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Carbon Neutrality Commitment Announcements and Subsequent Stock Returns

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Carbon Neutrality Commitment Announcements and Subsequent Stock Returns

Michal Vyletelka¹

Abstract

This paper investigates the reaction of the stock market to corporate carbon neutrality (CN) announcements using a global dataset of 887 earnings call disclosures between 2019 and 2024. Employing event-study style comparisons, industry-adjusted returns and Fama–French factor models, the analysis reveals that CN commitments have limited short-term effects, but are associated with statistically significant negative abnormal returns over a 12-month horizon. The results suggest that investors perceive carbon neutrality pledges as credible signals of future cost burdens rather than value-enhancing strategies. The findings also highlight sectoral and temporal heterogeneity: technology, energy and materials firms exhibit positive return premia, while utilities and real estate underperform; longer-dated CN commitments (post-2040) are priced more favorably than near-term commitments. Regional effects largely disappear once the sector composition is controlled, underscoring the primary role of industry specifics in market responses.

Keywords: Carbon neutrality; ESG disclosure; stock returns; event study

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Introduction

Financial markets react not only to currently available material information but also to expectations formed around corporate claims and announcements. According to signaling theory, financially material ESG disclosures affect perceptions of future cash flows and risk, which consequently affect market reaction. This also holds true in the area of ESG finance. According to the literature, reactions to ESG-related claims are asymmetric: negative ESG events tend to decrease prices, whereas positive news typically bring only limited price gains (Capelle-Blancard and Petit, 2017). These effects tend to however be short-lived (Vu et al., 2023), lasting in most cases no more than 12 months. This asymmetry aligns with behavioural finance theories and suggests that investors react more strongly to signals of downside risk. A meta-analysis by Dorfleitner and Zhang (2024) reports average daily short-term stock price declines of approximately 0.1%–1% following negative ESG events, while positive announcements generate no statistically significant effects. Vu et al. (2023) find that abnormal returns related to ESG generally reverse within one month, consistent with models of market efficiency and information decay in high-speed markets.

Moreover, there is an evidence for a heterogeneity of the market reaction in terms of the ESG-alignment of the news-related company. Serafeim and Yoon (2021) demonstrate that markets primarily react to unexpected ESG news or news with high media visibility, which signals greater relevance for firm value. They find that positive ESG news leads to 75 basis points higher returns than negative news for firms with low ESG ratings, while the spread narrows to 34 basis points for firms with high ESG ratings, suggesting that expectations play a moderating role. For financially material ESG issues, the spread is 2.81% for low-rated firms and 79 basis points for high-rated ones, which supports the hypothesis that investors selectively react to news with implications for firm value.

Firm characteristics and regional context tend to moderate these effects. Evidence from the Chinese stock market also indicates that ESG-related news affects stock prices and that the magnitude of the reaction varies across regions and types of ESG information (Xu et al., 2022). Strategic disclosure behaviour may further influence observed market reactions, as firms may be less likely to disclose negative ESG news during periods of elevated market volatility and may amplify positive information under certain conditions (de Vincentiis, 2023).

Institutional ESG actions can amplify market impacts. Large-scale divestment announcements by influential investors (e.g. Norway's sovereign wealth fund) trigger significant negative abnormal returns, reaching up to -0.52% for targeted firms (Lindset & Nguyen, 2020). These findings reflect institutional investors' capacity to shape market perceptions and signal broader reputational risk.

Xie et al. (2023) extend this literature by examining market reactions to carbon neutrality commitments. The study analyses 166 firms from major indices (S&P 500, Russell 2000, FTSE 100), which announced carbon neutrality pledges between 2017 and 2021. Firms experience losses in market value from committing to being carbon neutral and the decline in cumulative abnormal returns ranges from -2.09% to -1.21% across different event windows. Furthermore they find, that better previous ESG performance, i.e. higher ESG scores and a higher level of disclosure of environmental metrics could mitigate adverse market reactions.

This adverse reaction is consistent with trade-off theory (Friedman, 1970), according to which markets may penalise costly commitments that introduce uncertainty about future profitability. Investors appear concerned about the expected costs of achieving carbon neutrality, such as technological investments, compliance costs and operational changes.

To further develop the study by Xie et al. (2023), this article will extend the scope of the analysis to a global stock universe and examines industry-specific differences in market reactions to carbon neutrality commitments of publicly listed companies. The analysis considers post-announcement returns over 1-, 3- and 12-month horizons, with particular attention to the 12-month window. In addition, it examines whether the observed market response varies according to firms' ESG performance, the timing of their carbon-neutrality targets, industry affiliation and geographical region.

