Managing Corporate Climate Change Risk: The Link Between Carbon Emissions and M&A Activity

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Dissertation written under the supervision of Professor Zoë Venter

Dissertation submitted in partial fulfilment of requirements for the MSc in Finance, at the Universidade Católica Portuguesa, 12th March 2024.

Abstract

This thesis studies the relationship between M&A activity and carbon risk, considering, at most, 183 deals between 2006 and 2023. First, it assesses the impact of carbon risk on merger likelihood. The findings suggest that (1) acquirors reporting on such a risk pre-merger are more likely to buy out firms that do so too, (2) firms subject to higher carbon risk are less likely to participate in deals and, thus, become acquirors or targets, and (3) acquirors subject to higher carbon risk pre-merger tend to buy out firms also subject to higher carbon risk pre-merger. Second, it investigates the relationship between targets' pre-merger carbon risk and M&A deal-specific characteristics. The results prove that targets disclosing their carbon emissions pre-merger engage in higher-value and longer-duration deals (especially those from the U.S. or Canada) and that European targets subject to higher carbon risk pre-merger are more likely to engage in deals with larger values (the opposite is true for targets from the U.S. or Canada) and longer duration (the inverse is true for targets from the U.S.). Third, it explores the impact of acquirors' pre-merger carbon risk on the short-term merger market response, concluding that the higher the acquirors' carbon risk pre-merger, the lower the CARs around merger announcements. Finally, it analyses the impact of acquirors' pre-merger carbon risk on the combined firms' long-term post-merger sustainability performance. The findings point to acquirors with higher pre-merger carbon risk experiencing a higher increase in their ESG scores in the aftermath of the merger.

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Keywords: Carbon Emissions, Carbon Risk, M&A, Performance, Reporting

Resumo

Esta tese estuda a ligação entre as operações de fusão e aquisição (M&A) de empresas e o risco de carbono, considerando até 183 transações entre 2006 e 2023. Os resultados sugerem que (1) os adquirentes que divulgam sobre este risco antes das transações têm maior probabilidade de comprar empresas que também o façam; (2) as empresas de maior risco carbónico têm menor probabilidade de participar em operações de M&A; e (3) os adquirentes sujeitos a um maior risco carbónico antes das transações tendem a comprar empresas também sujeitas a um maior risco carbónico pré-transação. Os resultados provam ainda que (1) os adquiridos que divulgam as suas emissões de carbono antes das transações participam em operações de maior valor e duração (especialmente os provenientes dos E.U.A. ou Canadá) e (2) os adquiridos provenientes da Europa e expostos a um maior risco carbónico antes das transações têm maior probabilidade de se envolver em operações de M&A de maior valor (o contrário verifica-se para os que são provenientes dos E.U.A. ou Canadá) e duração (o contrário verifica-se para os que são provenientes dos E.U.A.). Adicionalmente, conclui-se que, quanto maior é o risco carbónico dos adquirentes antes das transações, menores são os retornos anormais cumulativos em torno da divulgação das mesmas. Por fim, os resultados registam um melhor desempenho nas classificações ESG pós-transação das empresas que resultam de operações cujos adquirentes estão sujeitos a um maior risco carbónico pré-transação.

Título: Gestão de Risco Climático Corporativo: Ligação entre Emissões de Carbono e Operações de Fusão e Aquisição

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Palavras-chave: Emissões de Carbono, Risco Carbónico, M&A, Desempenho, Reporte

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List of Abbreviations

AR	Abnormal Return
CAR	Cumulative Abnormal Return
CO_2	Carbon Dioxide
E	Environmental
ESG	Environmental, Social, and Governance
ETS	Emission Trading Scheme
FTSE	Financial Times Stock Exchange
GHG	Greenhouse Gas
M&A	Mergers and Acquisitions
MSCI	Morgan Stanley Capital International
R&D	Research and Development
S&P	Standard and Poor's
SLR	Sea-level Rise
U.S.	United States of America
WRDS	Wharton Research Data Services

Acknowledgments

I would like to express my sincere gratitude to my supervisor, Professor Zoë Venter, for her exceptional support, invaluable guidance, and insightful feedback throughout the entire process. Her expertise, generosity, and permanent availability have been crucial to successfully reaching this key milestone in my academic and personal life. Professor Zoë, thank you for leading me this far, for your unwavering encouragement, and for helping me every step of the way.

Furthermore, I am deeply thankful to my friends for their loyalty, reassuring and calming influence, and for always cheering me up. Thank you for inspiring me, seeing the best in me, and helping me thrive. I hold great admiration for each one of you.

Finally, and notably, I extend my appreciation to my family for their unconditional support, endless kindness, and understanding. Thank you for allowing me to study at Católica-Lisbon and patiently enduring with me throughout my entire academic journey. I would not have come this far without your love, resilience, and fondness.

1. Introduction

CO_2, alongside other minor GHGs, makes up less than one percent of the constituents of our planet's atmosphere. Nevertheless, its presence is crucial to all living organisms given the large effect it has on Earth's surface temperature. Without CO_2, which traps heat, our planet's average surface temperature would be below freezing, and biological life would not exist. Note that CO_2 is naturally emitted by volcanoes and absorbed by biological and physical processes, cycling through the atmosphere, oceans, plants, and the Earth's mantle (Emanuel, 2020).

In the late 1890s, Svante Arrhenius, a Swedish scientist, pioneeringly understood that humans were beginning to emit disturbingly large amounts of CO_2 into the atmosphere from industrial processes. In fact, he was the first to worry that, owing to carbon's long-lasting lifetime in the atmosphere, we would significantly increase its atmospheric concentration and, consequently, alarmingly warm the planet (Emanuel, 2020).

Fast-forwarding to modern times, humans have been overloading the atmosphere with CO_2 for more than 170 years, now adding 57 billion tons of CO_2 yearly (United Nations Environment Programme, 2023). Consequently, our planet's surface temperature began to rise, leading to an undesirable and near-to-irreversible change in the climate. Note that the reason scientists know that anthropogenic CO_2 emissions are the cause of Earth's warming is because we are currently in a temperature cycle that should be cooling the planet (if the climate were to be changing naturally) (Emanuel, 2020). Such climate change has had increasingly profound consequences globally, from ocean acidification and accelerated sea-level rise to extreme weather events, prompting biodiversity loss and stronger natural catastrophes, thus threatening the lives of all living beings.

In an effort to address this issue, in 2015, 228 governments worldwide pledged to curb CO_2 emissions to prevent the global mean temperature from rising above 1.5°C from its pre-industrial level by 2050, having set targets to reach a net-zero[1] state by then (UNFCCC, n.d.). Following this, several directives have taken effect to encourage companies to adopt the much-needed transition, aiming to significantly reduce their carbon footprint. Hence, apart from the higher physical risks companies have become exposed to due to novel climate-change-provoked natural catastrophes, other risks have begun to materialize, namely transition and further litigation, market,

[1] A state where the amount of GHGs emitted into the atmosphere is equal to the amount removed from the atmosphere or offset through various measures, resulting in no additional increase in atmospheric concentrations of these.

and reputational risks. Derived from these, an overarching risk has emerged – the carbon risk. Hoffmann and Busch (2008) define it as any corporate risk related to climate change or the burning of fossil fuels (which releases CO_2). Naturally, the higher the company's carbon emissions, the higher its carbon risk.

Considering this, it is evident that risk management has played a crucial role in companies' overall activity, more so in the past couple of decades. Prior literature has pointed out the use of M&A as a means to manage certain corporate risks, such as those posed by economic, regulatory, and technological shocks (e.g., Harford, 2005; Mitchell & Mulherin, 1996). Moreover, recent research has shown how M&A can too be used to specifically address climate-related issues (e.g., Li *et al.*, 2020; Bai *et al.*, 2020). So far, few studies have covered the link between M&A activity and carbon risk management (e.g., Bose *et al.*, 2021; Altunbaş, *et al.*, 2023), with none investigating how carbon risk affects merger likelihood, value, and duration. Thus, this thesis adds to the literature by shedding light on these topics, as well as by complementing it with findings on short-term firm performance and long-term sustainability performance.

The results of this study prove that: (1) acquirors reporting on carbon emissions pre-merger are more likely to buy out firms that do so too (high statistical significance, *hss*); (2) firms subject to higher carbon risk are less likely to become acquirors (*hss* and robust for the two additional tests performed) and targets (low statistical significance and robust for one test); (3) acquirors subject to higher carbon risk pre-merger tend to buy out firms also subject to higher carbon risk pre-merger (*hss*); (4) targets disclosing their pre-merger carbon emissions participate in deals with larger values (moderate statistical significance, *mss*) and longer duration (*hss*), specially targets from the U.S. or Canada; (5) targets subject to higher carbon risk pre-merger tend to participate in deals with larger values (*mss* and not robust for either test) – testing for higher granularity, this holds for European targets but the opposite is true for targets from the U.S. or Canada – and longer duration (this holds for European targets, but the inverse is true for targets from the U.S.; *hss*); (6) the higher the acquirors' CO_2 emissions pre-merger, the lower the CARs around merger announcements (*hss*); and (7) acquirors with high pre-merger carbon risk tend to experience a higher increase in their ESG scores post-merger (*hss* and robust for both tests).

The remainder of this thesis is structured as follows: Section 2 presents an overview of the relevant literature; Section 3 develops the hypotheses tested; Section 4 describes the data in detail

and highlights key statistics; Section 5 outlines the methodology used; Section 6 discusses the main results; Section 7 analyses the robustness of specific results; and Section 8 concludes the study, summarizing its findings, addressing its limitations, and providing suggestions for further research.

2. Literature Review

2.1. M&A Activity

M&A is extensively covered in financial empirical studies, which amply center their attention on either the motivations of such transactions or the sources of their synergistic gains. Considerably fewer papers focus on why exactly some deals fail.

Several factors prove to drive M&A activity. The most conventional range from relative market valuations (e.g., Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003), economic, regulatory, and technological shocks (e.g., Harford, 2005; Mitchell & Mulherin, 1996) and competitive landscape disruptions (e.g., Akdoğu, 2011), to corporate life cycle (e.g., Owen & Yawson, 2010), managerial incentives (e.g., Jensen, 1986; Martin & McConnell, 1991), ownership structure (e.g., Shim & Okamuro, 2011), and innovation (e.g., Bena & Li, 2014), among others.

The main causes of post-merger synergies comprehend gains such as technology and asset complementarity (e.g., Huang & Xie, 2023; Rhodes-Kropf & Robinson, 2008), higher plant productivity (e.g., Lichtenberg & Siegel, 1987; McGuckin & Nguyen, 1995; Schoar, 2002), better resource allocation (e.g., Maksimovic & Phillips, 2001), performance improvement (e.g., Healy *et al.*, 1992), product differentiation (e.g., Hoberg & Phillips, 2010), higher product quality (e.g., Sheen, 2014), tax and cost savings (e.g., Devos *et al.*, 2009; Fee *et al.*, 2012), increased buying power (e.g., Bhattacharyya & Nain, 2011; Fee & Thomas, 2004; Shahrur, 2005), and better structured management practices (e.g., Bai *et al.*, 2021).

Regarding triggers of deal withdrawals, Attah-Boakye *et al.* (2020), for instance, find that the acquiror's (target's) country's economic freedom and legal environment quality are positively (negatively) associated with the probability of the deal withdrawal. Besides, they report that the likelihood of a deal withdrawal increases if the target size is bigger than that of the acquiror or if its profitability is lower. As expected, they also reveal that deal characteristics affect the outcome

of announced deals. The latter, according to Caiazza and Pozzolo (2016), are the most relevant factors determining the failure of announced deals.

This study differs from the above by addressing an unorthodox potential driver of M&A activity and source of synergistic gains – corporate carbon emissions. Note that I do not explore whether carbon emissions contribute to transaction withdrawals.

2.2. Climate Finance – Financial Implications of Climate Risks

As climate change gets progressively more severe, so do the consequences that its associated risks pose to market participants and the underlying assets. Therefore, the call for action to adapt, mitigate such risks and, thus, avoid reaching a harmful no-turning point becomes imperative to companies and investors.

Aware of that, researchers have contributed to increasing the financial literature on this matter, allowing for a better understanding of the financial implications of climate risks. Krueger *et al.* (2020) show that institutional investors take climate risks into account as they believe such risks, which they reckon have begun to materialize, affect portfolio risk and returns and their reputation.

El Ghoul *et al.* (2018) and Sharfman and Fernando (2008) conclude that financial markets reward firms with higher corporate environmental responsibility or improved environmental risk management policies by lowering their cost of capital. Heinkel *et al.* (2009) show that, as green investors abstain from polluting firms' stock, the lack of risk-sharing among non-green investors leads to lower stock prices for these firms and, hence, higher costs of equity, which have increased since the Paris Agreement (Bua *et al.*, 2022). While Chava (2014) confirms this, he also finds that firms with environmental issues are subject to higher interest rates on bank loans.

Ginglinger and Moreau (2023) show that greater physical climate risk impacts firms' capital structure as a result of both a decrease in optimal leverage and an increase in yield spreads, which are associated with lower credit ratings (Seltzer *et al.*, 2022). Additionally, Zhou and Wu (2023) reveal that the higher the exposure to climate risk, the higher the speed of leverage adjustment.

Dowell *et al.* (2000) document lower market values for firms failing to adopt rigorous environmental standards. Furthermore, Pástor *et al.* (2022) prove that U.S. brown stocks

underperformed green over the past decade as climate concerns strengthened. They also show that German non-green bonds underperformed their green twins as the "greenium" widened.

Huang *et al.* (2018) posit that the more vulnerable firms are to climatic threats, the lower and more volatile their earnings and cash flows are, and the more likely they are to have more long-term than short-term debt and hold more cash to build financial slack. These firms are also less likely to distribute cash dividends. Analogously, Pankratz *et al.* (2023) show that increased heat exposure linked to climate change reduces firms' revenues and operating income.

2.2.1. Pinpointing to Carbon Dioxide

With the excessive anthropogenic CO_2 emitted into the atmosphere for the past centuries being one of the leading causes of climate change, transitioning to a low-carbon economy has become a top priority. That, too, has financial repercussions, which sparked concern in academia and put carbon risk under the spotlight.

Griffin *et al.* (2011) show that investors use GHG emission information to assess company value and view estimates of non-disclosed GHG emissions as value-relevant.

Bolton and Kacperczyk (2021a) prove that, in the U.S., investors already demand a carbon premium to compensate for their risk exposure to carbon emissions. They further observe that, in some prominent industries, institutional investors are now implementing exclusionary screening based on direct emission intensity. Later, the authors complement their findings by studying a much broader range of cross-sectional stock return data, covering 77 countries. Once again, Bolton and Kacperczyk (2023) provide evidence that higher stock returns are associated with higher levels and growth rates of carbon emissions in most countries. In addition, they show that the carbon-transition risk premium has increased with investor awareness about climate change risk.

Studying the effects of attention to global warming on financial markets, Choi *et al.* (2020) argue that carbon-intensive stocks underperform those low in emissions in abnormally warm weather. They also find that in such weather, retail investors sell their carbon-intensive shares.

Matsumura *et al.* (2014) show that markets penalize firms in their values for their emissions but impose a further penalty on firms that do not disclose such information, as investors perceive non-disclosure to increase carbon-transition risk uncertainty (Bolton & Kacperczyk, 2021b).

Moreover, Ilhan *et al.* (2021) conclude that the cost of option protection against downside tail risk is higher for more-carbon-intense firms and magnified when the attention to climate change spikes. With respect to bond markets, Delis *et al.* (2019) show that, after the Paris Agreement, banks started to charge slightly higher borrowing costs to fossil fuel (carbon-intensive) firms.

Bolton *et al.* (2022) document that carbon emission levels have had a significant and increasingly negative impact on price-to-earnings ratios.

Finally, De Haas and Popov (2019) prove that stock markets are reallocating investment towards less carbon-intensive sectors.

This study complements the literature on the financial implications of climate risks, namely carbon risk, by investigating how firms respond to such a risk in the market for corporate control.

2.3. M&A Activity and Climate Risks

Literature connecting M&A and climate-related issues has grown to fill the gap of understanding whether such matters motivate deals and have material financial implications.

Tampakoudis and Anagnostopoulou (2020) reveal that acquirors' post-merger ESG performance increases following the acquisition of targets with higher ESG performance than their pre-merger, which, in turn, increases their post-merger market value. Aktas *et al.* (2011) corroborate this finding. Furthermore, Feng (2021) shows the significant impact a target's ESG score has on an acquiror's change in its return on assets after a deal. Barros *et al.* (2022) find that, overall, M&A deals improve firms' ESG scores, as well as each of the three pillar scores individually, although not immediately.

Post-merger, Li *et al.* (2020) find that engaging in green M&A decreases heavy polluters' financing constraints and improves their organizational legitimacy.

Lodh *et al.* (2023) conclude that managers should consider climate change risks when engaging in M&A to avoid unsuccessful deals. They not only record a lower probability of engaging in M&A for firms with higher climate change risks (proxied by physical, regulatory, and reputational risks) but indicate that if acquirors with higher climate change risks choose to engage in M&A, announcement returns are significantly reduced.

Bai *et al.* (2020) show that firms exposed to high SLR risk are more likely to become acquirors and tend to acquire firms with lower SLR exposure. The authors also find that acquirors with higher SLR exposure experience significantly higher CARs around merger announcements, see post-merger analyst coverage and forecast accuracy increase, and see their overall ESG scores improve.

2.3.1. M&A Activity and Carbon Emissions

Recent literature suggests carbon emissions do play a role in M&A activity.

Chen *et al.* (2022) demonstrate that ETSs lead to considerably fewer cross-border M&A deals in the host countries, decrease firms' financial performance, and increase market risks.

According to Bose *et al.* (2021), firms with higher carbon emissions are more likely to acquire foreign targets in an attempt to benefit from weaker environmental, regulatory, or governance standards. Additionally, the authors unfold that cross-border acquisition announcement returns are higher when carbon-intensive acquirors buy targets in countries with fewer regulations or weaker environmental standards.

Lin and Shi (2023) show that corporate environmental R&D and GHG emissions performance encourage companies to initiate deals. Moreover, Guo *et al.* (2023) show that for acquirors with high initial carbon risk, the reduction of carbon risk after the deal may lead to better M&A performance.

Altunbaş, *et al.* (2023) find that M&A activity only impacts firm-level carbon footprint in the short-term.

This study contributes to the existing literature on M&A and carbon emissions by providing evidence on whether the disclosure of and the amount of CO_2 emissions affect the likelihood of a merger, whether mergers motivated by carbon risk are worth more and are shorter in time, whether markets value mergers that diversify away from carbon risk, and whether mergers motivated by carbon risk boost post-merger ESG scores.

3. Hypotheses Development

I develop nine hypotheses centered on the link between carbon risk and M&A to address the research topics mentioned above.

