The University of Manchester

Q-Step | Data Fellow 2022

Environmental Sustainability at Impacted Cubed

Deciphering the quantitative evidence for emissions reduction and decoupling in listed companies

James Duffy & Micaela Benvenuto | **BASS Politics and Data Analysis**

Overview of the Data Fellowship

Our fellowship was hosted by a sustainable finance firm that utilises ESG facts instead of normative ratings in its sustainable investment and research. As well as generating financial returns, this strategy helps ensure that the capital allocation process better considers its non-financial impacts. For 8 weeks we worked with the Head of Research and a Senior Data Scientist to collect and analyze environmental market externality data relating to carbon, water and waste in the FY 2021/22. We used the carbon data we collected to explore the degree of carbon emission reductions and the relationship between carbon and revenue (specifically the evidence for decoupling) in listed companies between 2016 and 2021.

Data Analysis

While we collected over 6000 data points and for total CO2 emissions (000s tCO2e) we had data for 641 unique companies. However due to the incomplete and complex nature of carbon data, the result of our data cleaning was far fewer companies available for analysis: 411 unique companies for our emission reduction analysis and 105 for our decoupling analysis. The decoupling analysis was more affected since we were dependent on the availability of revenue data (millions of USD) and historic carbon data whereas for emissions reduction analysis we were only dependent on historic carbon data.

Findings

From our analysis we found unconvincing quantitative evidence for emissions reduction and decoupling.

Figure 1 shows individual companies' total emissions (000s of tCO2e) between 2016 and 2021. Emissions reduction levels have not been ideal, especially amongst the heaviest polluting companies (see largest circles on graph). Data for 2020 and 2021 are the most troubling since it does not clearly reflect the rapid emissions reductions required to comply with the 1.5 degrees pathways as laid out in the IPCC.

Figure 2 shows decreasing average carbon intensity (000s of tCO2e per million USD) i.e., decoupling, for industries between 2016- 2021. There are at least two reasons to be cautious in interpreting this graph. Firstly, where there was a dramatic decrease in carbon intensity in 2021, we were unable to identify a statistical significance between carbon emission and revenue in our linear regression modelling. Secondly, three industries were outliers, these were all in 2021 for 'Industrials', 'Materials' and 'Consumer Staples', all of which increased their carbon intensity by more than six fold and are hence are not displayed on the graph at its current scale. These two reasons likely reflect the a mix of the impact of the pandemic, how recent the data is (carbon emission data often gets adjusted retrospectively) and a possible structural dependence on carbon.

Key Skills Learnt

As a result of working in Python we were able to learn a new coding language which has contributed to the overall development in our data analytics skills. We also became more comfortable handling real-world, complex datasets. Apart from collecting data, the largest part of this project was the data cleaning and wrangling. Furthermore, we were able to enhance our teamwork abilities as a result of jointly producing a report containing our data analysis and findings while working remotely. In this sense, communication was key.

Figure 1: Total emissions for companies between 2016 and 2021

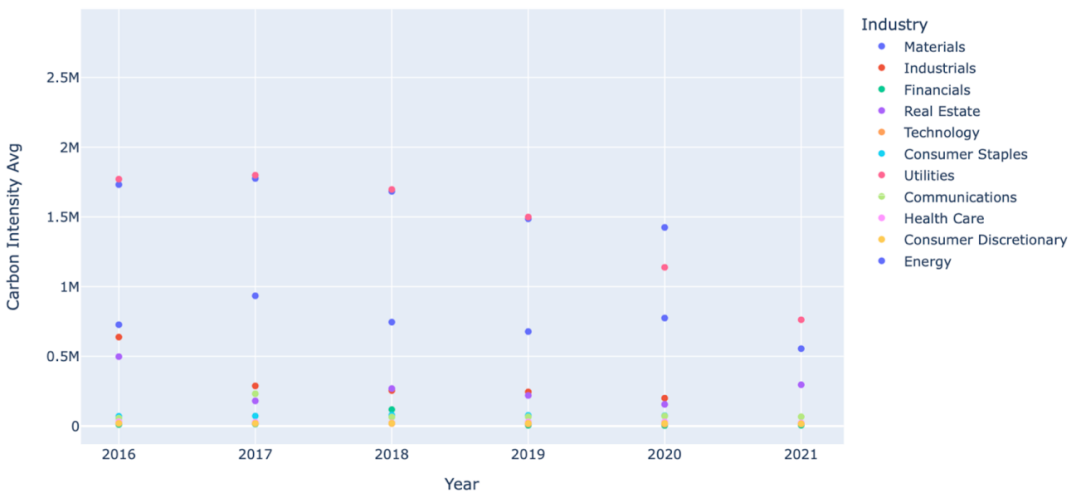

Figure 2: Average carbon intensity across different industries between 2016 and 2021

james.duffy -4@student.manchester.ac.uk & micaela.benvenutodippolito@student.manchester.ac.uk