The body of the article is organised as follows. The next section describes the dataset, sample construction and variables used in the analysis. The subsequent section comprises of performed t-tests, moderation analysis and linear regression tests complemented with further robustness checks, where industry and regional variables are employed. The final section interprets achieved results and concludes.

Data

For the purpose of the analysis, the company announcements committing to achieve carbon neutrality in their business operations during their earnings call have been selected. For this, I extracted global companies' earnings calls from the Bloomberg database for the period 2019–2024 that contained the keywords “*net zero*”, “*carbon neutrality*”, “*zero emissions*” or “*zero carbon footprint*”, along with their possible variations. Then, I have manually filtered claims with a clearly stated year of reaching their carbon-neutral business operation. After the extraction, 801 companies have been identified for the sample. In cases where the company announced carbon neutrality multiple times during the tracking period, only the oldest announcement was kept in the sample to avoid duplicates. Conversely, when a company readjusted its target to an earlier year, both records were entered into the testing dataset. Following these procedures, a total of 887 observations have been stored.

For each company, additional characteristics, besides the price on a given date, were extracted, notably, market capitalisation converted to EUR, the P/B ratio, 1Y net operating margin, the previous year's asset growth, the ROBECOSAM ESG score, operating industry and continent. After extracting data for the preceding and subsequent 12 months, momentum and future returns were calculated. The same characteristics were collected for each month in which a company in the sample held an earnings call, for use as a control group. The counts of CN commitments made by companies during earnings calls in each year and by industry and continent, respectively, is displayed in Tables 1 and 2.

Table 1: Frequency distribution of Net Zero Carbon commitments by year and Industry

Industry	2019	2020	2021	2022	2023	2024	All
Communications	0	1	8	5	5	0	19
Consumer Discretionary	0	8	23	19	27	1	78
Consumer Staples	0	3	18	13	9	0	43
Energy	2	12	35	20	10	0	79
Financials	2	4	19	13	6	1	45
Health Care	0	3	13	10	4	2	32
Industrials	2	11	58	40	35	6	152

Industry	2019	2020	2021	2022	2023	2024	All
Materials	3	14	48	44	25	13	147
Real Estate	2	15	31	30	12	5	95
Technology	0	0	13	20	12	1	46
Utilities	13	33	49	31	22	3	151
All	24	104	315	245	167	32	887

Note: Missing values for the field “Industry” were omitted from the analysis and were treated as NAs.

From both tables, it can be seen that the total number of carbon neutrality pledges peaked in 2021, possibly related to the introduction of the Glasgow Climate Pact at COP26, which called for countries and companies to strengthen their environmental targets and to bind to the net-zero commitments. Another possible factor was the release of the IPCC’s Sixth Assessment Report in August 2021, which provided warnings about the urgency of limiting global warming to 1.5°C, which increased the importance of earlier net-zero commitments.

Table 2: Frequency distribution of Net Zero Carbon commitments by year and continent

Continent	2019	2020	2021	2022	2023	2024	All
Africa	0	1	2	7	4	4	18
Americas	9	38	130	92	56	4	329
Asia-Pacific	1	14	54	53	41	7	170
Europe	14	52	129	93	66	17	371
All	24	104	315	245	167	32	887

Note: Missing values for the field „Continent” were omitted from the analysis and were treated as NAs..

Table 1 also reveals that industries with the highest CN activity include *Industrials*, *Materials*, *Utilities* and *Energy*, i.e., sectors traditionally associated with higher carbon footprints. Notably, *Industrials* and *Materials* show a clear rising trend in announcements through 2022. This may indicate, that industry-level shifts are likely driven by ESG investors pressure, or forthcoming regulatory activities, such as EU Taxonomy Regulation, which provided legislative background for business operations on the trajectory to the carbon neutrality to be considered as *green*. Conversely, sectors such as *Healthcare* and *Communications* account for fewer CN commitments, potentially due to their lower direct emissions profiles or less ESG scrutiny. Technology, often viewed as a highly innovative sector, shows surprisingly moderate levels of CN activity.

Table 2 shows that companies from North America consistently lead in the number of CN announcements, peaking in 2021–2022 and declining afterward. This could, however, be attributed not only to the ESG narrative in the region but also to the size of the region’s equity market universe. Europe follows a similar trajectory, though with slightly lower absolute counts. The number of Asia-Pacific’s CN announcements remain stable and significant, reflecting increasing ESG awareness in emerging markets. Africa, though starting from a lower base, shows a notable increase between 2019 and 2022, with a small drop in 2024, which could, however, also be attributed to the limited time period observed for 2024.