3.1. Merger Likelihood

Whether or not deals are motivated by carbon risk, it seems reasonable to first infer that acquirors that, voluntarily or mandatorily, disclose their CO_2 emissions are more likely to buy out targets that follow the same practice. That is because, apart from mitigating risk, this level of alignment helps maximize synergies and the success of the integration process in this regard. Hence, I develop the following hypothesis:

H_1: Acquirors that disclose their CO_2 emissions pre-merger are more likely to acquire firms that do so too.

Concerning carbon risk exposure itself, one potentially effective method of buffering against it is to acquire firms with considerably less exposure to that type of risk. Given today's urge for a net-zero transition, those firms become attractive acquisition targets. On the other hand, big emitters become quite hard to sell in the market for corporate assets, as potential acquirors are aware of the difficulty of diversifying away from what is at stake regarding these firms' environmental harm. Considering this, I conjecture merger likelihood to be correlated with carbon risk and form the second and third hypotheses:

H_2: The likelihood of a firm becoming an acquiror (a target) in a deal is positively (negatively) correlated with its exposure to carbon risk.

H_3: Acquirors subject to high carbon risk pre-merger are more likely to acquire firms subject to low carbon risk pre-merger.

3.2. Deal-specific Characteristics

3.2.1. Deal Value

Noting that investors view information about CO_2 emissions as value-relevant (Griffin *et al.*, 2011; Matsumura *et al.*, 2014) and non-disclosure as a catalyst for increased carbon risk (Bolton & Kacperczyk, 2021b), I expect acquirors to pay more for targets that report on such information and, among those, do so for the ones subject to lower carbon emissions. Building on this, I establish the fourth and fifth hypotheses:

H_4: Targets that disclose their CO_2 emissions pre-merger participate in transactions with larger deal values.

H_5: Targets subject to high carbon risk pre-merger participate in transactions with smaller deal values.

3.2.2. Deal Duration

Due to their complexity[2], M&A procedures can take a significant amount of time to reach an end. Notwithstanding, it seems probable that acquirors intending to mitigate their carbon risk see their due diligence process hastened when targets disclose emissions-related data. Altogether, bearing in mind that mergers motivated by carbon risk help mitigate the combined firms' exposure to such a risk and, thus, increase their credibility, I conjecture that these mergers may even have a better chance of receiving faster approval from various parties. The fact that acquirors engaged in green M&A activity gain greater access to resources and reduced financing constraints also due to their implicitly improved legitimacy (Li *et al.*, 2020) supports my assumption. Hence, I posit that carbon-risk-induced mergers are shorter in duration as summarized in the sixth and seventh hypotheses:

H_6: Targets that disclose their CO_2 emissions pre-merger participate in shorter-time transactions.

H_7: The duration of mergers is positively correlated with targets' carbon risk exposure pre-merger.

3.3. Short-term Merger Market Response

Since investors are actively shifting their portfolios towards low-carbon risk holdings (Krueger *et al.*, 2020; Bolton & Kacperczyk, 2020), I expect the market to view acquisitions that diversify away from such a risk as value-improving. I test this prediction with the following hypothesis:

H_8: The CARs of acquirors around merger announcements are positively correlated with acquirors' exposure to carbon risk pre-merger.

[2] Briefly, M&A transactions' complexity depends on the number of participants involved in the different stages of the process, the number and extension of the documents produced and the number of needed financial, legal, and regulatory approvals.

3.4. Long-term Sustainability Performance Post-merger

Given that risks associated with CO_2 emissions are rather long-term, I anticipate firms' ESG scores to improve after the completion of deals that reduce carbon risk. Thus, my final hypothesis is as follows:

H_9: Post-merger, the ESG scores of combined firms improve significantly more for acquirors subject to high carbon risk pre-merger.

4. Data

4.1. Sample Selection

I extract data on deals announced between January 1st, 2006, and September 21st, 2023 (inclusive) from the Thomson Reuters Refinitiv Eikon (Eikon) database, using Deal Screener. The sample period begins in 2006 as before that, information on ESG-related variables in Eikon is scarce. I apply the following filtering criteria: (1) the deal is completed; (2) the deal value is equal to or greater than U.S. $1 million (Bai *et al.*, 2020); (3) the target nation is the U.S., Canada, or Europe[3]; (4) the acquiror holds less than 50% of the shares of the target at the announcement date, and (5) 100% after the transaction is completed[4]. These filters yield 1,248 deals (2,329 companies), between 2006 and 2023.

4.2. Sample Construction

I complement this dataset with annual information on firm fundamentals between 2000 and 2022 from the Compustat Capital IQ (Compustat) database, using both the North America and Global sub-datasets, accessed through WRDS. Observe that, in the absence of a common global identifier, the different datasets are merged manually using the companies' names. After cleaning the data and considering only the deals for which there was sufficient accounting data available for, at least, the year prior to that of the deal, for either the acquiror or the target, I remain with 183 deals (331 companies[5]). Of these, 148 have accounting data for both counterparts.

[3] Initially, the purpose was to solely study deals in which both the acquiror and the target were from the U.S. However, due to data scarcity, I ended up only restricting the targets' nation and including deals whose targets were also either from Canada or Europe. I believe I do not entirely compromise sampling data and results interpretability as these markets share similarities across multiple domains.
[4] I apply the last two criteria to clearly assess the impact of the merger in the acquiror's carbon risk post-merger.
[5] 35 companies participate in more than one deal.

I obtain quarterly total CO_2 emissions between 2005[6] and 2022 from the Datastream database, accessed through Eikon. I assume the value of the closest quarter for which data is available. Given the lack of data availability, I supplement this set of data with the annual CO_2 emissions (reported and estimated, when actual values are not available) of some[7] of the firms with missing data on Datastream, for the same period and extracted directly from Eikon's website[8], and assume the same value for each quarter. Since Datastream does not often recognize Deal Screener's company tickers, I once more match each company's name to merge the different datasets. I create a dummy variable equal to one if, for a given firm in each quarter, data on CO_2 emissions is available (meaning, that the firm reports on it) and zero otherwise, and keep the 183 previous deals. This constitutes my first sample, which consists of unbalanced panel data on deal characteristics, accounting figures and information on CO_2 reporting. This sample is used to test hypotheses 1, 4 and 6.

From the 148 deals aforementioned, I then consider only the deals for which there was CO_2 emissions data available for, at least, the year prior to that of the deal, for both the acquiror and the target, and end up with 20 deals (40 companies). However, I disregard 10 of these deals due to a Datastream bias – essentially, even though I apply the fourth aforementioned filtering criterion, the database outputs the buyer's CO_2 emissions for both counterparts when these already share a relationship before the deal[9]. To ensure the quality of observations and their independence, I drop these data points and hold 10 deals. Furthermore, for the acquirors of this set of firms, I compute the CARs around nine different estimation periods surrounding the announcement date, from three days before the announcement to three days after. The shortest event window is (-1,+1), while the longest is (-3,+3). To estimate the CARs, I first compute each acquiror's logarithmic daily returns ($ln\left({P_t}/{P_{t-1}}\right)$) between 2000 and 2022, using the price index available on Datastream. I then estimate each of the factor loadings of the Fama and French (1993) three-factor model for developed markets[10] using the S&P500 composite index as the benchmark portfolio and an estimation window of (-255,-46). I compute the expected returns using those factor loadings.

[6] One year prior to the first year I obtain at least one deal.
[7] Precisely, 44 companies.
[8] As expected, both Datastream database (accessed through Eikon) and Eikon's website database follow the standards of the Greenhouse Gas Protocol to identify, collect and calculate corporate GHG emissions. This means there are very limited variations in the data.
[9] An example is Archrock Inc acquires Archrock Partners LP.
[10] I extracted the model's daily returns from Kenneth R. French Data Library.

Finally, I compute the ARs as the difference between the actual and predicted returns to then estimate the announcement CARs as the cumulative sum of the ARs during each event window. In addition, I extract these firms' annual (in lack of more granular data) ESG scores between 2002[11] and 2022 from Datastream. The data are merged following the procedure stated above. This dataset comprises my second sample, which consists of unbalanced panel data on deal characteristics, accounting figures, CO_2 emissions, CARs and ESG values. This sample is used to test hypotheses 3, 5, and 7 through 9.

To build the sample for hypothesis 2, I follow Bai *et al.* (2020) and construct four matched samples: two industry- and size-matched samples and two industry-, size-, and stock volatility[12]-matched samples. To construct the first matched sample, for each *real* acquiror (target) of a deal announced in year t (from the 10 deals of the second sample), I find up to three matching acquirors (targets) by industry – using the FF10 classification[13] – and by size in year $t-1$, that are neither an acquiror nor a target in the three years before the deal. This allows to capture clustering by industry and in time (Bena & Li, 2014). To do this, I first build an auxiliary sample of untreated firms (that are neither an acquiror nor a target in the three years before a given year between 2006 and 2022). I start by extracting the annual CO_2 emissions of the constituents from the Datastream, FTSE, MSCI, Refinitiv and S&P equity lists available on Datastream[14] between 2003[15] and 2022 and consider only the firms for which there is annual accounting data (for all the same firm fundamentals aforementioned) available for the same time span[16] on Compustat. These two datasets are also merged using the companies' names, checked individually. Considering the entire Deal Screener M&A dataset, I then assign these firms a dummy variable equal to one if, in year t, they took part in one or more deals and zero otherwise, dropping the observations equal to one and their respective three preceding observations (considering the observations are sorted by year). Once again, the companies' names were used to combine both datasets. I obtain an auxiliary sample of 1,203 companies. Since Stata[17] cannot perform staggered analyses and I have multiple

[11] Datastream only has ESG data available from 2002 onwards.
[12] Instead of stock volatility, Bai et al. (2020) use the M/B ratio as their third matching characteristic but given the lack of data availability for that ratio, I match with stock volatility (which also proxies for firm performance).
[13] Kenneth R. French's 10 Industry Portfolios definition.
[14] The goal is to gather data on as many firms as possible to increase the probably of doing the match with great accuracy. Although these equity lists have companies in common and there is data missing for several companies, I remain with a large group of firms.
[15] Three years prior to the starting year of the primary sample of M&A deals extracted from Eikon.
[16] From 2000 to 2022.
[17] Statistical Software.

deals in different years, I proceed with matching the treated and untreated firms manually. For each *real* acquiror (target) in deal m in year t, I find up to three matching acquirors (targets) by first filtering the untreated firms' sample by year (only considering $t-1$), then by industry and, finally, by size. Each time, I drop the matched firms from the auxiliary sample to prevent the same firm from being picked up more than once. I end up with 80 firms (meaning 40 deals, which are the 10 *real* deals plus 30 matched deals, three for each *real* one). For the second matched sample, I replicate this process but instead of three, I find up to five matching firms for each counterpart. Therefore, I end up with 120 firms (meaning 60 deals, which are the 10 *real* deals plus 50 matched deals, five for each *real* one). To construct the third matched sample, for each *real* acquiror (target) of a deal announced in year t, I find up to three matching acquirors (targets) by industry, size, and stock volatility in year $t-1$, that are neither an acquiror nor a target in the three years before the deal. Adding stock volatility allows me to further capture clustering by risk profile[18] and growth opportunities[19] (both important M&A drivers). I follow the manual matching process stated above with the exception that, after filtering the untreated firms' sample by year and industry, I use propensity scores calculated using size and stock volatility to do the matching. For the fourth matched sample, I replicate this but find up to five matching firms. Similarly to the first and second matched samples, the third and fourth comprise 40 and 60 deals, respectively. I keep a dummy variable equal to one for firms participating in *real* deals and zero otherwise, for all four matched samples. Overall, these samples consist of unbalanced panel data on deal engagement, accounting figures, and CO_2 emissions.

4.3. Descriptive Statistics

Figure 1 presents the first and second samples' absolute yearly deal frequencies over the period considered, showing a dispersed distribution for both samples. Whereas in the first sample, 2018 was the year with the highest number of deals announced, in the second sample it was 2022.

[18] By definition, volatility is a measure of risk (put differently, of missing what is expected or predicted).
[19] Liu and Zhang (2021) find a declining trend in realized idiosyncratic return volatility as firms age, and Loderer and Waelchli (2010) find that older firms manifest slower growth. Therefore, I expect firms subject to shrinking growth opportunities (in principle, older firms) to evince lower stock volatility.

Figure 1: Number of Deals over Time – First and Second Samples

The illustrated years are the calendar years in which the deal is considered effective. Over the entire period considered, there are 183 deals in the first sample and 10 in the second.

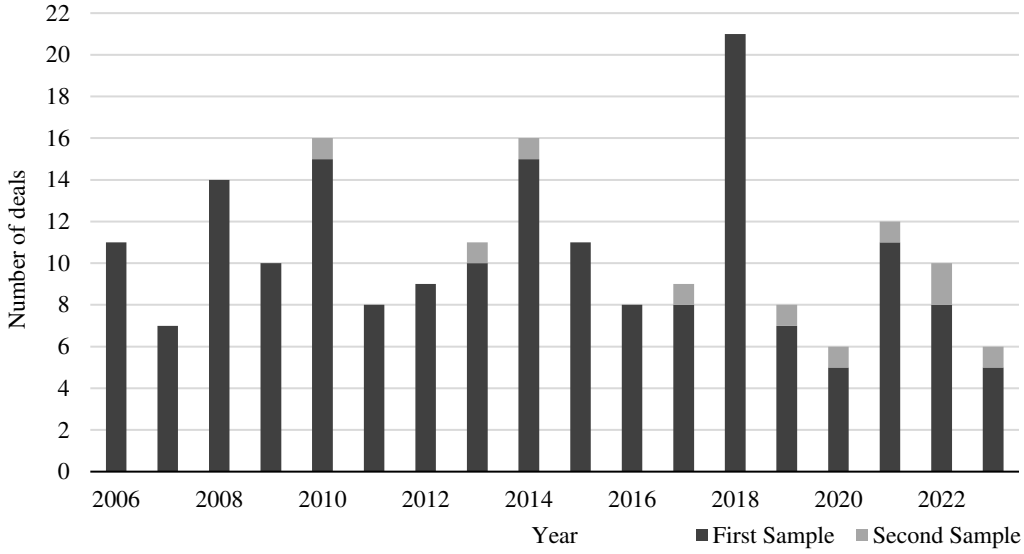


Table 1 highlights that, according to the FF10 classification, most firms belong to the "Other" category, which includes the mining, construction, building materials, transportation, hospitality, business services, entertainment, and finance industries. Furthermore, it shows that similarly to targets that come from Europe, the U.S., or Canada (fulfilling the third filtering criterion aforementioned), most acquirors also come from these regions.

Table 1: Sample Composition by Industry and Region – First and Second Samples

Panel A presents the composition of the first sample by industry (Panel A.1.) and region (Panel A.2.), for each type of firm. Panel B presents the composition of the second sample by industry (Panel B.1.) and region (Panel B.2.), for each type of firm. A detailed description of the industry classification used (FF10) is provided in the Appendix. The European region includes the following countries: Austria, Belgium, Bulgaria, Cyprus, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Monaco, Netherlands, Norway, Poland, Romania, Slovakia, Sweden, Switzerland, and the United Kingdom. Percentages may not add up to 1 due to rounding.

Panel A. First Sample

Panel A.1. Industry	Acquirors	Targets	Panel A.2. Region	Acquirors	Targets
1 Nondurables	4 (2%)	10 (6%)	Europe	52 (32%)	64 (38%)
2 Durables	1 (1%)	5 (3%)	United States	50 (31%)	55 (33%)
3 Manufacturing	11 (7%)	11 (7%)	Canada	46 (28%)	50 (30%)
4 Energy	10 (6%)	14 (8%)	Australia	3 (2%)	-
5 High Tech	12 (7%)	19 (11%)	China	2 (1%)	-
6 Telecom	6 (4%)	3 (2%)	Japan	2 (1%)	-
7 Shops	7 (4%)	10 (6%)	Russia	2 (1%)	-
8 Health	9 (6%)	10 (6%)	Isle of Man	1 (1%)	-
9 Utilities	10 (6%)	10 (6%)	Hong Kong	1 (1%)	-
10 Other	92 (57%)	77 (46%)	Philippines	1 (1%)	-
Total	*162 (100%)*	*169 (100%)*	Singapore	1 (1%)	-
			South Africa	1 (1%)	-
			Total	*162 (100%)*	*169 (100%)*

Panel B. Second Sample

Panel B.1. Industry	Acquirors	Targets	Panel B.2. Region	Acquirors	Targets
2 Durables	-	2 (20%)	Europe	5 (50%)	4 (40%)
3 Manufacturing	2 (20%)	-	United States	2 (20%)	3 (30%)
4 Energy	1 (10%)	-	Canada	2 (20%)	3 (30%)
6 Telecom	2 (20%)	1 (10%)	China	1 (10%)	-
9 Utilities	2 (20%)	2 (20%)	*Total*	*10 (100%)*	*10 (100%)*
10 Other	4 (40%)	5 (50%)			
Total	*10 (100%)*	*10 (100%)*			

Table 2 reports descriptive statistics for the first and second samples. Panel A shows that, on average, there are more acquirors than targets reporting on their CO_2 emissions. However, Panel B indicates that acquirors have higher exposure to carbon risk than targets as they present, on average, considerably higher CO_2 emissions[20]. This suggests a positive (negative) correlation between carbon risk and the probability of being an acquiror (a target). Moreover, the acquiring firms present higher total assets and leverage than the target firms in both samples. Conversely,

[20] The higher the CO_2 emissions produced, the toughest the net-zero corporate transition and, thus, the higher the carbon risk.

the former have lower quick ratios than the latter, also in both samples. Whereas in the first sample, acquirors show lower stock volatility when compared to targets, in the second sample, the opposite is true. Overall, both samples are identical[21] to those used in other comparable studies, such as Bai *et al.* (2020) and Bena and Li (2014). Regarding the second sample, the mean value for the CARs across most estimation windows is around 1%, with a modest cross-section variation. Additionally, deals take, on average, around half a year to complete and close, on average, at around U.S. $8.5 billion. On average, 60% of the acquirors engage in transactions with targets from another industry. Finally, on average, acquirors are slightly above middle rank in terms of their ESG scores (considering pre- and post-merger observations).

[21] Regarding accounting data.

Table 2: Summary Statistics – First and Second Samples

Panel A presents the summary statistics of the first sample, for both acquirors (Panel A.1.) and targets (Panel A.2.). Panel B presents the summary statistics of the second sample, for both acquirors (Panel B.1.) and targets (Panel B.2.). The statistics are displayed for each firm type (acquirors and targets). $DealValue$ is reported in U.S. $ millions, $DealDuration$ in days, and $CO2\_E$ in tons. Detailed definitions of the variables are provided in the Appendix.

