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Short communication

Carbon price and firm greenhouse gas emissions

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ABSTRACT

Drawing on the recent enthusiasm in the carbon markets, I examine the impact of carbon prices on firm greenhouse gas (GHG) emissions. Using a sample of 1591 firms from 23 European countries, I demonstrate that an increase in carbon price decreases corporate GHG. At hypothesized higher carbon pricing levels, I document that the effect of pricing on corporate GHG emissions is negative. The negative impact of high carbon prices manifests in other harmful gases such as sulphur and volatile organic compounds (VOCs). In evaluating how the various phases of the EU emission trading scheme have affected firm greenhouse gas emissions, I show that the negative effect of pricing became pronounced in Phase 3 of the EU ETS. The findings from this study are robust to alternative econometric specifications and further sample selection criteria.

1. Introduction

Several years of environmental degradation because of anthropogenetic pollution prompted a barrage of climate mitigation policies (Avagyan, 2021). One example of such initiatives is carbon markets. Trading systems that offer entities the opportunity to buy and sell carbon credits have become widely adopted worldwide. Current estimates indicate that about 33% of the world is subject to some form of emission trading system (ICAP, 2023). Chief among the tools deployed by carbon markets is pricing emission allowance (Boyce, 2018). In this paper, using unique data from EU firms and the EU carbon market, I examine the relationship between carbon price and firm GHG emissions. The impetus for using the EU as the setting for this study is that the EU houses the world's first and biggest carbon market (De Beule et al., 2022). Although carbon price is crucial in carbon markets, there is a paucity of research on how it impacts corporate GHG emissions.

Prior studies in the literature have documented the varying impact of carbon pricing on various phenomena along with significant differences among countries (Avagyan, 2018). For example, in a duopoly game that considers consumer awareness and carbon markets, the findings reveal that increasing carbon price may be more effective for carbon abatement than increasing consumer awareness (Wen et al., 2018). Furthermore, the presence of a carbon pricing system in a country could force country-level emissions to diverge in the future (Best et al., 2020). Correspondingly, the presence of a carbon pricing mechanism has been demonstrated to accelerate the national green transition, with investment in solar energy and wind farms more popular in countries with carbon pricing systems (Best and Burke, 2018).

Despite the overwhelming arguments for carbon pricing, other proponents in the literature posit that it may be an ineffective mechanism for achieving net zero. In support of this view, Daggash and Mac Dowell (2019) argue that the long-term carbon abatement objectives will not be met unless carbon pricing is employed in conjunction with other carbon removal incentives. Similarly, since 2019, it has been documented that carbon price is correlated with transitional climate risk (Goodell et al., 2023). In addition, Ulrich et al. (2022) point out that carbon pricing would increase the production cost of gold. They argue that this will inevitably result in country-level loss of competitiveness with the effect more pronounced in developing countries. In line with this argument, Wong and Zhang (2022) posit that the impact of carbon pricing has varying effects on electric power generation. Comparatively, territories with hydroelectric power sources are less affected by carbon pricing when compared with regions that rely on coal.

As regards carbon price behaviour, prices in the EU carbon market are relatively more stable than other carbon markets in the world (Gao et al., 2023). However, increased uncertainties in economic policies, capital markets and energy markets could spill over to carbon markets in the EU and China, forcing prices to decline (Gao et al., 2023). Theoretically, carbon prices are projected to increase in line with economic growth. However, temperature-related risks as well as other anthropogenic-induced environmental emergencies will accelerate the rise in carbon prices (Olijslagers et al., 2023). Albeit there is a burgeoning literature on carbon price, it is still at a nascent stage and has so far neglected its effect on firm greenhouse gas emissions.

Using data from EU firms for the period 2005 to 2021, I fill this gap in the literature. I document that an increase in carbon price is negatively

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associated with firm greenhouse gas emissions. At hypothesized higher levels of carbon prices, the result reveals that the relationship remains negative albeit the magnitude of the coefficient declines. Furthermore, the findings indicate that the impact of carbon price is also visible in the emission of other harmful gases such as sulphur and volatile organic compounds (VOCs). I find that an increase in carbon prices is negatively related to firm emissions of sulphur and VOCs. Furthermore, I examine how the various EU ETS phases affect the dynamics of the relationship between carbon price and firm greenhouse gas emissions. The results indicate that the effectiveness of pricing is pronounced in Phase 3 of the EU ETS.