Table 3 presents descriptive statistics of the sample. The average market capitalisation is EUR 14.5 bn, indicating a predominance of large-cap firms in the sample. Furthermore, given the provided data, the dataset is skewed towards highly valued growth stocks (mean P/B ratio of 11.9) with negative operating margins (-6%) and moderate ESG scores (4th decile). Interestingly, a preliminary examination of the dataset indicates that, for observations with a CN announcement during the earnings call (CN = 1), the subsequent price change over the following months is, to some extent, lower compared to the price change following an earnings call without any CN announcement (CN = 0). This pattern provides preliminary evidence of a potentially negative market response to CN announcements, which will be in the next section statistically tested for significance.

Table 3: Descriptive statistics of the sample

							Percentiles	
	CN	N	Mean	SD	Minimum	Maximum	25 th	75 th
Market Cap (mil. EUR)	1	887	14524.99	39688.731	0.000	719,205	1952.40	43796.065
P/B Ratio	1	862	11.879	213.1	0.109	6,174.578	1.060	15.001
ESG Score	1	554	4.411	1.366	0.670	8.510	3.485	5.460
Asset Growth	1	805	11.960	38.691	-80.65	513.9	-0.919	12.880
Operating margin	1	807	-6.460	24.545	-49.98	275.2	-30.872	23.343
1M	0	8747	0.140	3.511	-11.906	146.508	-0.777	0.719
	1	887	0.107	1.610	-5.382	13.688	-0.676	0.783
3M	0	8358	0.106	1.057	-3.912	21.012	-0.375	0.456
	1	859	0.077	1.153	-3.619	15.605	-0.347	0.382
12M	0	7169	0.126	0.683	-1.000	22.863	-0.187	0.276

							Percentiles	
	CN	N	Mean	SD	Minimum	Maximum	25 th	75 th
	1	751	0.0379	0.421	-0.983	3.613	-0.207	0.209

Note: This table presents descriptive statistics and selected percentiles for key firm-level variables, comparing companies in time of the earnings call on which carbon neutrality was announced (CN = 1) with times of usual earnings calls.

Results

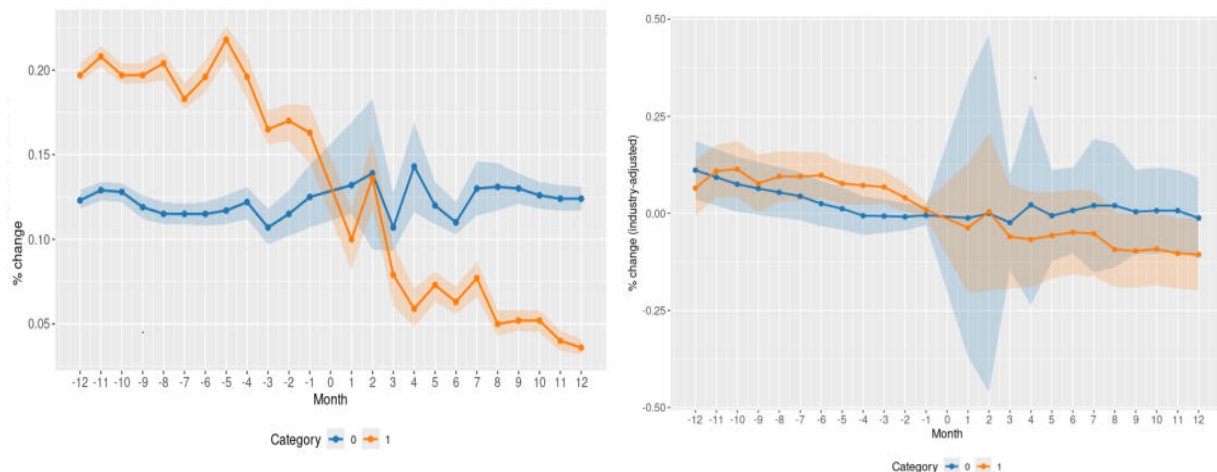
As part of the exploratory analysis, annualized returns over 1-12 months have been analysed. For the purposes of this and subsequent analyses, industry-adjusted returns were constructed to control for industry-specific effects, in line with Serafeim and Yoon (2021). Group 1 represents companies that announced a future commitment to achieving carbon neutrality during their earnings calls. In contrast, Group 0 serves as a control group consisting of standard earnings calls with no such sustainability announcement.

In terms of gross performance, both groups exhibit similar return profiles in the early months. In month 1, firms with standard earnings disclosures (Group 0) slightly outperform CN-announcing firms (Group 1) at 14% versus 11%, albeit with much higher return volatility. From month 2 to month 6, mean returns remain relatively close across groups, but from month 8 onward, Group 1 exhibits a consistent decline in gross returns. For example, by month 12, the average return of CN announcers is only 4%, compared to a 13% price increase following standard earnings call. This suggests that the initial market response to carbon neutrality announcements is neutral to mildly positive. However, relative to standard earnings calls, the performance of announcing firms gradually weakens over time. This may be a sign of investor uncertainty about the materiality and long-term implications of the ESG commitments tied to the carbon neutrality pledges.