Panel A. First Sample

Panel A.1. Acquirors

	N	Mean	SD	Median	Min	Max
DealValue	162	2,059.035	5,790.770	232.860	1.100	37,435.109
DealDuration	162	168.963	162.366	120.000	28.000	1,364.000
DiversifyingDeal	162	0.704	0.458	1.000	0.000	1.000
CO2_D	3,322	0.293	0.455	0.000	0.000	1.000
FirmSize	3,321	7.614	3.002	7.848	1.005	14.750
Leverage	3,321	0.236	0.212	0.197	0.000	0.855
StockVol	1,252	0.491	0.348	0.431	0.000	2.038
QuickRatio	2,390	1.983	2.725	1.150	0.087	19.951

Panel A.2. Targets

	N	Mean	SD	Median	Min	Max
DealValue	169	1,952.247	5,619.712	247.778	1.100	37,435.109
DealDuration	169	168.848	133.096	134.000	35.000	829.000
DiversifyingDeal	169	0.702	0.459	1.000	0.000	1.000
CO2_D	1,980	0.154	0.361	0.000	0.000	1.000
FirmSize	1,971	5.758	2.500	5.581	1.005	12.641
Leverage	1,971	0.215	0.212	0.162	0.000	0.855
StockVol	215	0.399	0.309	0.377	0.000	1.740
QuickRatio	1,650	2.664	3.955	1.234	0.087	19.951

Panel B. Second Sample

Panel B.1. Acquirors

	N	Mean	SD	Median	Min	Max
DealValue	10	8,595.297	10,665.002	5,853.068	281.963	37,435.109
DealDuration	10	278.500	172.630	245.000	46.000	537.000
DiversifyingDeal	10	0.600	0.516	1.000	0.000	1.000
CO2_E	53	5,234,812	10,127,392	1,220,000	2,675	38,975,996
FirmSize	182	10.155	1.847	10.545	6.127	13.681
Leverage	182	0.347	0.131	0.363	0.014	0.678
StockVol	182	0.398	0.245	0.368	0.000	1.341
QuickRatio	153	0.943	0.535	0.823	0.246	3.115
ESG	132	62.689	20.475	69.295	15.480	91.850
Post	182	0.308	0.463	0.000	0.000	1.000
CAR (-1,+1)	30	0.001	0.014	-0.002	-0.022	0.043
CAR (-1,+2)	40	0.002	0.017	-0.002	-0.036	0.058
CAR (-1,+3)	50	0.002	0.022	0.000	-0.063	0.075
CAR (-2,+1)	40	0.000	0.013	-0.002	-0.023	0.043
CAR (-2,+2)	50	0.001	0.016	-0.002	-0.036	0.058
CAR (-2,+3)	60	0.001	0.020	-0.002	-0.063	0.075
CAR (-3,+1)	50	0.000	0.012	-0.002	-0.023	0.043
CAR (-3,+2)	60	0.000	0.015	-0.002	-0.036	0.058
CAR (-3,+3)	70	0.000	0.019	-0.002	-0.063	0.075

Panel B.2. Targets

	N	Mean	SD	Median	Min	Max
DealValue	10	8,595.297	10,665.002	5,853.068	281.963	37,435.109
DealDuration	10	278.500	172.630	245.000	46.000	537.000
DiversifyingDeal	10	0.600	0.516	1.000	0.000	1.000
CO2_E	32	4,864,439	9,314,723	132,570	7,340	30,299,988
FirmSize	131	9.234	1.544	8.935	5.903	12.368
Leverage	131	0.316	0.208	0.352	0.000	0.792
StockVol	113	0.431	0.260	0.406	0.000	1.341
QuickRatio	109	1.381	1.199	1.004	0.246	5.918

Table 3 reports descriptive statistics for all four matched samples. In general, the same conclusions are verified. Even still, note that, in the third and fourth matched samples, the difference between acquirors' and targets' average CO_2 emissions is much higher.

Table 3: Summary Statistics – Matched Samples

Panel A presents the summary statistics of the first (Panel A.1.) and second (Panel A.2.) matched samples (both matched by industry and size), which comprise, respectively, three and five matching firms for each *real* firm. Panel B presents the summary statistics of the third (Panel B.1.) and fourth (Panel B.2.) matched samples (both matched by industry, size, and stock volatility), which comprise, respectively, three and five matching firms for each *real* firm. The statistics are displayed for each firm type (acquirors and targets), aggregating both *real* and matched firms. $CO2\_E$ is reported in tons. Detailed definitions of the variables are provided in the Appendix.

Panel A. Industry and size-matched

	Panel A.1. Up to 3 matches						**Panel A.2. Up to 5 matches**					
	Acquirors						**Acquirors**					
	N	**Mean**	**SD**	**Median**	**Min**	**Max**	**N**	**Mean**	**SD**	**Median**	**Min**	**Max**
CO2_E	364	6,920,722	12,011,545	1,227,500	2,675	69,999,936	607	11,834,660	19,065,191	1,611,001	1,923	91,800,016
DealFirm	493	0.369	0.483	0.000	0.000	1.000	736	0.247	0.432	0.000	0.000	1.000
FirmSize	493	10.180	1.389	10.416	6.069	13.681	736	10.188	1.278	10.329	6.005	13.681
Leverage	493	0.344	0.161	0.354	0.005	0.766	736	0.336	0.160	0.346	0.005	0.766
StockVol	493	0.366	0.206	0.311	0.000	1.341	736	0.366	0.212	0.307	0.000	1.341
QuickRatio	464	1.064	0.641	0.907	0.234	6.406	707	1.014	0.581	0.875	0.234	6.406
	Targets						**Targets**					
CO2_E	274	5,624,153	10,967,896	314,509	1,002	67,790,128	398	4,670,895	10,365,607	233,434	1,002	67,790,128
DealFirm	373	0.351	0.478	0.000	0.000	1.000	497	0.264	0.441	0.000	0.000	1.000
FirmSize	373	9.210	1.358	9.054	5.903	12.443	497	9.153	1.304	9.183	5.903	12.443
Leverage	373	0.294	0.180	0.296	0.000	0.792	497	0.280	0.180	0.281	0.000	0.792
StockVol	355	0.393	0.220	0.364	0.000	1.341	479	0.394	0.226	0.356	0.000	1.341
QuickRatio	351	1.221	0.923	1.011	0.246	6.406	475	1.260	0.916	1.064	0.246	6.406

Panel B. Industry, size, and stock volatility-matched

	Panel B.1. Up to 3 matches						**Panel B.2. Up to 5 matches**					
	Acquirors						**Acquirors**					
	N	**Mean**	**SD**	**Median**	**Min**	**Max**	**N**	**Mean**	**SD**	**Median**	**Min**	**Max**
CO2_E	373	23,235,874	31,526,576	6,300,000	2,675	111,400,000	569	20,162,199	29,185,939	4,615,491	2,675	111,400,000
DealFirm	502	0.363	0.481	0.000	0.000	1.000	698	0.261	0.439	0.000	0.000	1.000
FirmSize	502	10.131	1.541	10.338	6.127	13.681	698	10.235	1.495	10.413	6.127	13.681
Leverage	502	0.338	0.141	0.346	0.014	0.766	698	0.330	0.152	0.332	0.000	0.766
StockVol	502	0.384	0.214	0.337	0.000	1.341	698	0.374	0.201	0.321	0.000	1.341
QuickRatio	473	0.941	0.468	0.858	0.234	3.115	669	1.035	0.608	0.911	0.234	6.406
	Targets						**Targets**					
CO2_E	329	9,737,104	17,677,743	589,200	7,340	79,920,024	497	7,864,930	15,451,409	442,254	1,002	79,920,024
DealFirm	428	0.306	0.461	0.000	0.000	1.000	596	0.220	0.414	0.000	0.000	1.000
FirmSize	428	9.268	1.310	9.461	5.903	12.368	596	9.142	1.280	9.284	5.903	12.368
Leverage	428	0.317	0.176	0.329	0.000	0.792	596	0.303	0.174	0.313	0.000	0.792
StockVol	410	0.396	0.242	0.325	0.000	1.341	578	0.402	0.234	0.345	0.000	1.341
QuickRatio	406	1.129	0.922	0.902	0.234	6.257	574	1.200	0.929	0.994	0.234	6.406

Please note that the statistics for deals' value and duration (in Table 2) and firms' CO_2 emissions (in Tables 2 and 3) are reported in different measures than the ones used in the study (natural

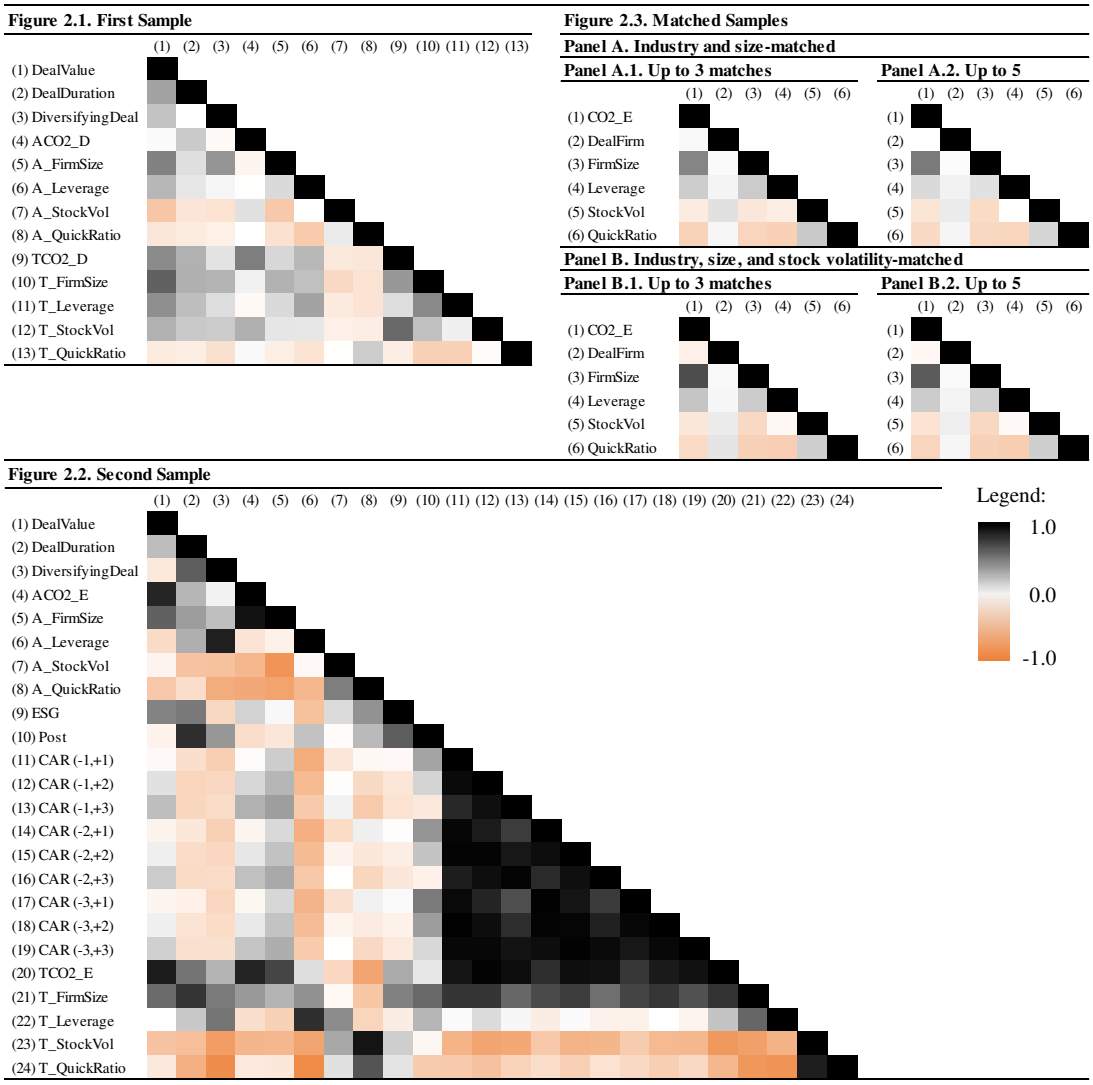
logarithms[22]), with the sole purpose of providing readable information (the order of magnitude of these variables). That is also to say that although these variables report standard deviations that are sometimes twice as high as their means, which implies the presence of outliers biasing the sample, this does not hold with the measures used in the study.

As shown in Figure 2, most variables from the first and the four matched samples are only slightly correlated with one another. Concerning the second sample, some variables show a stronger correlation, warranting careful consideration. Naturally, a higher degree of independence between them would allow for a higher precision assessment of the relationships further explored and a better interpretation of results. However, while this may raise concerns, it does not necessarily invalidate the findings. Note that, as for the CARs, it is evident that they present high correlation coefficients amongst them because of their daily frequency and nature (they gradually accumulate the same ARs).

[22] Used to normalize values (so as to address size variations).

Figure 2: Correlation Coefficient Maps

Figures 2.1., 2.2., and 2.3. present the correlation coefficient maps of the first, second, and the four matched samples, respectively. The color black (used when the coefficient is equal to 1) denotes a very strong positive correlation and orange (used when the coefficient is equal to -1) denotes a very strong negative correlation.



Moreover, with respect to the four matched samples, I also conduct the t-test for the mean differences of firm characteristics between *real* acquirors (targets) and matched acquirors (targets). This allows me to understand whether the matching process was effective. I find that, although some differences are statistically significant for both acquirors and targets in all four matched samples, they are not economically relevant.

Table 4: Mean Differences between *Real* and Matched Firms

Panel A presents firm characteristics' mean differences between the *real* and matched firms of the first (Panel A.1.) and second (Panel A.2.) matched samples (both matched by industry and size), which comprise, respectively, three and five matching firms for each *real* firm. Panel B presents firm characteristics' mean differences between the *real* and matched firms of the third (Panel B.1.) and fourth (Panel B.2.) matched samples (both matched by industry, size, and stock volatility), which comprise, respectively, three and five matching firms for each *real* firm. The mean differences are displayed for each firm type (acquirors and targets). ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. Detailed definitions of the variables are provided in the Appendix.

Panel A. Industry and size-matched

	Panel A.1. Up to 3 matches				**Panel A.2. Up to 5 matches**			
	Acquirors		**Targets**		**Acquirors**		**Targets**	
	N	**Difference**	**N**	**Difference**	**N**	**Difference**	**N**	**Difference**
FirmSize	493	0.040	373	-0.037	736	0.044	497	-0.109
Leverage	493	-0.005	373	-0.033*	736	-0.015	497	-0.049***
StockVol	493	-0.050***	355	-0.056**	736	-0.042**	479	-0.048**
QuickRatio	464	0.180***	351	-0.233**	707	0.091*	475	-0.157

Panel B. Industry, size, and stock volatility-matched

	Panel B.1. Up to 3 matches				**Panel B.2. Up to 5 matches**			
	Acquirors		**Targets**		**Acquirors**		**Targets**	
	N	**Difference**	**N**	**Difference**	**N**	**Difference**	**N**	**Difference**
FirmSize	502	-0.038	428	0.049	698	0.109	596	-0.117
Leverage	502	-0.014	428	0.002	698	-0.024*	596	-0.016
StockVol	502	-0.021	410	0.027*	698	-0.033*	578	-0.036
QuickRatio	473	-0.003	406	-0.345***	669	0.119**	574	-0.223**

5. Empirical Methodology

5.1. Variables Description

This study comprises four main sets of analyses, testing for (1) merger likelihood, (2) deal-specific characteristics (deal value and duration), (3) short-term merger market response, and (4) post-merger long-term sustainability firm performance.

To measure merger likelihood, I test three hypotheses, each with different dependent variables: hypothesis 1 has $TCO2\_D_{im,t-1}$ as its dependent variable, a dummy variable that equals one if target i in deal m reports its CO_2 emissions (meaning, data is available) in year $t-1$ (the year before the year of the announcement of deal m), and zero otherwise; hypothesis 2 has $DealFirm_{im,t}$ as its dependent variable, a dummy variable that equals one if firm i is the *actual* acquiror or target in deal m and year t, and zero otherwise (if it is a matched firm); and, similarly to the first hypothesis but considering the magnitude of the measure, hypothesis 3 has

$TCO2\_E_{im,t-1}$ as its dependent variable, that is the amount of CO_2 emissions of target i in deal m in year $t-1$ (the year before the year of the announcement of deal m).

To evaluate the impact of carbon risk on deal-specific characteristics, namely the deal value and duration, the dependent variables are, respectively, $DealValue_{m,t}$, meaning the value of deal m in year t (hypotheses 4-5), and $DealDuration_{m,t}$, meaning the duration of deal m in year t (hypotheses 6-7).

To examine the short-term merger market reactions (hypothesis 8), the dependent variable is $CAR_{im,t}$, the CAR around the merger announcement date of acquiror i in deal m and year t. According to Li and Prabhala (2007), CARs provide information on market efficiency (speed of adjustment to the announcement and subsequent changes in security holder wealth).

To assess the firm's post-merger long-term sustainability performance (hypothesis 9), I use $ESG_{im.t}$, the ESG scores in year t of combined firm i in deal m, as the dependent variable. I assume the combined firm to be the acquiror[23]. Note that ESG scores are determined, among other measures, by CO_2 emissions and other related elements (LSEG Data & Analytics, 2023). Therefore, it is possible to quantify the impact of the merger on the combined firm's carbon risk exposure (implicitly) and overall sustainability post-merger through this variable.

The independent variable of interest is carbon risk, measured by (1) whether a firm reports its CO_2 emissions and, in case it does, (2) the amount of emissions it produces annually.

I control for a range of observable firm characteristics for both the acquiring and target firms throughout the analyses, namely $FirmSize$ (measuring scale), $Leverage$ (measuring financial leverage), $StockVol$ (measuring risk, performance, and growth opportunities), and $QuickRatio$ (measuring liquidity). Moreover, in most cases I also control for merger deal characteristics, specifically $DealValue$, $DealDuration$, and $DiversifyingDeal$ (cross-industry or intra-industry deals).

[23] Since I only consider deals in which 100% of the target shares are acquired, by definition, a merger is implied in each deal. Typically, the smaller of the two entities (usually, the target firm) is merged into the larger one.

All continuous variables are winsorized at the 1% and 99% levels (Bai *et al.*, 2020) to reduce the impact of potential outliers and improve robustness. Detailed definitions of all variables are provided in the Appendix.

