and therefore any remaining correlation between the dependent and independent variable can be interpreted as a causal effect.

# 6 Results

Table 2 shows that we have a statistical significant first stage with F statistic superior to 10, which means that firms more exposed to mergers are more likely to undergo a merger in the sample. It's crucial to understand that the instrumental variables analysis yields estimates derived exclusively from firms deemed sensitive (Imbens and Angrist, 1994). Therefore the estimates obtained from the instrumental variable approach reflect the local average treatment effect (LATE), it is clear that certain firms will always merger or not irrespective of their exposure to merger waves. Prior to discussing the results in tables 3 and 4 is important

to note that as $MergerIndex_{it}$ decreases each time a merger occurs a positive coefficient ($\beta_1$) means that emissions decrease after the merger, to make the figure more visually intuitive I have inverted the sign of the coefficient.

**Table 2:** First-Stage MergerIndex

| Dependent variable | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Predicted Merger Index | 0.1*** | 0.2*** | 0.234*** | 0.67*** | 0.88*** |
| | (0.04) | (0.06) | (0.05) | (0.065) | (0.17) |
| Observations | 35,329 | 35,926 | 35,926 | 35,926 | 35,926 |
| $R^2$ | 0.010 | 0.011 | 0.517 | 0.843 | 0.844 |
| F Statistic | 2304 | 2765 | 2354 | 4812 | 4820 |
| Year fixed effect | | X | X | | X |
| Sector fixed effect | | | X | | |
| Composite-firm fixed effect | | | | X | X |

The findings across both tables 3 and 4 underscore a nuanced effect of mergers on environmental outcomes. Column (1) in both tables, serving as our baseline model without fixed effects, already hints at a statistically significant relationship between mergers and a reduction in both absolute emissions and emission intensity. Incorporation of year fixed effects (Column 2), and further, sector fixed effects (Column 3), maintains the significance of the impact on emissions, suggesting that the observed reductions are not merely artifacts of time-specific or sector-specific unobserved factors. The robustness of these findings is further solidified in Column (4) and (5), where the inclusion of composite-firm fixed effects provides a stringent test of the merger effect, isolating it from firm-specific characteristics that could otherwise confound our analysis.

The magnitude of the coefficients suggests a substantial effect of mergers on reducing emissions, potentially indicative of efficiency gains or shifts in production practices post-merger. However, it is crucial to note that while mergers appear to contribute to environmental efficiency, as seen in the decrease in emission intensity, the absolute emissions reduction underscores a broader impact, possibly reflecting operational efficiencies or reduction in output.

**Table 3:** The impact of mergers on absolute emissions

| Dependent variable | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Log (scope 1 absolute) | 0.1*** | 0.542 | 0.429*** | 0.27*** | 0.209*** |
| | (0.28) | (0.96) | (0.5) | (0.01) | (0.07) |
| Observations | 35,329 | 35,926 | 35,926 | 35,926 | 35,926 |
| $R^2$ | 0.010 | 0.011 | 0.517 | 0.843 | 0.844 |
| F Statistic | 1281 | 25.92 | 715.4 | 31.52 | 31.53 |
| Year fixed effect | | X | X | | X |
| Sector fixed effect | | | X | | |
| Composite-firm fixed effect | | | | X | X |

**Table 4:** The impact of mergers on emission intensity

| Dependent variable | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Scope 1 intensity | 0.13*** | 0.533*** | 0.56*** | 0.219*** | 0.757*** |
| | (0.17) | (0.12) | (0.1) | (0.61) | (0.47) |
| Observations | 35,329 | 35,329 | 35,329 | 35,329 | 35,329 |
| $R^2$ | 0.003 | 0.195 | 0.668 | 0.413 | 0.529 |
| F Statistic | 0.7375 | 3.724 | 7.505 | 2.625 | 3.069 |
| Year fixed effect | | X | X | | X |
| Sector fixed effect | | | X | | |
| Composite-firm fixed effect | | | | X | X |

Figure 8 plots the emissions of the merged companies, noting a decrease starting from the year of the merger event. Similarly, the results depicted in Figure 9 employ propensity score matching to pair companies that have not merged with those that have, matching them by sector and revenue size. Companies that underwent mergers show a reduction in their emission output in the year of the merger event compared to similar companies that did not merge. The y-axis represents the average percentage response of emissions