An important difference between the two groups can already be observed before the earnings calls. In terms of gross returns, Group 1 consistently outperforms Group 0 during the pre-announcement period. Twelve months before the earnings call, the average annualized return is approximately 19.5% for Group 1, compared with approximately 12.5% for Group 0, representing a difference of around 7 percentage points. One month before the earnings call, the difference is smaller but still present, with returns of approximately 16% for Group 1 and 13% for Group 0.

The industry-adjusted performance provides further insight. Firms announcing CN commitments underperform their sector peers across nearly the entire post-announcement window. While Group 0 maintains returns close to industry averages (hovering near 0%), Group 1 shows persistent negative abnormal returns, reaching -11% by month 12. This pattern suggests that, although the gross market does not harshly penalize CN announcements, investors recalibrate expectations downward when adjusting for sector benchmarks. Moreover, Group 1's lower volatility in adjusted returns indicates more consistent sentiment, which may be interpreted as either skepticism or more conservative impacts of ESG pledges that lack immediate financial materiality.

Figure 1: Market reaction after the standard earnings call (Group 0) and earnings call connected with carbon neutrality pledge (Group 1)



Note: This table presents immediate market reaction on announcement of carbon neutrality on 12months scale, the returns are annualized

The fact that Group 1 has higher gross returns but lower industry-adjusted returns 12 months before the call may indicate that CN-announcing firms are concentrated in industries that performed relatively well during the period, while individual firms within these industries did not necessarily outperform their sector peers. Second, the relatively strong gross performance before the announcement may indicate that expectations about future sustainability strategies were already partly reflected in stock prices before the formal CN announcement.

The difference in market responses following earnings calls, depending on whether the company announced a carbon neutrality commitment during the call, is further illustrated by an independent-samples t-test of monthly stock returns. The monthly returns are annualized and

adjusted for industry returns. As shown in Table 4, statistical significance is observed from the ninth month following the earnings call. Specifically, the difference in adjusted returns in the ninth month is statistically significant, with a Cohen's d of 0.09, indicating a modest but notable effect. This trend becomes statistically stronger in the subsequent months, with the strongest statistical significance observed in the eleventh month, with p -values of under 5%.

Table 4: Independent student test for industry-adjusted month stock performance after the Carbon neutrality call

Dependent Variable	t	df	p	d	95% CI
1M	-0.20	9 152	0.839	-0.01	[-0.08, 0.06]
2M	0.02	9 142	0.982	0.00	[-0.07, 0.07]
3M	-0.79	8 846	0.431	-0.03	[-0.10, 0.04]
4M	-0.96	8 787	0.336	-0.04	[-0.11, 0.04]
5M	-1.16	8 758	0.248	-0.04	[-0.12, 0.03]
6M	-1.37	8 526	0.171	-0.05	[-0.12, 0.02]
7M	-1.13	8 378	0.256	-0.04	[-0.12, 0.03]
8M	-1.92	8 319	0.055	-0.07	[-0.15, 0.00]
9M	-2.45	8 053	0.014*	-0.09	[-0.17, -0.02]
10M	-2.30	7 839	0.022*	-0.09	[-0.17, -0.01]
11M	-2.70	7 798	0.007**	-0.11	[-0.18, -0.03]
12M	-2.29	7 549	0.022*	-0.09	[-0.17, -0.01]

*Note: This table presents the results of independent samples t -tests comparing industry-adjusted, annualized, stock returns between immediate returns after earnings call on which firms announced carbon neutrality (CN) and after a regular earnings call. The column t reports the t -statistic. df indicates the degrees of freedom associated with each test, p -value reflects the two-tailed probability of no difference in means, d represents Cohen's d . Star symbols *, **, *** highlight statistical significance on a 5%, 1% and 0.1% level.*

The gradual emergence of performance differentials implies a lagged market response to sustainability signals, possibly reflecting investor scepticism or the delayed incorporation of such information into pricing models. Additionally, the relatively small effects across the observing time-horizons suggest that while the performance effects are statistically significant, they may not be economically large in isolation but could still be relevant for ESG-integrated portfolio strategies.

To further test the hypothesis that subsequent negative market returns after a carbon neutrality announcement are related to the integration of ESG activities throughout a company's operations, moderation analyses at the monthly, quarterly and annual levels were conducted. The results are displayed in Table 5.