5.2. Regressions

My empirical methodology proceeds in four steps. First, I study merger likelihood considering carbon risk (hypotheses 1-3). Hypothesis 1 examines the relationship between acquirors' and targets' carbon emissions disclosure pre-merger. I run the following logistic (better suited to modelling when the dependent variable is dichotomous) regression:

$$TCO2\_D_{im,t-1} = \alpha + \beta_1 ACO2\_D_{im,t-1} + \beta_2 X_{im,t-1} + \beta_3 Y_{m,t} + \varepsilon_{im,t} \qquad (1)$$

where i, m, and t index firm, deal, and year, respectively. $TCO2\_D_{im,t-1}$ equals one if target i in deal m (announced in year t) reports its CO_2 emissions in year $t-1$, and zero otherwise. The key independent variable $ACO2\_D_{im,t-1}$ equals one if acquiror i in deal m (announced in year t) reports its CO_2 emissions in year $t-1$, and zero otherwise. I include the following firm-level characteristics ($X_{im,t-1}$), measured in year $t-1$, to account for acquirors' fundamentals at the fiscal-year-end preceding the deal's announcement year: $FirmSize$, $Leverage$, $StockVol$, and $QuickRatio$. Since I do not have all these attributes for all 162[24] acquiring firms, I run the same regression specification three times, starting with all the characteristics I have available for all companies and gradually adding the remaining attributes one at a time. I also include the following deal-specific characteristics (Y_m): $DealValue$, $DealDuration$, and $DiversifyingDeal$. The error term is represented by $\varepsilon_{im,t}$. I cluster the standard errors at the deal level (Bai *et al.*, 2020; Bena and Li, 2014) to adjust for the presence of within-group correlation and obtain more accurate estimates of such errors, and do not include fixed effects.

Hypothesis 2 assesses whether exposure to carbon risk affects the probability of a firm becoming an acquiror or a target. To this end, I follow Bai *et al.* (2020) and run two types of regressions: (1) logistic, attempting to predict the probability of a firm taking part in a deal, given its carbon risk; and (2) and conditional logistic, which models upon the logistic regression but better accounts for the fact that I have matched data. I estimate the following specification:

[24] Number of deals in the first sample for which accounting data is available for acquirors.

$$DealFirm_{im,t} = \alpha + \beta_1 CO2\_E_{im,t-1} + \beta_2 X_{im,t-1} + \varepsilon_{im,t} \quad (2)$$

where $DealFirm_{im,t}$ equals one if firm i is the *real* acquiror (target) in deal m and year t, and zero otherwise. The key independent variable $CO2\_E_{im,t-1}$ equals firm i's CO_2 emissions measured in $t-1$. In this model, firm-level characteristics are specific to each firm (not the acquiror of each deal). Here, I do not include deal controls. All other variables are defined analogously to Equation (1).

Hypothesis 3 refines this analysis by examining whether high-carbon-risk firms are more likely to acquire low-carbon-risk firms. For this, I adapt the first hypothesis' model to the following ordinary least squares (OLS) specification:

$$TCO2\_E_{im,t-1} = \alpha + \beta_1 ACO2\_E_{im,t-1} + \beta_2 X_{im,t-1} + \beta_3 Y_{m,t} + \varepsilon_{im,t} \quad (3)$$

where $TCO2\_E_{im,t-1}$ and $ACO2\_E_{im,t-1}$ (key independent variable) equal the CO_2 emissions in year $t-1$ of target i and acquiror i in deal m (announced in year t), respectively. All other variables are defined analogously to Equation (1).

Second, I investigate whether targets' pre-merger carbon risk impacts deal-specific characteristics (hypotheses 4-7). Hypothesis 4 tests if targets disclosing carbon emissions pre-merger close higher-value deals. I estimate the following OLS model:

$$DealValue_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 X_{im,t-1} + \beta_3 Y_{m,t} + \varepsilon_{im,t} \quad (4)$$

where the dependent variable is the value of deal m in year t. Note both the independent variable of interest and target controls are measured in $t-1$. All other variables are defined analogously to Equation (1).

Hypothesis 5 enhances this analysis by evaluating the relationship between targets' carbon risk pre-merger and the value of the deals they take part in. I replace the key independent variable in Equation (4) with targets' CO_2 emissions and obtain the following specification:

$$DealValue_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 X_{im,t-1} + \beta_3 Y_{m,t} + \varepsilon_{im,t} \quad (5)$$

I complement this analysis by exploring whether the duration of deals is also affected by targets' carbon risk pre-merger. I substitute the dependent variable of Equations (4) and (5) with the time

deals take to get completed and obtain the following models, which concern to hypotheses 6 and 7, respectively:

$$DealDuration_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 X_{im,t-1} + \beta_3 Y_{m,t} + \varepsilon_{im,t} \quad (6)$$

$$DealDuration_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 X_{im,t-1} + \beta_3 Y_{m,t} + \varepsilon_{im,t} \quad (7)$$

Third, I study whether acquirors' CARs around the acquisition announcement are correlated with their carbon risk pre-merger (hypothesis 8). For this, I run the following OLS regression:

$$CAR_{im,t} = \alpha + \beta_1 ACO2\_E_{im,t-1} + \beta_2 X_{im,t-1} + \beta_3 Y_{m,t} + \varepsilon_{im,t} \quad (8)$$

where the dependent variable is acquirors' CARs around different windows surrounding the merger announcements. Note that the key independent variable and acquiror controls are measured in $t-1$. All other variables are defined analogously to Equation (1).

Finally, I assess how the combined firms' ESG score changes post-merger (hypothesis 9). I run an ordered probit regression, which allows me to model the probability of the score changing post-merger while accounting for the fact that the dependent variable is ordinal. I estimate the following specification:

$$ESG_{im,t} = a + \beta_1 Post_{im,t} + \beta_2 CO2\_E_{im,t} + \beta_3 Post \times CO2\_E_{im,t} + \beta_4 X_{im,t} + \varepsilon_{im,t} \quad (9)$$

where $Post_{im,t}$ is an indicator variable equal to one after the merger announcement, and zero otherwise. Here, I do not include deal controls. All other variables are defined analogously to Equation (1). I use three estimation windows of two (-1,+1), four (-2,+2), and six (-3,+3) years around the year of the deal completion, respectively.

Generally, the parameter of interest is β_1, except for Equation (9) where β_3 prevails.

6. Empirical Results

This section covers the findings of the four main sets of analysis, which hint at (1) the relationship between carbon risk and merger likelihood, (2) the impact of carbon risk on deal-specific characteristics (value and duration), (3) the short-term market response to carbon-risk-motivated mergers, and (4) the post-merger long-term sustainability performance of firms taking part in carbon-risk-motivated deals. Each table displays the results of each of the equations developed above.

6.1. Merger Likelihood

When testing hypothesis 1, I find that the relationship between acquirors' and targets' pre-merger CO_2 emissions disclosure is positive and statistically significant at the 1% level, as presented in Table 5 (Column 1). That means acquirors reporting on carbon emissions pre-merger are more likely to buy out firms that do so too, as first hypothesized. Note that, once acquirors' stock volatility and quick ratio are included in the model (Columns 2 and 3), this result loses statistical significance. Nonetheless, these last results are more subtle as they entail a pseudo R^2 of one, implying a perfect fit of the model to the data. This may be due to the number of observations that more than halves from the first to the second and third regression specifications.

Interestingly, the coefficient respecting the value of the deal is also positive and statistically significant at the 1% level in Column 1, meaning that the higher the price the acquirors pay for targets, the more likely it is that targets report on their CO_2 emissions pre-merger, all else equal.

Table 5: Acquiror CO_2 Dummy on Target CO_2 Dummy

This table reports the coefficient estimates from the logistic model in Equation (1). Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Logistic	(1)	(2)	(3)
		TCO2_D	
ACO2_D	3.601***	1,538.000	2,607.000
	(1.085)	(0.000)	(0.000)
DealValue	0.954***	261.300	478.600
	(0.254)	(0.000)	(0.000)
DealDuration	0.822	-311.500	-498.600
	(0.513)	(0.000)	(0.000)
DiversifyingDeal	0.105	-160.000	-163.900
	(0.702)	(0.000)	(0.000)
FirmSize	-0.364*	-82.500	-158.000
	(0.199)	(0.000)	(0.000)
Leverage	1.682	1878.000	3485.000
	(3.723)	(0.000)	(0.000)
StockVol		-370.600	-839.000
		(0.000)	(0.000)
QuickRatio			158.800
			(0.000)
Constant	-12.160***	-1,050.000	-2,376.000
	(3.718)	(0.000)	(0.000)
Cluster	Deal	Deal	Deal
Observations	162	61	56
Pseudo R^2	0.485	1.000	1.000

Looking at the relationship between carbon risk and merger likelihood (hypothesis 2), the findings indicate that there is a significant negative coefficient for acquirors' CO_2 emissions (this is broadly consistent across all panels from Table 6). Clearer results (larger estimates and higher statistical significance) are found when using the third and fourth matched samples and the conditional logistic model (Panels B.2.1. and B.2.2.)[25]. This suggests that firms subject to higher carbon risk (emitting more CO_2) are less likely to become acquirors, after controlling for a variety of firm characteristics, which contradicts what was initially predicted. There are a few possible reasons for this. First, acquirors may find it difficult to strategically align with potential targets less exposed to carbon risk, which reduces the attractiveness of the M&A opportunities acquirors

[25] That is most likely due to these samples being better-matched samples, as they ensure treated and untreaded firms are comparable across more dimensions, and the model being better suited to the matched data.

might resort to tackle this matter. Moreover, taking on the acquirors' management and/or shareholders perspective, efforts to reduce carbon risk *in-house* and internally transition to a more sustainable business model may take precedence over engaging in M&A to decrease exposure to carbon risk. Considering the scenario where mergers are not actually driven by carbon risk, engaging in such transactions could undesirably attract attention to these firms' carbon footprint (potentially leading to increased regulatory and reputational hurdles) or exacerbate their uncertain future cash flows (due to possible carbon taxes or other climate-related financial risks).

Results are more dubious regarding targets. Here, the coefficient of interest yields little to no statistical significance and often presents a contradictory sign in the third regression specification, where the model includes all firm controls. Even still, where there is statistical significance (Panels B.1.1. and B.2.1), the sign is also negative, implying that firms subject to higher carbon risk are less likely to become targets, corroborating what was originally conjectured. These higher-carbon-risk firms may, indeed, be perceived as less attractive targets because, among other things, their transition to a net-zero status is riskier and more costly – a challenge acquirors might not be willing to spend resources tackling.

Table 6: CO_2 Emissions and Merger Likelihood

This table reports the coefficient estimates from the model in Equation (2). Panel A presents the results from the logistic model. Panel B presents the results from the conditional logistic model. Panel A.1. shows the results using the first (Panel A.1.1.) and second (Panel A.1.2.) matched samples (both matched by industry and size), which comprise, respectively, three and five matching firms for each *real* firm. Panel A.2. shows the results using the third (Panel A.2.1.) and fourth (Panel A.2.2.) matched samples (both matched by industry, size, and stock volatility), which comprise, respectively, three and five matching firms for each *real* firm. Panels B.1., B.2. and subsequent panels are analogous to Panels A.1., A.2. and subsequent panels, respectively. The results are displayed for each firm type (acquirors and targets), aggregating both *real* and matched firms. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A. Logistic Regressions

Panel A.1. Industry and size-matched

	Panel A.1.1. Up to 3 matches						**Panel A.1.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		DealFirm			DealFirm			DealFirm			DealFirm	
CO2_E	-0.109**	-0.083	-0.130	-0.062	-0.078	0.261	-0.168***	-0.154*	-0.119	-0.027	-0.080	0.100
	(0.045)	(0.070)	(0.206)	(0.126)	(0.164)	(0.309)	(0.060)	(0.085)	(0.212)	(0.105)	(0.137)	(0.168)
FirmSize	0.255*	0.279	-0.214	0.143	0.046	-0.471	0.387*	0.401*	-0.109	0.195**	0.148	-0.177
	(0.154)	(0.172)	(0.290)	(0.090)	(0.171)	(0.390)	(0.200)	(0.218)	(0.306)	(0.085)	(0.097)	(0.268)
Leverage	1.351	0.970	-0.838	-1.153	-0.432	4.113	1.153	1.023	-0.434	-1.546	-1.356	1.509
	(1.552)	(1.539)	(0.876)	(2.423)	(3.506)	(2.599)	(1.388)	(1.402)	(1.089)	(2.324)	(2.861)	(3.480)
StockVol		0.925	1.806		1.875	4.854		0.409	0.656		1.395	1.728
		(1.594)	(1.958)		(2.763)	(3.332)		(1.446)	(1.616)		(0.988)	(1.257)
QuickRatio			-2.329*			0.463			-1.675			0.337
			(1.304)			(0.481)			(1.247)			(0.213)
Constant	-2.716	-3.541	4.589	-1.355	-1.409	-4.710	-3.701*	-4.152	2.434	-2.666*	-2.380	-3.516
	(1.951)	(2.699)	(4.283)	(1.602)	(2.606)	(3.533)	(2.053)	(2.957)	(3.850)	(1.573)	(2.196)	(2.658)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	40	40	38	40	39	36	60	60	58	60	59	56
Pseudo R^2	0.029	0.035	0.106	0.016	0.045	0.150	0.043	0.044	0.047	0.023	0.048	0.059

Panel A.2. Industry, size, and stock volatility-matched

	Panel A.2.1. Up to 3 matches						**Panel A.2.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		DealFirm			DealFirm			DealFirm			DealFirm	
CO2_E	-0.588***	-0.726*	-0.708*	-0.159	-0.215	-0.011	-0.355***	-0.353***	-0.261	-0.112	-0.155	0.035
	(0.159)	(0.374)	(0.407)	(0.104)	(0.134)	(0.185)	(0.124)	(0.126)	(0.210)	(0.129)	(0.163)	(0.183)
FirmSize	0.836***	1.070**	0.910*	0.387**	0.386**	-0.008	0.539***	0.562***	0.299	0.414**	0.391**	-0.045
	(0.240)	(0.498)	(0.521)	(0.152)	(0.158)	(0.424)	(0.182)	(0.183)	(0.308)	(0.168)	(0.178)	(0.347)
Leverage	-0.850	-0.603	-1.704	-2.028	-2.132	0.228	0.302	0.151	-0.637	-2.170	-2.254	0.730
	(2.109)	(2.171)	(1.964)	(3.331)	(3.659)	(4.759)	(1.263)	(1.194)	(1.428)	(3.348)	(3.785)	(4.349)
StockVol		2.584	2.303		0.741	0.504		0.881	0.870		0.689	0.724
		(2.823)	(2.933)		(0.676)	(1.900)		(1.069)	(1.780)		(1.065)	(1.621)
QuickRatio			-1.134			0.209			-1.191			0.278
			(1.154)			(0.319)			(1.033)			(0.272)
Constant	-0.791	-2.290	0.603	-2.049	-1.778	-2.011	-2.210	-2.769	-0.057	-3.382*	-3.063	-3.135
	(1.726)	(2.138)	(2.165)	(1.689)	(2.490)	(3.383)	(1.658)	(1.859)	(2.647)	(1.955)	(2.853)	(3.852)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	40	40	38	40	39	36	60	60	58	60	59	56
Pseudo R^2	0.212	0.237	0.141	0.073	0.097	0.020	0.115	0.119	0.059	0.064	0.080	0.024

Panel B. Conditional Logistic Regressions												
Panel B.1. Industry and size-matched												
	Panel B.1.1. Up to 3 matches						**Panel B.1.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	DealFirm			DealFirm			DealFirm			DealFirm		
CO2_E	-0.273*	-0.350**	-1.022	-0.161	-0.160	-37.320***	-0.306	-0.294	-0.364	-0.127	-0.148	-0.079
	(0.163)	(0.146)	(0.647)	(0.170)	(0.158)	(2.633)	(0.189)	(0.199)	(0.327)	(0.153)	(0.168)	(0.256)
FirmSize	3.370**	3.221**	1.757	1.057	0.969	396.300	2.161***	2.193***	1.373	1.205	1.161	1.843
	(1.390)	(1.340)	(1.320)	(1.049)	(1.324)	(0.000)	(0.736)	(0.688)	(0.954)	(0.954)	(1.253)	(1.558)
Leverage	2.159	1.805	-2.245	-2.079	-1.965	126.900***	2.533	2.178	0.181	-1.478	-1.964	0.459
	(3.547)	(3.499)	(6.536)	(3.841)	(4.109)	(15.660)	(2.660)	(2.580)	(1.992)	(2.603)	(2.937)	(3.220)
StockVol		3.168	14.270**		3.665	1225.000		1.051	2.599		3.111*	9.573**
		(3.314)	(6.424)		(4.478)	(0.000)		(2.092)	(1.792)		(1.760)	(3.965)
QuickRatio			-2.835			164.500***			-2.373			0.812*
			(1.737)			(22.370)			(1.996)			(0.438)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	40	40	32	40	36	24	60	60	48	60	54	36
Pseudo R^2	0.249	0.282	0.420	0.091	0.155	1.000	0.208	0.215	0.188	0.112	0.153	0.265
Panel B.2. Industry, size, and stock volatility-matched												
	Panel B.2.1. Up to 3 matches						**Panel B.2.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	DealFirm			DealFirm			DealFirm			DealFirm		
CO2_E	-1.776***	-2.408**	-2.415**	-0.904**	-0.844**	-0.586	-0.470**	-0.450**	-0.228	-0.178	-0.141	0.003
	(0.673)	(1.100)	(1.154)	(0.439)	(0.382)	(0.386)	(0.217)	(0.230)	(0.218)	(0.199)	(0.196)	(0.141)
FirmSize	3.194**	4.658**	4.699**	0.819	0.770	1.036	0.917**	0.996*	0.599	0.524	0.497	0.215
	(1.370)	(1.820)	(2.080)	(0.570)	(0.534)	(1.000)	(0.393)	(0.509)	(0.465)	(0.375)	(0.349)	(0.998)
Leverage	1.009	-4.853**	-4.737***	-2.851	-2.582	-0.186	2.594	1.828	1.373	-1.578	-1.427	0.955
	(2.875)	(1.976)	(1.406)	(5.449)	(4.959)	(4.754)	(2.368)	(1.583)	(1.924)	(3.725)	(3.743)	(3.763)
StockVol		17.180**	17.000**		2.203*	1.539*		3.274	4.000		1.056	1.483
		(7.698)	(6.670)		(1.214)	(0.852)		(3.829)	(3.603)		(1.548)	(2.125)
QuickRatio			0.182			0.039			-1.325			0.201
			(1.348)			(0.268)			(0.952)			(0.311)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	40	40	32	40	36	24	60	60	48	60	54	36
Pseudo R^2	0.584	0.728	0.660	0.235	0.234	0.072	0.252	0.269	0.179	0.104	0.112	0.029

Assessing hypothesis 3, the results show a positive and statistically significant (at the 1% level) relationship between acquirors and targets' CO_2 emissions pre-merger. Essentially, I find that acquirors subject to higher carbon risk pre-merger tend to acquire firms also subject to higher carbon risk pre-merger, which stands against what was first assumed. This suggests that carbon risk considerations are a less important factor in M&A decision-making and that firms seem to not use M&A as a strategy to reduce their carbon risk. However, keep in mind that this is true in a model that shows an adjusted R^2 of more than 95%, which may be indicative of overfitting, omitted variable bias, or multicollinearity, among other issues. Note that once controlling for all four acquiror fundamentals, the coefficient of interest loses statistical significance, as shown in Table 7 (Column 3). However, also note that this occurs parallel to stock volatility getting omitted (due to collinearity) and the R^2 equaling one, which means that this result is less reliable.