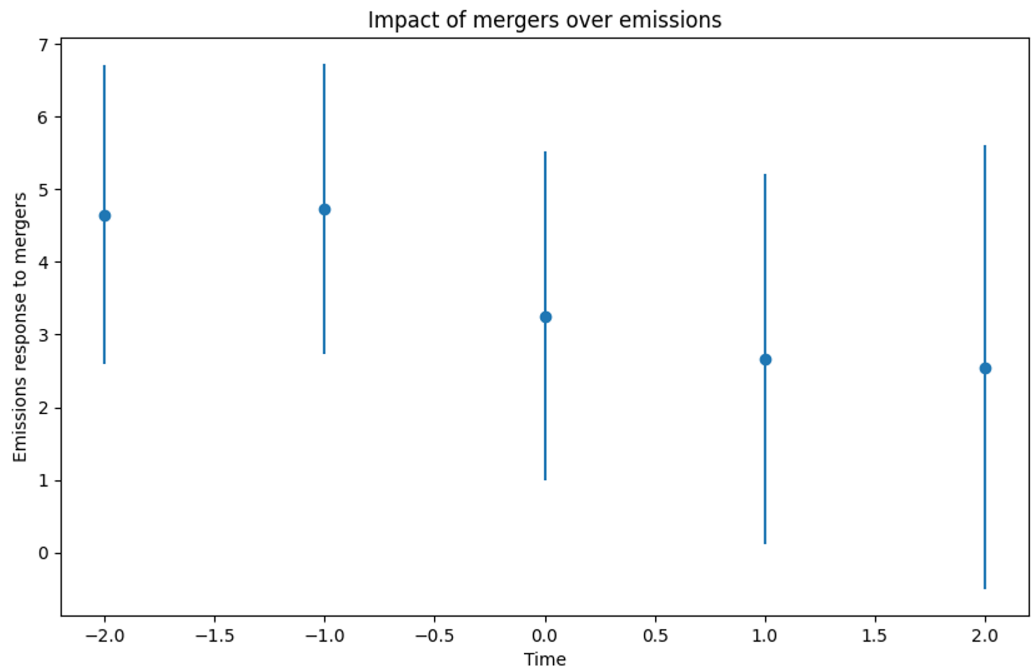


**Figure 7:** Impact of mergers over emissions

relative to the sample average.

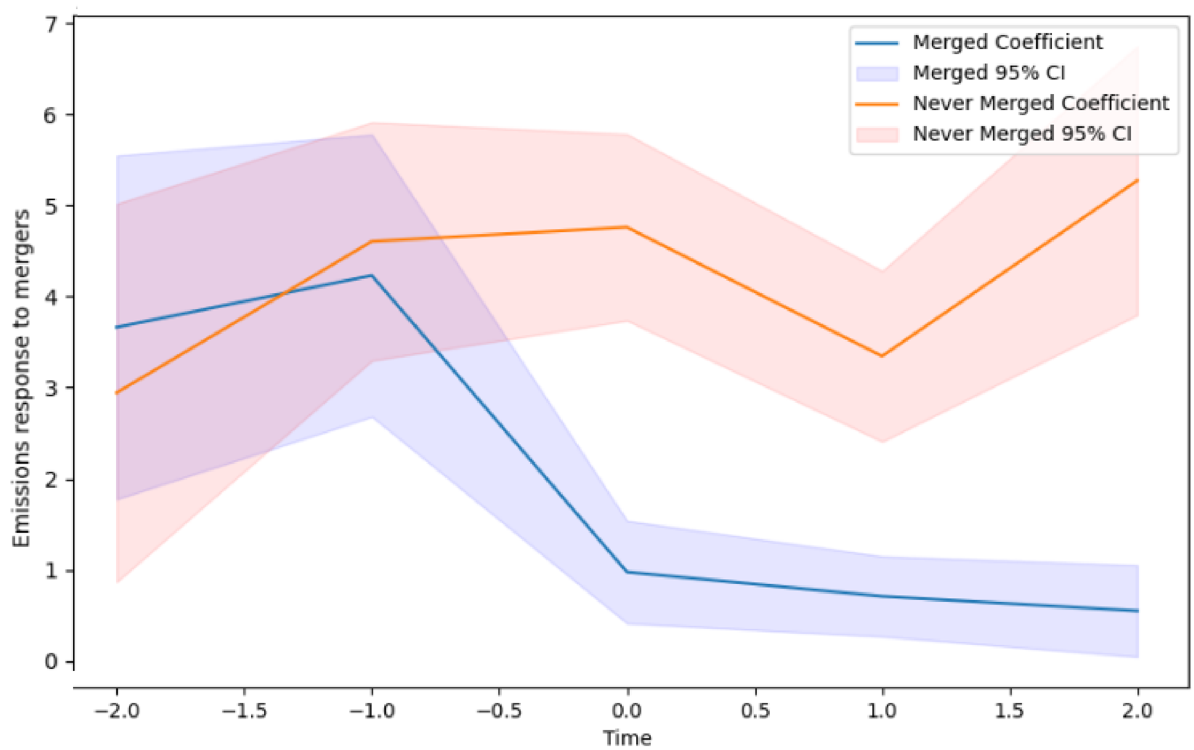


**Figure 8:** Impact of mergers over emissions

# 7 Conclusion

This paper explores intricate relationship between market concentration, as influenced by mergers and acquisitions, and its subsequent impact on environmental performance metrics, notably greenhouse gas (GHG) emissions. Leveraging a robust methodological framework, including a Bartik-style instrument to isolate exogenous variations in merger activities, we have unearthed novel findings useful for the academic and policy discourse.

The empirical analysis reveals an effect of mergers on reducing both absolute emissions and emissions intensity. These outcomes suggest that mergers can indeed serve as a catalyst for environmental efficiency. This result could be induced by two factors the introduction of merger-specific efficiencies or a decrease in market output. The positive environmental repercussions of mergers are accentuated in contexts where firms are subjected to stringent regulatory frameworks and heightened consumer awareness regarding sustainability. This observation posits that the external business environment plays a pivotal role in steering the post-merger trajectory towards environmental conscientiousness.

The findings from this study bear significant implications for policymakers, regulatory bodies, and corporate leaders. For policymakers, the evidence supports the development of regulatory frameworks that not only scrutinize mergers for potential anti-competitive behaviors but also recognize and incentivize the environmental benefits that can emerge from corporate consolidations, these however should not come with a decrease in output or anti-competitive practices. Policymakers should recognise mergers that bring upon an improvement in environmental performance without pursuing anti-competitive behaviours.

In conclusion, my study sheds light on the complex yet pivotal role of mergers in shaping corporate environmental performance. By bridging the gap between market structure and sustainability, this study contributes to a more nuanced understanding of how corporate strategies, when aligned with environmental goals, can foster a more sustainable and competitive business landscape.

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