Table 5: Moderation analysis of 1M, 3M and 12M returns after committing to net zero operations of a company after 2030

Variable	Predictor	df	b	t	p	95% CI
M	CN_call	5,984	-0.25	1.852	.645	[-1.36, 0.84]
	ESG_SCORE	5,984	-0.04	-0.460	.247	[-0.12, 0.03]
	CN_call × ESG_SCORE	5,984	0.03	0.282	.778	[-0.20, 0.27]
Q	CN_call	5,583	0.07	0.514	.607	[-0.22, 0.37]
	ESG_SCORE	5,583	-0.02	-1.464	.143	[-0.04, 0.01]
	CN_call × ESG_SCORE	5,583	-0.03	-0.969	.333	[-0.10, 0.03]
Y	CN_call	4,345	-0.16	-1.804	.071	[-0.35, 0.01]
	ESG_SCORE	4,345	-0.02	-3.695	< .001***	[-0.04, -0.01]
	CN_call × ESG_SCORE	4,345	0.02	0.858	.391	[-0.02, 0.06]

Note: The analysis covers three return windows: 1-month (M), 3-month (Q) and 12-month (Y). The column b reports the unstandardized regression coefficient, t is the associated t-statistic and p is the two-tailed p-value for the null hypothesis of no effect. Interaction terms (CN_call × ESG_SCORE) test whether the relationship between CN announcements and returns varies depending on ESG performance. Star symbols *, **, *** highlight statistical significance at the 5%, 1% and 0.1% levels.

For the short-term horizons (1M and 3M), none of the predictors or their interactions show statistically significant effects on returns, with coefficients close to zero and negligible explanatory power. The ESG score approaches marginal significance at the 3-month horizon, suggesting a weak negative relationship with returns; overall, neither the net-zero commitment nor ESG performance meaningfully influences short-term returns.

In contrast, at the 12-month horizon, both the *CN_call* and *ESG score* variables exhibit significant negative effects on returns, which indicates that firms committing to net zero at a later date and those with higher ESG scores tend to have lower annual returns. However, the interaction between *CN_call* and *ESG_SCORE* is not significant, implying that ESG performance does not moderate or amplify the impact of net zero commitment on returns.

To extend the analysis further and control for traditional Fama-French risk factors, an OLS regression was estimated. Table 6 reports linear regression results for three time horizons: 12-

month (Y), 3-month (Q) and 1-month (M) returns. Each model controls the Fama-French factors, with robust standard errors. The following model was therefore constructed as follows:

$$R_{n,j} = \alpha_j + \sum_{k=1}^K \beta_{k,j} Z_{k,n,j} + Y_j * CN_{call_{n,j}} + \varepsilon_{n,j}$$

Where $R_{n,j}$, represents the subsequent annualized return for observation n over horizon j , where j corresponds to 1, 3, or 12 months. $Z_{k,n,j}$ denotes control variable k and $\beta_{k,j}$ is its associated regression coefficient. $CN_{call_{n,j}}$ is a dummy variable equal to one when the earnings call contains an announced carbon-neutrality commitment and zero otherwise, while Y_j is its regression coefficient.

As can be seen from the results, market returns provide the highest statistical significance across all models, with coefficients above 1, indicating a slightly volatile sample of the equity market in the testing group. Interestingly, among the other Fama-French risk factors, only *asset growth* and *profitability* are relevant for the tested sample and time period. For industry-adjusted performance, momentum factor is also significant. It could be further seen that the dummy variable for the detection of the earnings call containing carbon neutrality commitment (CN_{call}) remains significant at the 0.1% level even after the controlling for risk factors for the 12-month period. The market response for 1-month and 3-month remains insignificant, in line with the t-test and moderation analysis results. The relatively low R^2 values across models are expected, given the inherently noisy nature of equity returns.

Table 6: OLS regression model and coefficients for 12M, 3M and 1M returns controlled for Fama-French factors.

	Gross performance			Industry-adjusted performance		
	Y	Q	M	Y	Q	M
(Intercept)	0.131*** (0.035)	0.037 (0.047)	-0.228 (0.139)	0.045 (0.054)	-0.029 (0.055)	-0.321* (0.143)
Market return	1.408*** (0.137)	4.260*** (0.193)	7.759*** (0.576)	0.535* (0.209)	3.534*** (0.223)	7.035*** (0.587)
size	-0.001 (0.004)	0.005 (0.005)	0.035* (0.016)	-0.004 (0.006)	0.000 (0.006)	0.032+ (0.017)
value	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)
momentum	0.021 (0.057)	-0.107 (0.080)	0.412 (0.239)	-0.763*** (0.088)	-0.819*** (0.094)	-0.236 (0.245)
Op. margin	0.000	0.000**	-0.001***	0.000*	0.000***	-0.001***