Additionally, note that, all else equal (except for Column 3): the higher the deal value, the higher the targets' CO_2 emissions (this is, at least, significant at the 10% level); acquirors choosing M&A as a diversifying strategy tend to acquire targets subject to higher carbon risk pre-merger, meaning carbon risk is, again, not much of a concern to them (this is, at least, significant at the 5% level); and the higher the acquirors' leverage pre-merger, the higher the CO_2 emissions of the targets that they buy out (this is statistically significant at the 1% level).

Table 7: Acquiror CO_2 Emissions on Target CO_2 Emissions

This table reports the coefficient estimates from the OLS model in Equation (3). "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)
		TCO2_E	
ACO2_E	0.807***	0.786***	0.560
	(0.087)	(0.137)	(0.000)
DealValue	5.804**	6.378*	8.513
	(1.800)	(3.308)	(0.000)
DealDuration	-0.075	-0.103	0.157
	(0.276)	(0.247)	(0.000)
DiversifyingDeal	1.578***	1.649**	1.043
	(0.374)	(0.549)	(0.000)
FirmSize	-0.017	-0.048	0.118
	(0.170)	(0.249)	(0.000)
Leverage	5.134***	5.230***	8.494
	(1.386)	(1.492)	(0.000)
StockVol		-0.532	
		(1.523)	
QuickRatio			1.817
			(0.000)
Constant	-12.430***	-12.725***	-19.891
	(2.641)	(3.658)	(0.000)
Cluster	Deal	Deal	Deal
Observations	10	10	8
R^2	0.986	0.986	1.000
Adj R^2	0.957	0.939	.

6.2. Deal-specific Characteristics

Next, I analyze how targets' carbon risk pre-merger impacts certain deal characteristics, namely deal value and duration.

6.2.1. Deal Value

When investigating whether targets' disclosure or non-disclosure of CO_2 emissions pre-merger affects the values of deals (hypothesis 4), I find that those who do disclose participate in transactions that are larger in deal value, supporting what I initially conjectured (acquirors are willing to pay more for targets disclosing such information). Note, however, this is only statistically significant (at the 5% level) when targets' stock volatility and quick ratio are not controlled for. More importantly, observe that, although not significant, the sign of this relationship inverts when controlling for all firm fundamentals. Nonetheless, I believe this does not weaken the conclusions from Column 1 in Table 8, given the material drop in the number of observations of the last two model specifications.

Curiously, all else equal, targets' size proves to affect deals' value positively, always being statistically significant, at least, at the 5% level.

After refining the former analysis to consider the impact of the magnitude of targets' pre-merger CO_2 emissions on deals' value (hypothesis 5), the findings indicate that targets subject to higher carbon risk pre-merger tend to participate in deals with larger values, with significance at the 5% level. Even though the coefficient estimates are small, this contradicts what was first hypothesized. Once more, this suggests that carbon risk does not seem to be amongst the decision-making factors acquirors prioritize when evaluating M&A opportunities and how much they are worth. Instead, acquirors may focus on other elements, such as targets' strategic assets, which could, in turn, drive up the deal's value (in spite of targets' carbon risk). In fact, while acquirors may recognize the environmental risks associated with buying out higher-carbon-emitting targets, they might prioritize the economic value generated by the acquisition – if the potential financial returns outweigh the perceived environmental risks, acquirors may be willing to pay a premium for targets subject to higher carbon risk. On the bright (more environmentally friendly) side, the acquirors' confidence in their ability to further mitigate carbon risk and achieve long-term sustainability goals could justify a higher deal value for targets with higher carbon risk. In reality, despite the upfront challenges associated with environmental risks, acquirors may view the purchase of higher-carbon-emitting firms as an opportunity to facilitate the forward strategic transformation of the combined firm towards a more sustainable one. Nevertheless, note that statistical significance disappears when the model includes all four target fundamentals (Table 9, Column 3). Also note

that, in this specification, two control variables get omitted (due to collinearity), and R^2 equals one. I believe this comes up as the sample size shrinks remarkably.

Table 8: Target CO_2 Dummy on Deal Value

This table reports the coefficient estimates from the OLS model in Equation (4). "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)
	DealValue		
TCO2_D	0.781**	0.636	-0.035
	(0.324)	(0.715)	(1.250)
DealDuration	-0.414**	-1.205	-0.330
	(0.197)	(0.700)	(1.036)
DiversifyingDeal	-0.234	0.940	0.616
	(0.194)	(0.566)	(1.170)
FirmSize	0.678***	0.604***	1.060**
	(0.083)	(0.193)	(0.361)
Leverage	-0.147	-0.152	-0.680
	(0.663)	(1.860)	(2.398)
StockVol		-1.078	-2.427
		(1.259)	(2.421)
QuickRatio			0.904
			(0.951)
Constant	3.585***	8.427**	0.224
	(0.839)	(3.763)	(7.523)
Cluster	Deal	Deal	Deal
Observations	169	14	11
R^2	0.585	0.671	0.757
Adj R^2	0.572	0.389	0.189

Table 9: Target CO_2 Emissions on Deal Value

This table reports the coefficient estimates from the OLS model in Equation (5). "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)
	DealValue		
TCO2_E	0.045**	0.059**	0.096
	(0.019)	(0.025)	(0.000)
DealDuration	-0.108	-0.042	-0.029
	(0.074)	(0.071)	(0.000)
DiversifyingDeal	-0.009	-0.147	
	(0.056)	(0.133)	
FirmSize	0.057*	0.032	0.013
	(0.027)	(0.026)	(0.000)
Leverage	-0.033	0.061	0.318
	(0.198)	(0.188)	(0.000)
StockVol		0.365	
		(0.265)	
QuickRatio			0.124
			(0.000)
Constant	1.626***	1.233**	0.609
	(0.256)	(0.463)	(0.000)
Cluster	Deal	Deal	Deal
Observations	10	9	6
R^2	0.737	0.857	1.000
Adj R^2	0.407	0.426	.

It is essential to draw attention to the fact that, here, I only deal with target data, except for the dependent variable which is deal-specific. Being aware that I consider deals in which targets are solely from Europe, the U.S., or Canada, and that, despite being similar, these markets present some differences (for instance, in the regulatory environment specific to carbon emissions), I proceed to test hypotheses 4 and 5 for each of these three regions to take such a matter into account.

With respect to hypothesis 4, results differ by region (see Appendix 3). Whereas I find that targets from the U.S. or Canada that disclose their carbon emissions pre-merger participate in higher-value transactions (statistical significance at the 1% level is found when controlling for all

four target fundamentals), supporting what I initially assumed, I obtain no reliable results regarding targets from Europe (the coefficient of interest presents no statistical significance and gets omitted once the model controls for stock volatility and the quick ratio).

Concerning hypothesis 5, results also diverge by region (see Appendix 4). On the one hand, the findings suggest that, for European firms, the higher their carbon risk pre-merger, the higher the values of the deals they participate in (with statistical significance at the 5% level), as concluded previously. Note that this only holds when controlling for deal characteristics, size, and leverage (doubtlessly due to the reduced number of observations that remain when adding more controls, which leads to variables getting omitted and R^2 reaching one). On the other hand, I find the opposite result for firms from the U.S. or Canada, endorsing what was initially conjectured. Note, as well, that this only holds when excluding stock volatility and the quick ratio from the model.

6.2.2. Deal Duration

Similarly to the previous analysis, I study the relationship between targets' disclosure and amount of CO_2 emissions pre-merger and the duration of deals (hypotheses 6 and 7, respectively).

First, I find that targets disclosing their pre-merger carbon emissions are more likely to participate in longer-duration deals (with significance at the 1% level), which stands against what was initially assumed. One possible reason is that, whereas acquirors purchasing non-carbon-disclosing targets potentially neglect environmental concerns, acquirors purchasing carbon-disclosing targets plausibly care more about environmental risks, thus performing more thorough due diligence processes related to environmental sustainability, which contributes to longer deal timelines. Nevertheless, statistical significance disappears as the model incorporates stock volatility and quick ratio controls (Table 10, Columns 2 and 3). Note that the lack of observations, which drop significantly, may be the reason as to why this happens.

Second, I find no conclusive results regarding the relationship between targets' level of CO_2 emissions pre-merger and deals' duration (Table 11). The coefficient of interest lacks statistical significance and changes signs once all firm fundamentals are controlled for (even though this happens while other controls get omitted and R^2 equals one).

Table 10: Target CO_2 Dummy on Deal Duration

This table reports the coefficient estimates from the OLS model in Equation (6). "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)
		DealDuration	
TCO2_D	0.382***	0.210	0.217
	(0.133)	(0.313)	(0.992)
DealValue	-0.085*	-0.243	-0.051
	(0.046)	(0.167)	(0.174)
DiversifyingDeal	0.002	0.629*	0.637
	(0.101)	(0.319)	(0.982)
FirmSize	0.119***	0.166	-0.101
	(0.042)	(0.126)	(0.318)
Leverage	0.391	0.429	0.255
	(0.247)	(1.004)	(1.628)
StockVol		0.368	2.184
		(0.712)	(1.770)
QuickRatio			-0.531
			(0.641)
Constant	4.509***	4.880***	5.612*
	(0.159)	(1.008)	(2.921)
Cluster	Deal	Deal	Deal
Observations	169	14	11
R^2	0.163	0.565	0.733
Adj R^2	0.137	0.192	0.111

Table 11: Target CO_2 Emissions on Deal Duration

This table reports the coefficient estimates from the OLS model in Equation (7). "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)
		DealDuration	
TCO2_E	0.161	0.085	-0.974
	(0.095)	(0.212)	(0.000)
DealValue	-0.346	-0.229	1.462
	(0.220)	(0.465)	(0.000)
DiversifyingDeal	0.328	0.594	6.050
	(0.354)	(0.729)	(0.000)
FirmSize	0.296**	0.241	0.611
	(0.107)	(0.138)	(0.000)
Leverage	0.579	0.562	
	(1.138)	(1.342)	
StockVol		0.091	
		(1.821)	
QuickRatio			0.892
			(0.000)
Constant	3.197***	3.390**	-6.253
	(0.873)	(1.283)	(0.000)
Cluster	Deal	Deal	Deal
Observations	10	9	6
R-squared	0.737	0.764	1.000
Adj R^2	0.408	0.057	.

Similarly to what I do at the end of Section 6.2.1., I also test hypotheses 6 and 7 for each of the three target regions considered.

With respect to hypothesis 6, results vary by region (see Appendix 5). Whereas I find that targets from the U.S. or Canada that disclose their carbon emissions pre-merger participate in longer-duration transactions (statistical significance at the 1% level is found when controlling for all four target fundamentals), as concluded previously, I obtain no valid results regarding European targets (the coefficient of interest has no statistical significance and gets omitted once the model controls for stock volatility and the quick ratio).

Regarding hypothesis 7, results also differ by region (see Appendix 6). While the findings suggest that, for European firms, the higher their CO_2 emissions pre-merger, the longer the

duration of the deals they participate in (with statistical significance at the 1% level), the opposite is true for firms from the U.S. Note that, once more, this only holds when controlling for deal characteristics, size, and leverage. No statistical significance is found regarding the coefficient of interest respecting the study including a dummy variable for Canada.

6.3. Short-term Merger Market Response

Looking at the results from the short-term merger market response analysis (hypothesis 8), I find that, when controlling for all firm fundamentals except the quick ratio, the higher the acquirors' CO_2 emissions pre-merger, the lower the CARs around the mergers' announcements (this is statistically significant at the 1% level). This holds across all estimation windows, as presented in Table 12. Even though the estimates slightly decrease with the increase of the event window's length (thus, gaining less relevance), this differs from what was first conjectured. Even when acquirors seek to address carbon risk through M&A, this may happen if the market remains skeptical about the effectiveness and sufficiency of such efforts, which may occur when acquirors have historically performed poorly on environmental and transitioning metrics. This is in line with the findings of Lodh *et al.* (2023). Notwithstanding, a different conclusion emerges when the model includes the quick ratio. Here, the coefficient of interest appears rather positive, also at the 1% significance level (although not for every event window). However, in this case, leverage gets omitted, possibly leading other parameter estimates to be biased (despite gaining statistical significance). Hence, I believe the first results are more reliable.

Table 12: Acquiror CO_2 Emissions on CARs

This table reports the coefficient estimates from the OLS model in Equation (8). "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	CAR (-1,+1)			CAR (-1,+2)			CAR (-1,+3)			CAR (-2,+1)			CAR (-2,+2)		
ACO2_E	-0.005***	-0.008***	0.002***	-0.005***	-0.008***	0.004***	-0.005***	-0.008***	0.007***	-0.004***	-0.007***	0.001	-0.004***	-0.007***	0.003***
	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.000)
DealValue	0.003*	0.013**	0.005***	0.005**	0.014**	0.005***	0.007**	0.016**	0.005***	0.002*	0.011***	0.005***	0.003*	0.012**	0.004***
	(0.002)	(0.005)	(0.000)	(0.002)	(0.005)	(0.000)	(0.003)	(0.007)	(0.000)	(0.001)	(0.004)	(0.000)	(0.002)	(0.004)	(0.000)
DiversifyingDeal	0.002	0.018**	-0.001**	0.000	0.015*	-0.004***	-0.002	0.014	-0.008***	0.001	0.017***	0.000	0.000	0.015**	-0.003***
	(0.007)	(0.007)	(0.000)	(0.006)	(0.008)	(0.000)	(0.007)	(0.011)	(0.000)	(0.007)	(0.005)	(0.000)	(0.006)	(0.006)	(0.000)
FirmSize	0.002	-0.001	-.002***	0.002	0.000	-0.005***	0.003	0.000	-0.008***	0.002*	-0.001	0.000	0.002	-0.001	-0.003***
	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)	(0.000)	(0.002)	(0.003)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.000)
Leverage	0.003	-0.030		0.021	-0.011		0.034	0.001		-0.005	-0.037*		0.010	-0.021	
	(0.027)	(0.022)		(0.024)	(0.022)		(0.026)	(0.027)		(0.025)	(0.018)		(0.023)	(0.018)	
StockVol		-0.058**	-0.065***		-0.057**	-0.067***		-0.060*	-0.073***		-0.057***	-0.059***		-0.056***	-0.062***
		(0.020)	(0.002)		(0.022)	(0.003)		(0.028)	(0.001)		(0.015)	(0.006)		(0.017)	(0.002)
QuickRatio			0.016***			0.005***			-0.002***			0.019***			0.010***
			(0.000)			(0.000)			(0.000)			(0.001)			(0.000)
Constant	0.008	0.026	-0.038***	-0.007	0.010	-0.024***	-0.027	-0.009	-0.028***	0.010	0.027	-0.044***	-0.003	0.015	-0.032***
	(0.023)	(0.023)	(0.001)	(0.029)	(0.028)	(0.001)	(0.037)	(0.036)	(0.000)	(0.018)	(0.016)	(0.002)	(0.023)	(0.021)	(0.001)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	30	30	24	40	40	32	50	50	40	40	40	32	50	50	40
Number of Companies	10	10	8	10	10	8	10	10	8	10	10	8	10	10	8
R^2	0.596	0.722	0.756	0.555	0.640	0.597	0.518	0.581	0.554	0.379	0.529	0.747	0.388	0.489	0.548
Adj R^2	0.495	0.635	0.644	0.478	0.563	0.476	0.455	0.513	0.455	0.272	0.428	0.671	0.308	0.406	0.447
	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)			
	CAR (-2,+3)			CAR (-3,+1)			CAR (-3,+2)			CAR (-3,+3)					
ACO2_E	-0.004***	-0.007***	0.005***	-0.003***	-0.006***	0.000	-0.003***	-0.006***	0.002***	-0.004***	-0.007***	0.004***			
	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)			
DealValue	0.005**	0.015**	0.005***	0.002	0.010***	0.005***	0.003**	0.011***	0.005***	0.004**	0.013**	0.005***			
	(0.002)	(0.006)	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)	(0.003)	(0.000)	(0.002)	(0.005)	(0.000)			
DiversifyingDeal	-0.001	0.014	-0.006***	0.001	0.015***	0.002***	0.000	0.014**	-0.001***	-0.001	0.013*	-0.004***			
	(0.006)	(0.008)	(0.000)	(0.006)	(0.004)	(0.000)	(0.005)	(0.005)	(0.000)	(0.005)	(0.007)	(0.000)			
FirmSize	0.002	0.000	-0.006***	0.002*	-0.001	0.001	0.002*	0.000	-0.002***	0.002*	0.000	-0.004***			
	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)			
Leverage	0.023	-0.009		-0.006	-0.034**		0.008	-0.021		0.019	-0.011				
	(0.024)	(0.022)		(0.022)	(0.014)		(0.020)	(0.015)		(0.022)	(0.018)				
StockVol		-0.059**	-0.068***		-0.051***	-0.051***		-0.051***	-0.055***		-0.054**	-0.061***			
		(0.022)	(0.003)		(0.011)	(0.003)		(0.013)	(0.002)		(0.018)	(0.004)			
QuickRatio			0.003***			0.018***			0.010***			0.005***			
			(0.000)			(0.000)			(0.000)			(0.001)			
Constant	-0.020	-0.002	-0.034***	0.007	0.022*	-0.042***	-0.003	0.013	-0.032***	-0.018	-0.001	-0.033***			
	(0.031)	(0.029)	(0.001)	(0.014)	(0.012)	(0.001)	(0.019)	(0.017)	(0.001)	(0.026)	(0.024)	(0.001)			
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal			
Observations	60	60	48	50	50	40	60	60	48	70	70	56			
Number of Companies	10	10	8	10	10	8	10	10	8	10	10	8			
R^2	0.394	0.466	0.484	0.318	0.469	0.679	0.331	0.433	0.495	0.343	0.415	0.429			
Adj R^2	0.330	0.396	0.393	0.228	0.383	0.607	0.260	0.359	0.406	0.284	0.351	0.346			

6.4. Long-term Sustainability Performance Post-merger

Finally, in assessing the relationship between the combined firm's long-term ESG performance and acquirors' carbon risk pre-merger (hypothesis 9), the findings indicate that acquirors subject to high carbon risk pre-merger tend to experience a notably higher and statistically significant (at the 1% level) increase in their ESG scores in the aftermath of the merger, as was initially assumed. That means that combined firms have a higher positive impact on both the environment and society post-merger, particularly so for mergers that are carbon-risk-induced in the first place. This suggests that carbon risk may, after all, play a role in pursuing M&A activity. Note that, as shown in Table 13, this proves true in the long run (two and three years after the merger's completion), meaning once combined firms have had enough time to undergo the transitioning process. Also note that not all the second sample's 10 deals are considered, given that some lack the number of year observations necessary for the estimation windows considered in the analysis.

Withal, it is interesting to observe that, holding other factors constant, acquirors' ESG scores decrease remarkably two- and three-years post-merger, with statistical significance at the 1% level.