The study contributes to the burgeoning conversation in several ways. Firstly, this study deepens the knowledge of climate mitigation initiatives, in particular, it sheds light on their effectiveness as it relates to firms (see for example, Liu and Li, 2022; Ni et al., 2022; Yang, 2023). Likewise, this study adds to the literature by demonstrating how carbon prices affect corporate environmental practices. In addition, the study complements the myriad of studies that have examined the linkages between carbon price and various market components (for instance, Aslan and Posch, 2022; Best and Burke, 2018; Ulrich et al., 2022). This study advances the debate by revealing its effect on the effusion of harmful gases such as carbon, sulphur and other volatile organic compounds (VOCs).

Substantively, the findings support the need for increased pricing of carbon allowances and further reinforce the global policy direction on carbon markets, which is aimed at discouraging companies from relying heavily on fossil fuels by raising the cost of allowances. Furthermore, I demonstrate that there may be leverageable behavioural ramifications for appreciated carbon prices.

2. Empirical strategy

In testing the impact of carbon price on firm greenhouse gas emissions, I collect firm-level data from Rifinitiv Eikon and Worldscope respectively. I merged firms across the databases based on their ISIN codes. Data on allowance prices were collected from the International Carbon Action Partnership (ICAP). Firm level data covers the period 2005 to 2021 spanning across 1591 firms from 23 European countries. Further information on sample distribution is reported in Table 1. Markedly, as presented in panel A, firms from the UK, France and Germany represent a significant portion of the sample. Panel B demonstrates that in recent years, data availability on the subject improved. According to panel C of Table 1, firms from the industrial and consumer discretionary industries are heavily represented in our sample.

A generalized linear model (GLM) of the following form is specified for the investigation:

$$g(y_i) = \alpha_0 + \sum_{j=1}^{p} \beta_i X_i + \varepsilon_i$$

The term “g” in this context is a link function that connects the response variable “y" (which is the natural logarithm of a company’s greenhouse gas emissions) with various covariates including carbon price, ESG score, company size, market-to-book ratio, PPE, slack, and RoA. One main advantage of the GLM is that because of the maximum likelihood estimation procedure it adapts, it generates accurate estimates (Sellers and Shmueli, 2010). The choice and measure of the selected variables are motivated by existing studies in the corporate environmental practice literature (for example, Adamolekun et al., 2022; Azar et al., 2021; Bolton and Kacperczyk, 2021). Further information on the definition of the variables is presented in Appendix 1.

3. Findings and discussion

Table 2 reports the summary statistics of the data used for the study. On average, firms in the sample emit 3.4 million tonnes of carbon. Correspondingly, companies in the sample release 5 thousand tonnes of volatile organic compounds (VOCs) and 20 thousand tonnes of sulphur. The mean carbon allowance price in the EU ETS for the period is €29 per tonne. Other firm-level features such as RoA, leverage, MTB, PPE, and Slack are comparable to those of similar studies (Adamolekun et al., Azar et al., 2021; Bolton and Kacperczyk, 2021).

Fig. 1 presents the pictorial representation of the relationship between carbon price and firm GHG emissions. The graph demonstrates a downward trend in firm GHG emissions. For carbon prices, there appears to be an upward trajectory in the last 4 years. Corporate emission of sulphur and VOCs appears to be in decline.

In Tables 3 and I report the baseline regression. Across the four models in Table 3, the results indicate that carbon price is positively

Table 1
Data distribution.

Panel A: Country Distribution			Panel B: Yearly Distribution			Panel C: Industry Distribution		
Country	Freq	Percentage	Year	Freq	Percentage	Industry	Freq	Percentage
Austria	139	1.52	2005	181	1.99	Basic Materials	851	9.33
Belgium	149	1.63	2006	231	2.53	Consumer Discretionary	2037	22.34
Czech Republic	16	0.18	2007	291	3.19	Consumer Staples	822	9.02
Denmark	185	2.03	2008	305	3.35	Energy	680	7.46
Finland	266	2.92	2009	375	4.11	Health Care	530	5.81
France	1135	12.45	2010	419	4.6	Industrials	2522	27.66
Germany	824	9.04	2011	423	4.64	Real Estate	92	1.01
Greece	91	1	2012	452	4.96	Technology	592	6.49
Hungary	16	0.18	2013	493	5.41	Telecommunications	389	4.27
Iceland	7	0.08	2014	500	5.48	Utilities	602	6.6
Ireland	252	2.76	2015	552	6.05	Total	9117	100
Italy	418	4.58	2016	575	6.31			
Luxembourg	85	0.93	2017	577	6.33			
Malta	6	0.07	2018	806	8.84			
Netherlands	432	4.74	2019	880	9.65			
Norway	274	3.01	2020	1122	12.31			
Poland	111	1.22	2021	935	10.26			
Portugal	92	1.01	Total	9117	100			
Romania	2	0.02						
Slovenia	5	0.05						
Spain	509	5.58						
Sweden	400	4.39						
United Kingdom	3703	40.62						
Total	9117	100						