	Gross performance			Industry-adjusted performance		
	Y	Q	M	Y	Q	M
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ assets	0.000***	0.000**	0.000	0.000***	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CN call	-0.109***	-0.043	-0.060	-0.129**	-0.067	-0.088
	(0.027)	(0.038)	(0.113)	(0.043)	(0.045)	(0.117)
Num.Obs.	7108	8371	8780	6857	8120	8419
R2	0.022	0.057	0.025	0.015	0.041	0.021

*Note: this table presents the results of OLS regression models estimating stock return performance over three time horizons: 1-month (M), 3-month (Q) and 12-month (Y), using both gross and industry-adjusted returns as dependent variables. The upper value for each factor refers to the unstandardized regression coefficients, the lower value in parentheses represents standard errors. The variable CN call is a binary indicator for whether a firm announced a carbon neutrality (CN) target during the earnings call. The model controls for Fama-French-style risk factors: Market return general market return (either STOXX600 or industry ETF performance) during the observed period; size reflects the log of the firm's market capitalization, value refers to the P/B ratio; Op. margin stands for operating margin; and Δ assets denotes year-over-year asset growth, indicating investment activity. Star symbols *, **, *** highlight statistical significance at the 5%, 1% and 0.1% levels*

Impact of company's ESG activities and carbon neutrality year

The regression analysis presented in Table 7 provides further insights into the relationship between the subsequent price changes and the ESG characteristics of the announcer. In the regression model, the announcer's ESG score was added. The reason why the ESG score was not included in the previous model is the relatively low coverage of ESG-rated companies in the sample (62.4%). Moreover, a subset of the ESG-rated universe was not throughout the entire period, which would result in a loss of approximately 40% of the dataset.

For robustness purposes, the dummy variable tracking whether the announced CN target year is after 2040 (variable *CN_2040*; ca. 50% of all CN announcements) was incorporated into the model. The rationale for this inclusion is to examine whether the time horizon of the commitment influences investor perceptions and subsequent price reactions. The results of the regression analysis are presented in the table below.

Table 7: Comparison of regression analyses on a 12M basis without (0) and with (1) ESG Score variable included

	Gross Performance		Industry-adjusted performance	
	(1)	(2)	(1)	(2)
(Intercept)	0.131***	0.307***	0.043	0.213*
	(0.035)	(0.046)	(0.054)	(0.084)
Market return	1.410***	1.576***	0.559**	-0.364
	(0.137)	(0.128)	(0.209)	(0.229)
Size	-0.001	-0.002	-0.004	-0.003

	Gross Performance		Industry-adjusted performance	
	(1)	(2)	(1)	(2)
Value	(0.004) -0.000	(0.004) -0.000	(0.006) -0.000	(0.008) 0.000
Momentum	(0.000) 0.022	(0.000) -0.146**	(0.000) -0.755***	(0.000) -0.996***
Op. margin	(0.057) 0.008	(0.055) -0.001	(0.088) 0.007t	(0.099) 0.000
Δ assets	(0.000) 0.000***	(0.000) 0.000	(0.000) 0.000***	(0.000) -0.001+
CN call	(0.000) -0.119***	(0.000) -0.085*	(0.000) -0.243***	(0.000) -0.151*
CN_2040	(0.036) 0.024	(0.039) -0.048	(0.056) 0.258**	(0.071) 0.267**
ESG_SCORE	(0.052)	(0.053) -0.028***	(0.082)	(0.096) -0.036**
		(0.006)		(0.012)
Num.Obs.	7108	4199	6857	4161
R2	0.022	0.045	0.017	0.030

*Note: this table presents the results of OLS regression models estimating stock return performance over three time horizons: 1-month (M), 3-month (Q) and 12-month (Y), using both gross and industry-adjusted returns as dependent variables. The upvalue for each factor refers to the unstandardized regression coefficients, the lower value in parentheses represents standard errors. The variable CN call is a binary indicator for whether a firm announced a carbon neutrality (CN) target during the earnings call. The model controls for Fama-French-style risk factors: Market return general market return (either STOXX600 or industry ETF performance) during the observed period; size reflects the log of the firm's market capitalization, value refers to the P/B ratio; Op. margin stands for operating margin; and Δ assets denotes year-over-year asset growth. indicating investment activity., CN_2040 is a dummy variable indicating, the carbon neutrality deadline was set later than 2040. ESG score is a raw ROBECOSAM score of a company at the time of earnings call. Star symbols *, **, *** highlight statistical significance at the 5%, 1% and 0.1% levels.*

In terms of the impact of ESG scores, a significant negative relationship is observed in both models, with coefficients of -0.028 and -0.036 for gross and industry-adjusted performance, respectively. This finding is in line with the hypothesis of Pástor (2019) asserting that ESG activities can serve as a climate-risk hedge, thereby lowering financing costs. It can also be seen that, following the reduction in the sample size and the inclusion of ESG scores as a control variable, the investment and profitability risk factors are no longer statistically significant. The momentum variable, however, remains significant, indicating mean-reversion characteristics in the stock returns observed in the sample.