Table 13: Acquiror CO_2 Emissions on ESG Score

This table reports the coefficient estimates from the ordered probit model in Equation (9). Panels A, B, and C present the results using estimation windows of two, four, and six years around the year of the deal's announcement, respectively. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Ordered Probit	**Panel A. Estimation window (-1,+1)**			**Panel B. Estimation window (-2,+2)**			**Panel C. Estimation window (-3,+3)**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		ESG			ESG			ESG	
Post x CO2_E	0.123	0.107	0.407	2.965***	2.906***	3.181***	2.255***	2.328***	2.330***
	(0.312)	(0.379)	(0.446)	(0.789)	(0.765)	(0.546)	(0.391)	(0.393)	(0.268)
CO2_E	0.049	0.066	0.213	-2.988***	-2.841***	-3.242***	-2.184***	-2.424***	-2.485***
	(0.332)	(0.409)	(0.528)	(0.948)	(0.918)	(0.715)	(0.425)	(0.413)	(0.345)
Post	-1.202	-0.984	-5.561	-39.440***	-38.840***	-42.970***	-29.120***	-29.950***	-30.330***
	(4.672)	(5.505)	(6.824)	(10.120)	(9.760)	(6.970)	(5.129)	(5.261)	(3.731)
FirmSize	0.572**	0.571**	0.0925	-1.008***	-1.056***	-0.613*	-0.630***	-0.556***	-0.272
	(0.257)	(0.256)	(0.455)	(0.344)	(0.335)	(0.337)	(0.169)	(0.175)	(0.284)
Leverage	-2.945*	-3.014**	0.437	-4.303***	-5.020***	0.988	-2.234***	-1.896***	0.848
	(1.578)	(1.286)	(2.452)	(0.922)	(1.064)	(2.834)	(0.446)	(0.582)	(0.977)
StockVol		-0.155	-1.476		-0.886**	-0.0373		1.044	0.824
		(1.570)	(1.377)		(0.395)	(0.807)		(0.748)	(0.879)
QuickRatio			1.113**			2.029***			1.168
			(0.529)			(0.587)			(0.800)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	21	21	18	20	20	20	28	28	28
Number of Companies	7	7	6	4	4	4	4	4	4
Pseudo R^2	0.090	0.090	0.104	0.283	0.286	0.311	0.184	0.191	0.203

7. Robustness Tests

I perform two sets of robustness tests over hypotheses 2 (carbon risk on merger likelihood), 5 (targets' pre-merger CO_2 emissions on deal values), and 9 (acquirors' pre-merger CO_2 emissions on post-merger long-term sustainability firm performance). The criterion for choosing these hypotheses is selecting the most relevant within each of the four main sets of analyses (since both the third and fourth sets of analyses assess performance, short-term and long-term, respectively, I chose to test the latter). First, I conduct the analysis excluding regulated and financial firms. Second, I carry out the study substituting CO_2 emissions (for hypotheses 2 and 5) and ESG scores (for hypothesis 9) with E scores.

7.1. Excluding the regulated and financial sectors

It is relevant to call attention to the fact that, when selecting the initial sample of deals, I do not disregard deals in which either counterpart (or both) belongs to the regulated or financial sectors (see Section 4.1.). That is because the initial sample size would shrink tremendously. However,

given the importance of doing so (due to these sectors' distinct characteristics and influence), I proceed to dismiss the deals in which firms integrate the regulated sector (SIC codes 4900-4999) or the financial sector (SIC 6000–6999). Concerning the second sample (used to re-test hypotheses 5 and 9), I remain with 6 deals (out of the initial 10). Respecting the four matched samples (used to re-test hypothesis 2), I not only take out the firms from the same four *real* deals set aside in the second sample and their matched firms, but also some other matched firms (respecting firms from the remaining 6 *real* deals) that are from either one of these sectors. This results in not every *real* firm having exactly 3 or 5 matches, as previously. The first and third matched samples end up with 23 deals (out of the initial 40), and the second and fourth with 30 (out of the initial 60).

7.1.1. Merger likelihood

Testing hypothesis 2 while excluding financial and regulated firms, I find that, overall, results specific to acquirors prove robust, although showing slightly lower statistical significance.

Regarding targets, results remain generally dubious (the coefficient of interest keeps yielding contradictory signs) and lose robustness where they used to be statistically significant.

Table 14: CO_2 Emissions and Merger Likelihood (Robustness Test 1)

This table reports the coefficient estimates from the model in Equation (2). Panel A presents the results from the logistic model. Panel B presents the results from the conditional logistic model. Panel A.1. shows the results using the first (Panel A.1.1.) and second (Panel A.1.2.) matched samples (both matched by industry and size), which comprise, respectively, three and five matching firms for each *real* firm. Panel A.2. shows the results using the third (Panel A.2.1.) and fourth (Panel A.2.2.) matched samples (both matched by industry, size, and stock volatility), which comprise, respectively, three and five matching firms for each *real* firm. Panels B.1., B.2. and subsequent panels are analogous to Panels A.1., A.2. and subsequent panels, respectively. The results are displayed for each firm type (acquirors and targets), aggregating both *real* and matched firms. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A. Logistic Regressions

Panel A.1. Industry and size-matched

	Panel A.1.1. Up to 3 matches						**Panel A.1.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		DealFirm			DealFirm			DealFirm			DealFirm	
CO2_E	-0.125	-0.347*	-0.699	0.027	-0.036	-0.216	-0.119	-0.148	-0.320	0.051	-0.038	-0.113
	(0.094)	(0.209)	(0.654)	(0.198)	(0.288)	(0.592)	(0.157)	(0.197)	(0.359)	(0.204)	(0.295)	(0.483)
FirmSize	0.276	0.651	0.604	0.152	0.271	0.600	0.358	0.506	0.448	0.127	0.343	0.750
	(0.261)	(0.397)	(0.468)	(0.362)	(0.575)	(1.022)	(0.296)	(0.566)	(0.699)	(0.386)	(0.682)	(1.011)
Leverage	1.107	3.137	4.140	-0.906	-0.810	2.335	0.407	0.784	0.540	-1.853	-2.231	0.410
	(2.308)	(3.427)	(4.047)	(3.803)	(3.893)	(3.109)	(1.926)	(2.039)	(2.258)	(3.435)	(3.708)	(3.802)
StockVol		4.581	6.483		3.526	15.920		1.377	2.481		1.940	4.882
		(3.131)	(6.122)		(7.323)	(10.480)		(2.468)	(3.708)		(2.754)	(3.509)
QuickRatio			-2.270			0.022			-1.956			0.477*
			(2.502)			(0.308)			(2.037)			(0.265)
Constant	-2.404	-5.486*	1.080	-2.443	-4.277	-11.980*	-3.432**	-5.157	-0.610	-2.632	-4.156	-9.725
	(1.487)	(2.842)	(7.181)	(1.673)	(5.247)	(7.150)	(1.656)	(4.767)	(6.706)	(2.285)	(4.036)	(6.054)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	23	23	23	23	23	19	30	30	30	30	30	24
Pseudo R^2	0.021	0.068	0.170	0.009	0.038	0.267	0.023	0.032	0.096	0.025	0.041	0.144

Panel A.2. Industry, size, and stock volatility-matched

	Panel A.2.1. Up to 3 matches						**Panel A.2.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		DealFirm			DealFirm			DealFirm			DealFirm	
CO2_E	-0.831***	-2.769*	-2.852*	-0.014	0.024	-0.014	-0.482***	-1.079***	-1.758***	0.039	0.042	0.045
	(0.159)	(1.526)	(1.475)	(0.210)	(0.229)	(0.252)	(0.121)	(0.382)	(0.529)	(0.203)	(0.216)	(0.258)
FirmSize	1.177***	3.799	3.712*	0.045	-0.031	0.145	0.724**	1.490***	1.883***	0.041	0.033	0.147
	(0.337)	(2.383)	(2.253)	(0.271)	(0.363)	(0.396)	(0.282)	(0.546)	(0.680)	(0.378)	(0.439)	(0.448)
Leverage	-2.650	-3.438	-4.026	-0.833	-0.748	1.458	-1.996	-1.745	-3.225	-1.480	-1.478	1.198
	(3.296)	(5.684)	(5.496)	(4.569)	(4.508)	(4.670)	(3.020)	(2.960)	(3.522)	(4.505)	(4.495)	(4.629)
StockVol		16.840**	17.470**		-0.596	0.844		8.045**	12.790***		-0.098	1.320
		(8.184)	(7.610)		(0.576)	(1.848)		(3.510)	(3.482)		(1.218)	(1.549)
QuickRatio			-1.112			0.257			-3.875*			0.330
			(1.537)			(0.261)			(2.287)			(0.279)
Constant	-0.393	-6.236	-3.196	-1.132	-0.677	-3.556	-1.394	-4.004	3.921	-1.988	-1.921	-4.973
	(2.246)	(6.938)	(7.021)	(3.274)	(3.689)	(3.761)	(1.901)	(2.728)	(4.827)	(3.533)	(3.989)	(4.017)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	23	23	23	23	23	19	30	30	30	30	30	24
Pseudo R^2	0.161	0.387	0.402	0.003	0.005	0.030	0.082	0.182	0.330	0.010	0.010	0.047

Panel B. Conditional Logistic Regressions												
Panel B.1. Industry and size-matched												
	Panel B.1.1. Up to 3 matches						**Panel B.1.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	DealFirm			DealFirm			DealFirm			DealFirm		
CO2_E	-0.849	-0.876	-0.834	0.015	-0.043	-0.766	-0.149	-0.159	-0.297	0.000	-0.057	-1.030
	(0.730)	(0.694)	(0.572)	(0.182)	(0.275)	(0.498)	(0.181)	(0.182)	(0.342)	(0.180)	(0.233)	(0.751)
FirmSize	5.494**	5.634***	5.069***	0.373	-0.326	-1.745	4.148**	4.265**	3.986*	0.350	0.248	1.214
	(2.184)	(2.016)	(1.401)	(1.373)	(1.516)	(1.311)	(1.953)	(2.124)	(2.177)	(1.578)	(1.567)	(1.370)
Leverage	13.130	13.550	11.760**	-0.733	-0.875	6.078*	2.428	2.601	-0.533	-1.450	-2.065	0.734
	(11.370)	(10.880)	(4.696)	(3.885)	(4.058)	(3.375)	(3.557)	(3.901)	(1.864)	(3.848)	(4.413)	(3.602)
StockVol		-2.396	-0.684		4.401	40.530**		-1.200	0.651		2.060	25.260**
		(7.075)	(9.952)		(5.843)	(17.450)		(1.739)	(1.768)		(1.493)	(10.780)
QuickRatio			-0.569			2.958**			-2.008			2.189***
			(2.352)			(1.299)			(2.579)			(0.848)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	23	23	23	23	23	19	30	30	30	30	30	24
Pseudo R^2	0.403	0.407	0.411	0.012	0.058	0.628	0.218	0.225	0.275	0.021	0.043	0.477
Panel B.2. Industry, size, and stock volatility-matched												
	Panel B.2.1. Up to 3 matches						**Panel B.2.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	DealFirm			DealFirm			DealFirm			DealFirm		
CO2_E	-3.315*	-165.100	-145.500***	-0.007	0.060	-0.172	-1.491***	-1.731***	-1,266.000	0.035	0.036	-0.078
	(1.900)	(0.000)	(0.801)	(0.354)	(0.406)	(0.468)	(0.245)	(0.655)	(0.000)	(0.236)	(0.230)	(0.264)
FirmSize	5.913*	326.700	199.900	0.004	-0.085	0.930	2.349***	2.930**	1,637.000	-0.131	-0.119	0.713
	(3.314)	(0.000)	(0.000)	(0.904)	(0.958)	(1.152)	(0.479)	(1.390)	(0.000)	(0.948)	(0.939)	(0.955)
Leverage	3.403	-311.200	-257.000	-0.758	-0.663	1.740	-0.475	-3.380	-2780.000	-1.484	-1.395	1.547
	(4.990)	(0.000)	(0.000)	(4.130)	(4.132)	(4.436)	(3.707)	(6.261)	(0.000)	(4.789)	(4.772)	(4.512)
StockVol		1,148.000	1,253.000		-1.191	-0.542		7.616	14,857.000		-0.530	0.361
		(0.000)	(0.000)		(1.234)	(0.791)		(8.846)	(0.000)		(1.382)	(1.172)
QuickRatio			-81.670			0.134			-2,730***			0.243
			(0.000)			(0.232)			(1.953)			(0.221)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	23	23	23	23	23	19	30	30	30	30	30	24
Pseudo R^2	0.624	1.000	1.000	0.005	0.012	0.075	0.341	0.408	1.000	0.014	0.015	0.066

7.1.2. Deal Value

Testing hypothesis 5 only considering deals in which firms do not belong to the financial or regulated sectors, I am only able to prove the same results when not controlling for any of the target fundamentals. That is probably because of the small number of observations I get to by dropping financial and regulated firms.

Table 15: Target CO_2 Emissions on Deal Value (Robustness Test 1)

This table reports the coefficient estimates from the OLS model in Equation (5). "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)	(4)
		DealValue		
TCO2_E	0.091***	0.105	0.105	0.094
	(0.016)	(0.000)	(0.000)	(0.000)
DealDuration	-0.048	-0.026	-0.026	0.019
	(0.057)	(0.000)	(0.000)	(0.000)
DiversifyingDeal	0.074	-0.124	-0.124	
	(0.195)	(0.000)	(0.000)	
FirmSize	-0.261	-0.098	-0.098	
	(0.264)	(0.000)	(0.000)	
Leverage		0.335	0.335	0.302
		(0.000)	(0.000)	(0.000)
StockVol				
QuickRatio				0.146
				(0.000)
Constant	1.153*	1.669	1.669	0.395
	(0.572)	(0.000)	(0.000)	(0.000)
Cluster	Deal	Deal	Deal	Deal
Observations	6	6	6	5
R^2	0.941	1.000	1.000	1.000
Adj R^2	0.707	.	.	.

7.1.3. Long-term Sustainability Performance Post-Merger

Testing hypothesis 9 while only considering non-financial and non-regulated firms, I find that the results prove robust (statistical significance is kept at the 1% level and the coefficients of interest become even more economically significant).

Table 16: Acquiror CO_2 Emissions on ESG Score (Robustness Test 1)

This table reports the coefficient estimates from the ordered probit model in Equation (9). Panels A, B, and C present the results using estimation windows of two, four, and six years around the year of the deal's announcement, respectively. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Ordered Probit	**Panel A. Estimation window (-1,+1)**			**Panel B. Estimation window (-2,+2)**			**Panel C. Estimation window (-3,+3)**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		ESG			ESG			ESG	
Post x CO2_E	0.471	0.229	0.723	6.238***	6.009***	5.522***	3.046**	2.981***	2.749***
	(0.522)	(0.645)	(0.783)	(2.026)	(2.310)	(1.669)	(1.198)	(1.132)	(0.479)
CO2_E	1.147	1.534*	1.045	-6.036***	-5.215***	-4.253***	-2.366***	-2.120**	-1.937***
	(0.744)	(0.887)	(0.916)	(1.341)	(1.550)	(1.108)	(0.905)	(1.011)	(0.536)
Post	-5.505	-2.179	-9.250	-81.970***	-79.270***	-75.720***	-38.990**	-38.240***	-35.740***
	(8.069)	(9.984)	(11.820)	(26.020)	(29.950)	(24.400)	(15.460)	(14.490)	(6.252)
FirmSize	-3.480**	-3.666***	-3.662***	-3.164	-4.014	-4.433	-1.970*	-2.149***	-2.033**
	(1.379)	(1.326)	(1.006)	(2.408)	(3.538)	(4.198)	(1.050)	(0.787)	(0.869)
Leverage	14.350**	13.160**	24.880***	-1.880	1.205	19.450	4.504	4.930	14.020**
	(6.536)	(5.895)	(5.654)	(11.540)	(15.330)	(30.700)	(5.188)	(4.946)	(5.656)
StockVol		-3.072	0.245		-2.142	-2.621		-0.834	0.081
		(1.967)	(2.861)		(2.294)	(3.310)		(1.328)	(0.843)
QuickRatio			2.291*			4.659			2.086***
			(1.234)			(3.441)			(0.236)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	15	15	15	15	15	15	21	21	21
Number of Companies	5	5	5	3	3	3	3	3	3
Pseudo R^2	0.183	0.197	0.240	0.417	0.427	0.494	0.214	0.216	0.239

7.2. E Score

In a second attempt to test the robustness of the selected hypotheses' results, I substitute the independent variable of interest, CO_2 emissions, with annual E scores extracted from Datastream. Note that I do this except for hypothesis 9, where instead I use E scores to replace the dependent variable. That is because otherwise, the dependent and independent variables (ESG and E scores, respectively) would be highly correlated. Given that E scores are unavailable for some firms in the sample period considered, I end up with 9 deals in the second sample (out of the initial 10), 36 in the first and third matched samples (out of the initial 40), and 54 in the second and fourth matched samples (out of the initial 60). Note that, similarly to the matched samples used in the first set of robustness tests, the ones used here also do not have exactly 3 or 5 matches for every remaining *real* firm. It is relevant to highlight that using E scores rather than CO_2 emissions when re-testing hypotheses 2 and 5 seems sound, since the latter is pivotal to creating the former. Likewise, when re-testing hypothesis 9, it seems reasonable to focus only on the impact of carbon risk on the environmental pillar score rather than the overall sustainability score.

7.2.1. Merger likelihood

When investigating the relationship between environmental risk (proxied by firms' E scores[26]) and merger likelihood (in parallel to hypothesis 2), I find a positive and statistically significant coefficient for acquirors' E scores (Table 17). This corroborates the previous finding that firms subject to higher carbon risk (and, thus, rated worse in terms of their E scores[27]) pre-merger are less likely to participate in deals as the acquiring counterpart.

With respect to targets, results gain substance. Similarly, I find a positive and statistically significant (occasionally, at the 1% level) coefficient for targets' E scores. That is in accordance with the scarce statistically significant results of the main results (firms subject to higher carbon risk and, thus, lower E scores pre-merger are less likely to become targets in mergers).

[26] The higher the E score, the lower the environmental risk.
[27] Firms producing more CO_2 emissions (subject to higher carbon risk) tend to be rated with lower E scores.