Furthermore, the regression results show that CN commitment year is statistically significant and positively associated with 12-month industry-adjusted returns, with a beta coefficient of 0.267, significant on the 1% level. This finding suggests that the expected cost burden associated with fulfilling CN commitments is moderated by the greater discounting of the costs that are expected

to rise in later years. It could however be also suggested that investors may perceive longer-term climate goals as more strategic, less disruptive to short-term profitability and better aligned with long-term business models. Interestingly, while the *CN_2040* is not statistically significant in the gross return model, its significance appears when explaining the industry-adjusted performance. This supports the idea that the observed effect is not driven by sectoral dynamics, but by firm-specific characteristics and investors' perception of the credibility.

Industry and regional effect

To explore sectoral and regional dynamics in greater depth and examine their effects on price changes following CN announcements, the regression model was extended by incorporating industry- and region-specific effects. The *Industry* category was based on the Bloomberg Industry Classification Standard (BICS), while the regional component was defined based on the continent of a headquarters of a given company. Thus, the multilevel mixed effects model was constructed in the form:

$$R_{n,j} = \alpha_j + \sum_{k=1}^K \beta_{k,j} Z_{k,n,j} + \gamma_j * CN_{call_{n,j}} + \sum_{l=1}^L \delta_{l,j} * Industry_{l,n} + \sum_{m=1}^M \delta \lambda_{m,j} Region_{m,n} + \varepsilon_{n,j}$$

where, $Z_{k,n,j}$ denotes the set of control variables included in the model and $\beta_{k,j}$ represents the corresponding regression coefficients. γ_j is the estimator of subsequent returns associated with a carbon-neutrality announcement and $\delta_{l,j}$ and $\lambda_{m,j}$ measure differences relative to the reference categories of industry (Communications) and region (Africa).

Table 8: Regression results: Regional vs. Industrial specific effect

	Regional-specific effects	Regional and Industrial-specific effects
(Intercept)	0.345** (0.127)	0.127 (0.095)
Market	0.579** (0.209)	1.415*** (0.136)
Size	-0.008 (0.006)	-0.005 (0.004)
Value	-0.000 (0.000)	-0.000 (0.000)
month_change	-0.762*** (0.088)	0.001 (0.057)
Operating MARGIN	0.000+ (0.000)	0.000 (0.000)
ASSET GROWTH (12M)	0.000*** (0.000)	0.000*** (0.000)
CN_call	-0.131** (0.043)	-0.091*** (0.027)

	Regional-specific effects	Regional and Industrial-specific effects
ContinentAmericas	-0.278* (0.117)	-0.004 (0.077)
ContinentAsia-Pacific	-0.128 (0.120)	0.076 (0.078)
ContinentEurope	-0.314** (0.118)	-0.030 (0.076)
IndustryConsumer Discretionary		0.019 (0.053)
IndustryConsumer Staples		-0.050 (0.056)
IndustryEnergy		0.102* (0.051)
IndustryFinancials		-0.003 (0.054)
IndustryHealth Care		0.090 (0.062)
IndustryIndustrials		0.083+ (0.049)
IndustryMaterials		0.111* (0.049)
IndustryReal Estate		-0.128* (0.053)
IndustryTechnology		0.123* (0.053)
IndustryUtilities		-0.066 (0.050)
Num.Obs.	6857	7108
R2	0.020	0.041

*Note: this table presents the results of OLS regression models estimating stock return performance over three time horizons: 1-month (M), 3-month (Q) and 12-month (Y), using both gross and industry-adjusted returns as dependent variables. The upper value for each factor refers to the unstandardized regression coefficients, the lower value in parentheses represents standard errors. The variable CN call is a binary indicator for whether a firm announced a carbon neutrality (CN) target during the earnings call. The model controls for Fama-French-style risk factors: Market return general market return (either STOXX600 or industry ETF performance) during the observed period; size reflects the log of the firm's market capitalization, value refers to the P/B ratio; Op. margin stands for operating margin; and Δ assets denotes year-over-year asset growth, indicating investment activity. Star symbols *, **, *** highlight statistical significance at the 5%, 1% and 0.1% levels*

In the industry-adjusted return model, geographic origin continues to explain a significant proportion of firm-level return variation, even after accounting for industry-wide effects. Firms located in Europe and North America exhibit statistically significant negative coefficients, with Europe showing the largest regional discount (greater than -0.3). A negative coefficient in this context implies that, all else being equal, firms from these regions tend to generate lower returns relative to the benchmark region, after accounting for their sector exposure. This suggests a consistent investor discount applied to firms operating in more mature, possibly more regulated or less growth-oriented markets. The Asia-Pacific region also shows a negative, albeit weaker, coefficient, indicating a similar but less pronounced pricing effect. These findings point to a residual pricing mechanism in equity markets where geography matters independently of sector,

possibly capturing regional risk premia, institutional frictions, or macroeconomic uncertainty that are not fully reflected in fundamental firm characteristics.

In the extended model that includes both regional and industry effects, the impact of the CN commitment shifts toward sector-level dynamics. Several industries show positive and statistically significant coefficients, e.g., the coefficient for Technology exceeds +0.12, suggesting that investors assign a return premium to technology firms, likely due to their perceived innovation, scalability and long-duration growth prospects. Similarly, Materials and Energy sectors also receive a positive pricing premium, possibly reflecting their exposure to global inflation cycles or supply constraints.

Once industry exposure is accounted for explicitly, regional effects diminish substantially, both in magnitude and in statistical significance. The coefficients for North America and Europe shrink to negligible levels and become statistically insignificant, suggesting that the earlier observed underperformance was largely attributable to their sectoral composition, particularly underweighting in high-performing sectors like Technology or overweighting in lagging sectors like Real Estate.

Most importantly, the *CN_call* variable remains statistically significant even after controlling for regional and industry-specific effects. This supports the main finding of the analysis, as the negative market response to carbon-neutrality commitments does not seem to be driven only by differences between industries or regions. The fact that the *CN_call* coefficient remains significant suggests that carbon-neutrality announcements themselves may have a negative effect on investors' valuation of the company and its future returns regardless the industry and region the company operates in.

Conclusions

The analysis of firms' carbon neutrality (CN) commitments reveals that, despite initial expectations of a positive market response, the effect of CN announcements is either statistically insignificant in the short term or moderately negative in the medium to long term. While gross market returns do not penalize CN-announcing firms immediately, the industry-adjusted models display consistent underperformance by such firms relative to their sector peers. These findings suggest that capital markets, on average, do not attribute excess returns to carbon neutrality pledges and may, in fact, price in the anticipated costs or uncertainties associated with long-term

sustainability commitments. The statistical significance of the CN_call variable at the 12-month horizon further supports the interpretation that investors treat carbon neutrality announcements as information that may be reflected negatively in subsequent returns and potentially carry future financial burdens. The fact that CN-announcing firms have higher gross returns but lower industry-adjusted returns 12 months before the call may indicate that (i) these firms are either concentrated in industries that performed relatively well during the period, while individual firms within these industries did not necessarily outperform their sector peers or (ii.) that expectations about future sustainability strategies were already partly reflected in stock prices before the formal CN announcement.

The interaction between ESG scores and CN announcements does not demonstrate a moderating effect on returns, implying that the degree of ESG alignment level does not significantly alter how markets price sustainability commitments during the observed period. Although ESG scores themselves exhibit a negative and statistically significant association with long-term stock performance, this finding is consistent with the possibility that firms with stronger ESG characteristics have lower expected returns, rather than providing evidence that ESG scores directly reduce the cost of capital. Interestingly, the temporal dimension of the CN commitment does appear to matter. Announcements targeting years beyond 2040 correlate positively with industry-adjusted returns, suggesting that longer-dated pledges are perceived as less disruptive and more strategically aligned. This supports the hypothesis that investors may perceive the costs of carbon neutrality commitments more favourably when they are projected further into the future.

The sectoral and regional dimensions of the market response reveal further insights. Industry effects are particularly strong: firms in the Technology, Energy and Materials sectors show positive return premiums, while Real Estate shows a statistically significant negative return effect. Utilities also have a negative coefficient, although this effect is not statistically significant. Regional differences, on the other hand, diminish substantially when sector exposure is controlled for. The initial underperformance of European and American firms becomes statistically insignificant in the extended model, indicating that there is limited evidence that geography independently explains market responses to CN announcements. This highlights the greater importance of industry affiliation than regional context in shaping investor expectations around climate-related disclosures.

Despite the statistical rigor of the models employed, the study is not without limitations. The reliance on earnings calls for CN pledge detection, while methodologically consistent, may overlook informal or strategic disclosures occurring outside earnings calls. Furthermore, only a subset of firms in the sample was covered by ESG score providers, potentially introducing sample-selection bias in the moderation models. The relatively narrow time period and limited forward-looking horizon may also restrict the generalizability of the results, particularly in a context where ESG-related valuation dynamics evolve rapidly. Future research may benefit from exploring the long-term pricing of net-zero strategies across different capital structures, as well as the impact of regulatory alignment and green financing instruments on investor perceptions of carbon neutrality announcements.

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