Table 17: CO_2 Emissions and Merger Likelihood (Robustness Test 2)

This table reports the coefficient estimates from the model in Equation (2), adapted for the second set of robustness tests. Panel A presents the results from the logistic model. Panel B presents the results from the conditional logistic model. Panel A.1. shows the results using the first (Panel A.1.1.) and second (Panel A.1.2.) matched samples (both matched by industry and size), which comprise, respectively, three and five matching firms for each *real* firm. Panel A.2. shows the results using the third (Panel A.2.1.) and fourth (Panel A.2.2.) matched samples (both matched by industry, size, and stock volatility), which comprise, respectively, three and five matching firms for each *real* firm. Panels B.1., B.2. and subsequent panels are analogous to Panels A.1., A.2. and subsequent panels, respectively. The results are displayed for each firm type (acquirors and targets), aggregating both *real* and matched firms. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A. Logistic Regressions

Panel A.1. Industry and size-matched

	Panel A.1.1. Up to 3 matches						**Panel A.1.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		DealFirm			DealFirm			DealFirm			DealFirm	
EScore	0.061**	0.063*	0.073*	0.090***	0.084***	0.099***	0.038*	0.036*	0.058***	0.108***	0.102***	0.088***
	(0.031)	(0.034)	(0.042)	(0.028)	(0.026)	(0.027)	(0.020)	(0.019)	(0.021)	(0.035)	(0.034)	(0.029)
FirmSize	-0.194	-0.128	-0.719*	0.459*	0.347	-0.645	0.175	0.250	-0.335	0.516***	0.433***	-0.005
	(0.258)	(0.276)	(0.425)	(0.250)	(0.250)	(0.470)	(0.122)	(0.259)	(0.545)	(0.191)	(0.149)	(0.255)
Leverage	2.704	2.031	-0.642	-10.940**	-9.555	-0.650	-0.660	-0.771	-3.206*	-13.300**	-12.550**	-8.539***
	(2.701)	(2.913)	(2.635)	(5.531)	(6.349)	(6.004)	(2.265)	(2.018)	(1.694)	(5.493)	(5.015)	(3.285)
StockVol		1.918	1.065		1.769	0.362		0.826	-1.581		1.800	-0.438
		(2.427)	(3.347)		(2.458)	(5.683)		(1.767)	(2.643)		(2.058)	(3.018)
QuickRatio			-1.226			0.412			-0.667*			0.120
			(0.756)			(0.559)			(0.390)			(0.299)
Constant	-2.807***	-4.160**	3.501	-6.166**	-6.021***	-0.412	-4.830***	-5.771*	0.935	-7.417***	-7.404***	-3.365
	(1.084)	(2.047)	(3.484)	(2.403)	(2.246)	(4.376)	(1.431)	(3.274)	(6.246)	(2.230)	(2.282)	(2.876)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	36	36	34	36	35	32	54	52	50	54	53	50
Pseudo R^2	0.251	0.269	0.375	0.500	0.482	0.451	0.148	0.153	0.220	0.545	0.526	0.430

Panel A.2. Industry, size, and stock volatility-matched

	Panel A.2.1. Up to 3 matches						**Panel A.2.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		DealFirm			DealFirm			DealFirm			DealFirm	
EScore	0.054***	0.063***	0.105**	0.052***	0.051***	0.075***	0.050***	0.052***	0.065**	0.044**	0.036**	0.035*
	(0.017)	(0.017)	(0.047)	(0.020)	(0.013)	(0.029)	(0.019)	(0.019)	(0.029)	(0.019)	(0.016)	(0.019)
FirmSize	0.092	0.153	-0.234*	0.569*	0.623**	-0.036	0.213**	0.292**	0.095	0.507**	0.509**	0.189
	(0.099)	(0.096)	(0.130)	(0.296)	(0.281)	(0.391)	(0.085)	(0.115)	(0.165)	(0.197)	(0.244)	(0.309)
Leverage	3.511	5.045	-4.332	-12.330***	-14.870***	-14.030**	0.840	1.065	-1.735	-9.076**	-10.310**	-6.206*
	(4.432)	(3.477)	(4.305)	(3.954)	(4.014)	(6.199)	(1.640)	(1.475)	(1.776)	(3.539)	(4.316)	(3.205)
StockVol		2.584***	1.836		-3.572*	-8.230		1.453	-0.308		-0.917	-0.927
		(0.939)	(1.403)		(2.091)	(6.082)		(0.925)	(1.231)		(1.352)	(1.711)
QuickRatio			-2.108***			-0.058			-0.921			0.205
			(0.790)			(0.213)			(0.881)			(0.295)
Constant	-5.735***	-8.329***	-1.550	-5.593**	-3.772*	2.599	-6.453***	-7.975***	-4.375*	-6.153***	-5.248***	-3.791
	(2.218)	(2.456)	(1.937)	(2.752)	(2.037)	(4.880)	(1.642)	(2.644)	(2.584)	(1.874)	(2.001)	(2.951)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	36	36	34	36	35	32	54	52	50	54	53	50
Pseudo R^2	0.303	0.354	0.444	0.474	0.508	0.429	0.247	0.260	0.298	0.344	0.346	0.240

Panel B. Conditional Logistic Regressions												
Panel B.1. Industry and size-matched												
	Panel B.1.1. Up to 3 matches						**Panel B.1.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	DealFirm			DealFirm			DealFirm			DealFirm		
EScore	0.059**	0.098	1.814	0.109*	0.104*	5.032***	0.031**	0.037**	0.091	0.109	0.085	4.080
	(0.028)	(0.071)	(1.965)	(0.059)	(0.057)	(0.000)	(0.016)	(0.018)	(0.064)	(0.071)	(0.053)	(0.000)
FirmSize	3.236*	4.531**	104.200	-0.031	-0.367	148.000	3.024***	3.193***	2.566***	0.279	0.153	336.100
	(1.942)	(2.160)	(441.000)	(0.725)	(0.723)	(0.000)	(1.040)	(1.233)	(0.905)	(0.874)	(0.692)	(0.000)
Leverage	5.922	8.276	-227.400	-5.779	-6.958	1,304.000	2.473	3.962	-6.812*	-10.810*	-11.710***	-695.900
	(4.143)	(6.450)	(0.000)	(6.426)	(5.708)	(0.000)	(2.562)	(5.397)	(3.729)	(6.019)	(4.250)	(0.000)
StockVol		6.864	330.700		3.441*	941.400		-1.924	-3.249		4.680**	2,764.000
		(5.412)	(356.900)		(1.843)	(0.000)		(3.903)	(6.220)		(2.100)	(0.000)
QuickRatio			-42.290			340.700			-1.315**			391.100
			(50.720)			(0.000)			(0.663)			(0.000)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	36	36	34	36	35	32	54	52	50	54	53	50
Pseudo R^2	0.481	0.568	1.000	0.621	0.622	1.000	0.382	0.398	0.546	0.680	0.684	1.000
Panel B.2. Industry, size, and stock volatility-matched												
	Panel B.2.1. Up to 3 matches						**Panel B.2.2. Up to 5 matches**					
	Acquirors			**Targets**			**Acquirors**			**Targets**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	DealFirm			DealFirm			DealFirm			DealFirm		
EScore	0.046**	0.044***	18.620	3.420***	3.246**	1.895***	0.040**	0.039**	0.044**	0.049*	0.052***	0.229
	(0.020)	(0.015)	(0.000)	(0.001)	(1.625)	(0.436)	(0.017)	(0.016)	(0.021)	(0.028)	(0.014)	(0.181)
FirmSize	0.396	0.675	123.900	122.800	105.500	34.300	0.829	0.911	1.282*	0.635*	0.724	3.889
	(0.424)	(0.577)	(0.000)	(0.000)	(0.000)	(25.690)	(0.511)	(0.641)	(0.727)	(0.353)	(0.496)	(3.215)
Leverage	4.615	6.817	-1,003.000	-947.200	-594.000	-263.700***	0.987	0.718	-0.594	-8.916***	-14.090**	-12.260
	(7.249)	(8.278)	(0.000)	(0.000)	(0.000)	(20.310)	(1.992)	(1.726)	(1.646)	(3.351)	(5.618)	(10.880)
StockVol		4.747	2,554.000		-293.800	-476.000		2.136	1.240		11.890	26.670
		(3.445)	(0.000)		(0.000)	(0.000)		(2.972)	(2.617)		(7.344)	(24.340)
QuickRatio			-897.800			93.960***			-1.298			7.041
			(0.000)			(15.880)			(0.902)			(5.468)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	36	36	34	36	35	32	54	52	50	54	53	50
Pseudo R^2	0.481	0.535	1.000	1.000	1.000	1.000	0.384	0.392	0.452	0.535	0.646	0.710

7.2.2. Deal Value

Looking at the relationship between targets' pre-merger E scores and deals' value (in parallel to hypothesis 5), I am not able to prove the same results. As presented in Table 18, except when also controlling for the quick ratio, the coefficient of interest is positive and statistically significant, at least, at the 5% level, meaning that targets rated better in terms of their E scores (thus, presumably subject to lower carbon risk) pre-merger are more likely to participate in higher-value deals. Since this contradicts the main findings, I cannot reliably conclude on the influence of pre-merger carbon risk in deal values (considering deals in which targets come from all the three regions selected).

Table 18: Target CO_2 Emissions on Deal Value (Robustness Test 2)

This table reports the coefficient estimates from the OLS model in Equation (5), adapted for the second set of robustness tests. "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

OLS	(1)	(2)	(3)
		DealValue	
T_EScore	0.005**	0.007***	-0.043
	(0.002)	(0.001)	(0.000)
DealDuration	0.067	0.125***	0.959
	(0.044)	(0.035)	(0.000)
DiversifyingDeal	-0.079	-0.311**	-0.061
	(0.130)	(0.095)	(0.000)
FirmSize	0.019	0.318**	
	(0.140)	(0.103)	
Leverage	-0.657	-1.351***	
	(0.472)	(0.371)	
StockVol		-0.216	
		(0.151)	
QuickRatio			0.755
			(0.000)
Constant	1.71***	2.238***	-4.805
	(0.331)	(0.186)	(0.000)
Cluster	Deal	Deal	Deal
Observations	9	8	5
R^2	0.638	0.969	1.000
Adj R^2	0.035	0.782	.

7.2.3. Long-term Sustainability Performance Post-Merger

Finally, when assessing the relationship between acquirors' carbon risk pre-merger and the combined firm's long-term environmental performance (in parallel to hypothesis 9), I find that the results prove robust and become even more relevant, showing statistical significance at the 1% level in all estimation windows. That allows me to conclude that acquirors' post-merger improvement in their ESG scores given their pre-merger carbon risk (as seen in Table 13), is due to the improvement in their E scores (note that, all else equal, these decrease remarkably). Note that regressing on E scores allows for a more precise and significant conclusion in comparison to the main findings (Table 13) since CO_2 emissions are particularly material to firms' environmental exposure.

Table 19: Acquiror CO_2 Emissions on ESG Score (Robustness Test 2)

This table reports the coefficient estimates from the ordered probit model in Equation (9), adapted for the second set of robustness tests. Panels A, B, and C present the results using estimation windows of two, four, and six years around the year of the deal's announcement, respectively. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Ordered Probit	**Panel A. Estimation window (-1,+1)**			**Panel B. Estimation window (-2,+2)**			**Panel C. Estimation window (-3,+3)**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		EScore			EScore			EScore	
Post x CO2_E	1.785**	1.706**	2.448***	2.296***	2.150***	2.120***	3.838***	3.840***	3.931***
	(0.905)	(0.850)	(0.917)	(0.418)	(0.477)	(0.532)	(0.508)	(0.523)	(0.715)
CO2_E	-2.301**	-2.000**	-2.201**	-3.733***	-3.447***	-3.426***	-4.163***	-4.137***	-4.073***
	(0.997)	(0.822)	(0.898)	(0.437)	(0.423)	(0.475)	(0.407)	(0.205)	(0.200)
Post	-21.570*	-20.630*	-31.440***	-28.880***	-27.090***	-26.670***	-48.690***	-48.720***	-50.170***
	(11.980)	(11.240)	(11.530)	(5.584)	(6.405)	(7.200)	(7.159)	(7.362)	(10.050)
FirmSize	2.708***	2.557***	2.211**	1.611***	1.418***	1.353***	0.0955	0.0824	-0.208
	(0.855)	(0.761)	(0.901)	(0.225)	(0.183)	(0.289)	(0.852)	(0.767)	(0.762)
Leverage	3.663**	2.611	-2.873	5.853***	5.095***	4.008	19.210***	19.220***	24.370***
	(1.568)	(1.742)	(3.301)	(1.411)	(1.808)	(4.546)	(4.240)	(4.084)	(8.777)
StockVol		-2.534	-5.945***		-3.245**	-3.477*		-0.232	-0.151
		(2.211)	(2.005)		(1.644)	(1.994)		(2.030)	(2.045)
QuickRatio			-2.012			-0.352			0.953
			(1.469)			(1.025)			(1.272)
Cluster	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal	Deal
Observations	18	18	15	20	20	20	21	21	21
Number of Companies	6	6	5	4	4	4	3	3	3
Pseudo R^2	0.441	0.457	0.436	0.336	0.369	0.37	0.339	0.339	0.347

8. Conclusion

The goal of this thesis is to examine the relationship between M&A activity and carbon emissions in light of the current growing relevance of carbon risk and the subsequent need to manage it. The study includes four main sets of analyses, addressing the impact of carbon emissions on (1) merger likelihood and (2) deal-specific characteristics, (3) investigating the short-term merger market response to carbon-risk-induced deals, and (4) assessing the post-merger long-term sustainability performance of firms engaged in carbon-risk-motivated deals. By doing so, this paper complements the scarce existing literature on the topic.

In total, six samples are constructed. The first sample contains 183 deals from 2006 to 2023, which fulfill all the requirements for the analyses, and the second carries 10. The last four are matched samples (two containing 40 deals and the other two 60). I use each sample to perform only determined analyses. Furthermore, I develop a regression model for each of the nine tested hypotheses, adopting the most suitable type of regression for each.

Respecting the first set of analyses, I find that acquirors reporting on carbon emissions pre-merger are more likely to buy out firms that do so too. Additionally, I show that firms subject to higher carbon risk are less likely to engage in deals, whether as the acquiring or the acquired counterpart. Moreover, the results suggest that acquirors subject to higher carbon risk pre-merger tend to acquire firms also subject to higher carbon risk pre-merger. Bearing this in mind, it is difficult to state whether carbon risk constitutes a driver of M&A activity, although it clearly impacts it.

Regarding the second set, I find that targets disclosing carbon emissions pre-merger participate in higher-value (especially those from the U.S. or Canada) and longer-duration (this only holds for targets from the U.S. or Canada) deals. Additionally, I prove that European targets subject to higher carbon risk pre-merger tend to also participate in higher-value and longer-duration deals, which is contrary to what happens with targets from the U.S. or Canada. All in all, I conclude that carbon risk impacts both the value and duration of deals, distinctly for different regions.

Concerning the third and fourth sets, I find that the higher the acquirors' CO_2 emissions pre-merger, the lower the CARs around mergers' announcements and that acquirors with high pre-merger carbon risk exposure tend to experience a higher increase in their ESG scores post-merger. Therefore, I reason that carbon risk affects both the short-term merger performance and the long-term post-merger sustainability performance of combined firms.

It is imperative to acknowledge that this thesis has limitations. The main drawback is the size of the samples analyzed, particularly that of the second sample. Had I had access to more complete databases on M&A and carbon emissions (the one variable shrinking samples the most), such as Refinitiv SDC Platinum M&A and Carbon Disclosure Project, respectively, I would have been able to regress the models on more data and potentially obtain more representative and meaningful results. Evidently, the same applies to the samples used in the robustness tests. Consequently, the results obtained may be biased, lack sufficient evidence, and, thus, may or may not hold should I be able to extend the datasets used. Hence, I recommend replicating this study using other databases, preferably in three- or four-years' time, where there will certainly be more data available on CO_2 emissions. Another limitation arises from the possibility of the CO_2 emissions reported by companies not resulting from the same estimation model and, thus, not being of the same order of magnitude. It is, then, worth conducting further research on this topic only using firms adopting

the same carbon accounting model. A third limitation is based on my assumption that the combined firm corresponds to each deal's acquiror because there is the possibility that the acquiror is the one being merged into the target or that the deal gives rise to a new identity. Moreover, observe that there might be unobservable factors influencing merger likelihood, deal-specific characteristics, and merger performance that are not captured in the models. Therefore, the results should be interpreted with caution, and additional analyses may be necessary to confirm the findings. Another limitation builds on the level of pre-merger carbon risk necessarily not translating into mergers being carbon-risk-induced or not. Furthermore, due to the lack of data, I could not test the last hypothesis using an estimation window of (-5,+5) to consider the target's full integration, following Bai *et al.* (2020). Still, in shortening the estimation windows, I am fortuitously preventing the risk of studying cofounding events.

Lastly, for future research, I recommend using emissions intensity instead of the amount of CO_2 emissions, as per Altunbaş, *et al.* (2023), or, for some analyses, the relative difference between acquirors and targets' CO_2 emissions. In addition, it would be interesting to study post-merger analyst coverage (indicating the post-merger variation of carbon risk), following Bai *et al.* (2020), which I was unable to do due to data unavailability.

Appendices

Appendix 1: Variables Definition

Variables	Description	Calculation	Source	Reference
Dependent Variables				
CAR	Acquiror's cumulative abnormal return over a given estimation period	Detailed in Section 4.2.	Datastream; Kenneth R. French Data Library	Bai *et al.* (2020)
$DealDuration$ *(is also a control variable)*	Duration of the deal in days	Natural logarithm of the number of calendar days between the deal's announcement and effective dates	Deal Screener (Eikon)	Dai *et al.* (2017)
$DealFirm$	Indicator if the firm is engaged in a *real* deal	Dummy variable equal to 1 if the firm (acquiror or target) takes part in a *real* deal, and 0 otherwise	Deal Screener (Eikon)	
$DealValue$ *(is also a control variable)*	Value of the deal	Natural logarithm of the value of the deal, extracted in US $ millions	Deal Screener (Eikon)	Bai *et al.* (2020)
ESG	Acquiror's Eikon ESG score	Extracted directly from the database	Datastream	
$TCO2\_D$ *(is also an independent variable)*	Indicator if the target reports its CO_2 and CO_2 equivalents emissions	Dummy variable equal to 1 if the target's total (direct and indirect) CO_2 and CO_2 equivalents emissions are available, and 0 otherwise	Datastream	
$TCO2\_E$ *(is also an independent variable)*	Target's CO_2 and CO_2 equivalents emissions	Natural logarithm of the target's amount of total (direct and indirect) CO_2 and CO_2 equivalents emissions in tons	Datastream	
Independent Variables				
$ACO2\_D$	Indicator if the acquiror reports its CO_2 and CO_2 equivalents emissions	Dummy variable equal to 1 if the acquiror's total (direct and indirect) CO_2 and CO_2 equivalents emissions are available, and 0 otherwise	Datastream	
$ACO2\_E$	Acquiror's CO_2 and CO_2 equivalents emissions	Natural logarithm of the acquiror's amount of total (direct and indirect) CO_2 and CO_2 equivalents emissions in tons	Datastream	
$CO2\_D$	Indicator if the firm reports its CO_2 and CO_2 equivalents emissions	Dummy variable equal to 1 if the firm's total (direct and indirect) CO_2 and CO_2 equivalents emissions are available, and 0 otherwise	Datastream	
$CO2\_E$	Firm's CO_2 and CO_2 equivalents emissions	Natural logarithm of the firm's amount of total (direct and indirect) CO_2 and CO_2 equivalents emissions in tons	Datastream	Bose *et al.* (2021)
$Post$	Indicator for the post-merger period	Dummy variable equal to 1 if fiscal year is equal or greater than the year in which the deal was announced, and 0 otherwise		
$Post \times CO2\_E$	Interaction term between Post and CO2_E	Multiplication of $Post$ by $CO2\_E$		
Deal Control Variables				
$DiversifyingDeal$	Indicator if the deal is an industry-diversifying merger	Dummy variable equal to 1 if the merging firms' industries are different (based on the FF10 classification), and 0 otherwise	Deal Screener (Eikon); Kenneth R. French Data Library	Bai *et al.* (2020)
Firm Control Variables				
$FirmSize$	Size of the firm	Natural logarithm of the firm's total assets, extracted in US $ millions	Compustat	Bai *et al.* (2020)
$Leverage$	Firm's financial leverage ratio	Sum between the firm's total long-term debt and its debt in current liabilities (both in US $ millions), divided by the firm's total assets (in US $ millions)	Compustat	Bai *et al.* (2020)
$QuickRatio$	Firm's quick ratio	Difference between the firm's current assets and its inventory (both in US $ millions), divided by the firm's current liabilities (in US $ millions)	Compustat	Bai *et al.* (2020)
$StockVol$	Firm's stock volatility	Annualized (assuming 252 trading days) standard deviation of the residuals of the Fama and French (1993) three-factors model for developed markets, computed using a 1-month estimation window; the firm's returns inputted in the model were its logarithmic daily returns, calculated using the firm's price index	Datastream; Kenneth R. French Data Library	Ang *et al.* (2006)

Appendix 2: FF10 Industry Classification Description

Each category's respective SIC codes are available for consultation in the source mentioned below.

Category	Description	
1	Consumer Nondurables	(Food, Tobacco, Textiles, Apparel, Leather, and Toys)
2	Consumer Durables	(Cars, Televisions, Furniture, and Household Appliances)
3	Manufacturing	(Machinery, Trucks, Planes, Chemicals, Office Furniture, Paper, and Commercial Printing)
4	Energy	(Oil, Gas, and Coal Extraction and Products)
5	High Technology	(Business Equipment – Computers, Software, and Electronic Equipment)
6	Telecommunications	(Telephone and Television Transmission)
7	Shops	(Wholesale, Retail, and Some Services – Laundries, Repair Shops)
8	Health	(Healthcare, Medical Equipment, and Drugs)
9	Utilities	(Utilities)
10	Other	(Mines, Construction, Building Materials, Transports, Hotels, Business Services, Entertainment, and Finance)

Source: Kenneth R. French (2024)

Appendix 3: Target CO_2 Dummy on Deal Value (by region)

This table reports the coefficient estimates from the adaptations done to the OLS model in Equation (4) to attempt to test the respective hypothesis by region. Panels A, B, and C present the results of the following adapted regression specifications (in respective order): $DealValue_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 E\_D_i + \beta_3 TCO2\_D_{im,t-1} \times E\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; $DealValue_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 US\_D_i + \beta_3 TCO2\_D_{im,t-1} \times US\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; and $DealValue_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 CA\_D_i + \beta_3 TCO2\_D_{im,t-1} \times CA\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$ (where E_D_i, US_D_i, and CA_D_i are dummies equal to one if firm i is from Europe, the U.S., and Canada, respectively, and zero otherwise; the parameters of interest are β_3, which respect to the interaction terms). Each regression is run over the entire first sample. "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A. Europe			
OLS	(1)	(2)	(3)
		DealValue	
TCO2_D	0.747**	0.820	0.451
	(0.317)	(0.514)	(1.038)
E_D	-0.446	-0.826	-2.712
	(0.276)	(1.656)	(2.115)
TCO2_D x E_D	0.190		
	(0.702)		
DealDuration	-0.377*	-0.926	0.671
	(0.197)	(0.906)	(1.131)
DiversifyingDeal	-0.180	0.765	0.291
	(0.194)	(0.762)	(1.595)
FirmSize	0.674***	0.661**	1.474***
	(0.084)	(0.249)	(0.460)
Leverage	-0.033	-0.466	-3.438
	(0.662)	(1.926)	(3.850)
StockVol		-1.500	-3.786
		(1.700)	(2.728)
QuickRatio			1.104
			(0.755)
Constant	3.462***	6.900	-6.894
	(0.850)	(5.137)	(7.507)
Cluster	Deal	Deal	Deal
Observations	169	14	11
R^2	0.592	0.697	0.890
Adj R^2	0.574	0.343	0.452

Panel B. United States			
OLS	(1)	(2)	(3)
		DealValue	
TCO2_D	1.151***	0.496	-3.422**
	(0.429)	(0.921)	(1.317)
US_D	0.471*	-0.116	0.902
	(0.276)	(1.701)	(1.216)
TCO2_D x US_D	-0.838	0.364	5.584***
	(0.558)	(1.279)	(0.985)
DealDuration	0.657***	0.609**	1.964***
	(0.087)	(0.267)	(0.184)
DiversifyingDeal	-0.457**	-1.221	1.346**
	(0.194)	(0.941)	(0.539)
FirmSize	-0.242	0.918	0.490
	(0.192)	(1.570)	(1.337)
Leverage	-0.153	-0.371	-9.947***
	(0.666)	(3.050)	(1.778)
StockVol		-1.263	-6.286***
		(1.914)	(1.943)
QuickRatio			2.840***
			(0.298)
Constant	3.778***	8.675*	-13.957***
	(0.844)	(4.683)	(1.385)
Cluster	Deal	Deal	Deal
Observations	169	14	11
R^2	0.595	0.673	0.997
Adj R^2	0.577	0.151	0.972

Panel C. Canada			
OLS	(1)	(2)	(3)
		DealValue	
TCO2_D	0.601*	-0.491	-0.305
	(0.353)	(1.802)	(0.431)
CA_D	0.142	-0.810	-11.233***
	(0.318)	(1.692)	(0.758)
TCO2_D x CA_D	0.637	2.648	16.972***
	(0.475)	(3.006)	(0.857)
DealDuration	0.679***	0.734**	0.612***
	(0.086)	(0.312)	(0.150)
DiversifyingDeal	-0.362*	-0.615	2.496***
	(0.204)	(0.971)	(0.292)
FirmSize	-0.198	0.678	-12.336***
	(0.205)	(1.097)	(1.006)
Leverage	-0.063	1.191	-1.286**
	(0.653)	(2.568)	(0.548)
StockVol		-0.398	-6.997***
		(2.100)	(1.566)
QuickRatio			-3.042***
			(0.321)
Constant	3.243***	4.118	7.424***
	(0.989)	(6.811)	(1.410)
Cluster	Deal	Deal	Deal
Observations	169	14	11
R^2	0.589	0.721	0.995
Adj R^2	0.571	0.275	0.950

Appendix 4: Target CO_2 Emissions on Deal Value (by region)

This table reports the coefficient estimates from the adaptations done to the OLS model in Equation (5) to attempt to test the respective hypothesis by region. Panels A, B, and C present the results of the following adapted regression specifications (in respective order): $DealValue_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 E\_D_i + \beta_3 TCO2\_E_{im,t-1} \times E\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; $DealValue_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 US\_D_i + \beta_3 TCO2\_E_{im,t-1} \times US\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; and $DealValue_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 CA\_D_i + \beta_3 TCO2\_E_{im,t-1} \times CA\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$ (where E_D_i, US_D_i, and CA_D_i are dummies equal to one if firm i is from Europe, the U.S., and Canada, respectively, and zero otherwise; the parameters of interest are β_3, which respect to the interaction terms). Each regression is run over the entire second sample. "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A. Europe				**Panel B. United States**				**Panel C. Canada**			
OLS	(1)	(2)	(3)	OLS	(1)	(2)	(3)	OLS	(1)	(2)	(3)
		DealValue				DealValue				DealValue	
TCO2_E	-0.008	0.044	0.062	TCO2_E	0.075***	0.060	0.076	TCO2_E	0.036***	0.024	0.165
	(0.020)	(0.000)	(0.000)		(0.018)	(0.000)	(0.000)		(0.005)	(0.000)	(0.000)
E_D	-1.021**	-0.39		US_D	1.262**	-0.126		CA_D	6.766***	10.116	
	(0.319)	(0.000)			(0.503)	(0.000)			(0.769)	(0.000)	
TCO2_E x E_D	0.076**	0.020	-0.019	TCO2_E x US_D	-0.097*	0.033	0.014	TCO2_E x CA_D	-0.530***	-0.805	-0.050
	(0.027)	(0.000)	(0.000)		(0.043)	(0.000)	(0.000)		(0.065)	(0.000)	(0.000)
DealDuration	0.058***	0.042	0.144	DealDuration	0.035	-0.005	0.051	DealDuration	0.151***	0.189	-0.195
	(0.015)	(0.000)	(0.000)		(0.026)	(0.000)	(0.000)		(0.013)	(0.000)	(0.000)
DiversifyingDeal	-0.148**	-0.009	0.028	DiversifyingDeal	-0.198*	0.136	0.024	DiversifyingDeal	0.007	0.009	0.014
	(0.048)	(0.000)	(0.000)		(0.093)	(0.000)	(0.000)		(0.025)	(0.000)	(0.000)
FirmSize	-0.010	-0.170		FirmSize	-0.023	-0.356		FirmSize	0.127***	0.268	
	(0.060)	(0.000)			(0.102)	(0.000)			(0.036)	(0.000)	
Leverage	0.233*	0.063		Leverage	0.209	-0.395		Leverage	0.440***	0.486	
	(0.126)	(0.000)			(0.303)	(0.000)			(0.053)	(0.000)	
StockVol		0.242		StockVol		0.359		StockVol		-0.211	
		(0.000)				(0.000)				(0.000)	
QuickRatio			0.160	QuickRatio			0.158	QuickRatio			0.155
			(0.000)				(0.000)				(0.000)
Constant	2.431***	1.262	-0.273	Constant	1.859***	0.772	0.224	Constant	-0.168	-0.454	1.548
	(0.372)	(0.000)	(0.000)		(0.275)	(0.000)	(0.000)		(0.146)	(0.000)	(0.000)
Cluster	Deal	Deal	Deal	Cluster	Deal	Deal	Deal	Cluster	Deal	Deal	Deal
Observations	10	9	6	Observations	10	9	6	Observations	10	9	6
R^2	0.971	1.000	1.000	R^2	0.944	1.000	1.000	R^2	0.991	1.000	1.000
Adj R^2	0.872	.	.	Adj R^2	0.750	.	.	Adj R^2	0.960	.	.

Appendix 5: Target CO_2 Dummy on Deal Duration (by region)

This table reports the coefficient estimates from the adaptations done to the OLS model in Equation (6) to attempt to test the respective hypothesis by region. Panels A, B, and C present the results of the following adapted regression specifications (in respective order): $DealDuration_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 E\_D_i + \beta_3 TCO2\_D_{im,t-1} \times E\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; $DealDuration_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 US\_D_i + \beta_3 TCO2\_D_{im,t-1} \times US\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; and $DealDuration_{m,t} = \alpha + \beta_1 TCO2\_D_{im,t-1} + \beta_2 CA\_D_i + \beta_3 TCO2\_D_{im,t-1} \times CA\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$ (where E_D_i, US_D_i, and CA_D_i are dummies equal to one if firm i is from Europe, the U.S., and Canada, respectively, and zero otherwise; the parameters of interest are β_3, which respect to the interaction terms). Each regression is run over the entire first sample. "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A. Europe				**Panel B. United States**				**Panel C. Canada**			
OLS	(1)	(2)	(3)	OLS	(1)	(2)	(3)	OLS	(1)	(2)	(3)
	DealDuration				DealDuration				DealDuration		
TCO2_D	0.325**	0.083	-0.015	TCO2_D	0.502***	-0.361	2.007**	TCO2_D	0.410***	0.687	0.124
	(0.152)	(0.397)	(1.063)		(0.177)	(0.460)	(0.728)		(0.140)	(0.625)	(0.173)
E_D	0.205	0.385	0.977	US_D	0.215*	-1.102	-0.812**	CA_D	-0.426***	0.421	4.394***
	(0.138)	(0.579)	(1.201)		(0.128)	(0.685)	(0.323)		(0.106)	(0.670)	(0.280)
TCO2_D x E_D	0.191			TCO2_D x US_D	-0.267	0.661	-3.441***	TCO2_D x CA_D	-0.139	-1.341	-6.642***
	(0.270)				(0.268)	(0.721)	(0.878)		(0.291)	(1.190)	(0.462)
DealValue	-0.075	-0.186	0.162	DealValue	-0.093**	-0.162	0.636***	DealValue	-0.068	-0.117	0.382***
	(0.046)	(0.217)	(0.303)		(0.047)	(0.179)	(0.153)		(0.042)	(0.220)	(0.053)
DiversifyingDeal	-0.018	0.622*	0.444	DiversifyingDeal	-0.005	0.891**	-0.041	DiversifyingDeal	-0.101	0.566	4.844***
	(0.103)	(0.347)	(1.024)		(0.101)	(0.399)	(0.510)		(0.099)	(0.437)	(0.275)
FirmSize	0.111***	0.103	-0.430	FirmSize	0.114***	0.188	-1.240***	FirmSize	0.096***	0.020	-0.233***
	(0.042)	(0.167)	(0.396)		(0.042)	(0.115)	(0.288)		(0.036)	(0.177)	(0.068)
Leverage	0.342	0.545	1.307	Leverage	0.363	0.996	6.691***	Leverage	0.220	-0.323	0.502**
	(0.247)	(1.078)	(2.327)		(0.246)	(1.111)	(1.011)		(0.247)	(1.384)	(0.172)
StockVol		0.573	2.508	StockVol		0.509	4.430***	StockVol		0.030	2.763***
		(0.952)	(1.784)			(1.000)	(0.524)			(0.962)	(0.506)
QuickRatio			-0.625	QuickRatio			-1.805***	QuickRatio			1.187***
			(0.565)				(0.414)				(0.128)
Constant	4.487***	4.863***	6.473**	Constant	4.526***	4.338***	9.226***	Constant	4.789***	5.393***	-2.786***
	(0.162)	(0.987)	(2.297)		(0.160)	(1.124)	(1.590)		(0.181)	(0.939)	(0.768)
Cluster	Deal	Deal	Deal	Cluster	Deal	Deal	Deal	Cluster	Deal	Deal	Deal
Observations	169	14	11	Observations	169	14	11	Observations	169	14	11
R^2	0.183	0.602	0.812	R^2	0.181	0.717	0.991	R^2	0.238	0.654	0.995
Adj R^2	0.148	0.138	0.061	Adj R^2	0.145	0.263	0.907	Adj R^2	0.205	0.100	0.946

Appendix 6: Target CO_2 Emissions on Deal Duration (by region)

This table reports the coefficient estimates from the adaptations done to the OLS model in Equation (7) to attempt to test the respective hypothesis by region. Panels A, B, and C present the results of the following adapted regression specifications (in respective order): $DealDuration_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 E\_D_i + \beta_3 TCO2\_E_{im,t-1} \times E\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; $DealDuration_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 US\_D_i + \beta_3 TCO2\_E_{im,t-1} \times US\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$; and $DealDuration_{m,t} = \alpha + \beta_1 TCO2\_E_{im,t-1} + \beta_2 CA\_D_i + \beta_3 TCO2\_E_{im,t-1} \times CA\_D_i + \beta_4 X_{im,t-1} + \beta_5 Y_{m,t} + \varepsilon_{im,t}$ (where E_D_i, US_D_i, and CA_D_i are dummies equal to one if firm i is from Europe, the U.S., and Canada, respectively, and zero otherwise; the parameters of interest are β_3, which respect to the interaction terms). Each regression is run over the entire second sample. "Adj" stands for adjusted. Robust standard errors (clustered at the deal level) are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A. Europe				**Panel B. United States**				**Panel C. Canada**			
OLS	(1)	(2)	(3)	OLS	(1)	(2)	(3)	OLS	(1)	(2)	(3)
		DealDuration				DealDuration				DealDuration	
TCO2_E	-0.110	0.325	-1.138	TCO2_E	0.267**	-7.121	0.381	TCO2_E	-0.174	-1.022	-1.771
	(0.101)	(0.000)	(0.000)		(0.087)	(0.000)	(0.000)		(0.407)	(0.000)	(0.000)
E_D	-5.805***	-10.075		US_D	5.341***	-42.485		CA_D	-58.960	-416.888	
	(1.648)	(0.000)			(1.039)	(0.000)			(67.847)	(0.000)	
TCO2_E x E_D	0.467***	0.722	0.060	TCO2_E x US_D	-0.455***	2.120	-0.257	TCO2_E x CA_D	4.743	33.638	0.236
	(0.128)	(0.000)	(0.000)		(0.072)	(0.000)	(0.000)		(5.418)	(0.000)	(0.000)
DealValue	0.273**	0.671		DealValue	0.153*	-1.290	-0.721	DealValue	-0.781	-6.807	1.362
	(0.092)	(0.000)			(0.069)	(0.000)	(0.000)		(1.335)	(0.000)	(0.000)
DiversifyingDeal	-0.600**	-1.918	1.870	DiversifyingDeal	-0.373*	13.093		DiversifyingDeal	0.724	4.976	2.159
	(0.201)	(0.000)	(0.000)		(0.182)	(0.000)			(1.265)	(0.000)	(0.000)
FirmSize	0.229	-1.449	5.653	FirmSize	0.296	22.185		FirmSize	-0.709	-10.512	5.861
	(0.197)	(0.000)	(0.000)		(0.185)	(0.000)			(1.581)	(0.000)	(0.000)
Leverage	1.591**	2.142		Leverage	1.733**	12.489	6.033	Leverage	-1.863	-13.843	
	(0.497)	(0.000)			(0.550)	(0.000)	(0.000)		(3.552)	(0.000)	
StockVol		2.366		StockVol		-24.748		StockVol		10.135	
		(0.000)				(0.000)				(0.000)	
QuickRatio			0.233	QuickRatio			-0.649	QuickRatio			
			(0.000)				(0.000)				
Constant	8.582***	10.847	-1.043	Constant	3.251***	-6.206	7.307	Constant	11.006	54.334	-7.641
	(1.607)	(0.000)	(0.000)		(0.596)	(0.000)	(0.000)		(10.391)	(0.000)	(0.000)
Cluster	Deal	Deal	Deal	Cluster	Deal	Deal	Deal	Cluster	Deal	Deal	Deal
Observations	10	9	6	Observations	10	9	6	Observations	10	9	6
R^2	0.971	1.000	1.000	R^2	0.979	1.000	1.000	R^2	0.774	1.000	1.000
Adj R^2	0.872	.	.	Adj R^2	0.903	.	.	Adj R^2	-0.015	.	.

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