The Table presents the distribution of the data used in this study. Panels A, B, and C report the distribution of the country, year, and industry of the sample.

Table 2
Summary statistics.

	Obs	Mean	SD	p25	p75
CO2 Equivalent	9117	3.4 m	12.6 m	25 k	1 m
CO2 Natural Log	9117	11.94	2.80	10.14	13.83
Volatile Organic Compounds (VOCs)	1396	5 k	17 k	79	2 k
VOCs Natural Log	1385	5.91	2.66	4.42	7.85
Sulphur	2229	20 k	104 k	44	8 k
Sulphur Natural Log	2187	6.50	3.54	3.91	9.10
Carbon Price	9117	29	16	17	48
Carbon Price Natural Log	9117	3.21	0.62	2.82	3.87
ESG Score	9117	57.20	17.48	45.00	70.62
RoA	9117	0.06	0.16	0.01	0.09
Slack	9117	0.40	0.20	0.25	0.52
Size	9117	22.24	1.76	20.99	23.47
Leverage	9117	0.28	0.19	0.15	0.37
MTB	9117	1.48	3.39	0.44	1.70
PPE	9117	0.28	0.22	0.10	0.42

The Table presents the summary statistics of the data employed in this study. Further information on the variable definition is presented in Appendix 1.

associated with firm greenhouse gas emissions. This implies that an increase in carbon price disincentivizes corporate GHG emissions. This contradicts the view that such carbon abatement policies are ineffective for decarbonization (Green, 2021). The result aligns with proponents of the literature that have called for increased prices to dissuade firms from pursuing dirty production practices (Adamolekun et al.,).

The results of the effect of the hypothetical increases in carbon prices on firm greenhouse gas emissions are reported in Table 4. The findings reveal that although the impact of carbon price on corporate greenhouse gas emissions remains negative, the magnitude reduces at heightened levels. This indicates that there is an optimal price for carbon emissions above which the benefit may be minimal. This supports the view that except carbon pricing is deployed with carbon removal initiatives, the dividends from its implementation may be suboptimal (Daggash and Mac Dowell, 2019).

Next, in Table 5, we examine whether increased carbon price is informative for modelling the emission of other harmful gases such as Sulphur and volatile organic compounds (VOCs). Accordingly, I document that there is a spillover effect on other gases. An increase in carbon price is associated with a decrease in sulphur and VOC emissions. This lends support to the position that pricing could be adopted as a behavioural modification mechanism for corporations (Liu and Li, 2022).

In Tables 6 and I examine if the various phases of the EU ETS have varying impacts on firm greenhouse gas emissions. Phase 1 covered the period 2005–2007, Phase 2 involved the period 2008–2012 and Phase 3 encompassed the period 2013–2020. As regards the price formation, Phase 1 and Phase 2 majorly utilised free allocation whereas Phase 3 used an auctioning system. To test the effect of price on the various phases of the ETS, I interacted carbon price with the various EU ETS phases. The results of the interaction are reported in Table 6. The findings indicate that the negative impact of carbon price is pronounced in Phase 3 of the EU ETS. This implies that the carbon auctioning system could amplify the dividends of carbon pricing. The findings have profound implications for countries in the process of establishing carbon markets. Accordingly, the findings lend credence to the notion that allowance auctioning systems may be a more efficient structure for carbon markets.

4. Robustness test

For added rigour, I specify the baseline model using alternative approaches. Firstly, I run the regression using a simple OLS regression. Secondly, to minimize the impact of cross-sectional dependency, I estimate the regression using Driscoll-Kraay standard errors. I also estimate a random effect model and a two-stage least squares regression (2 S LS) to mitigate potential endogenous concerns. To further limit issues of endogeneity, I specify the model using different variations of the first difference of carbon price and firm greenhouse gas emissions. The results from this procedure are presented in Table 7. Across all the estimation procedures, the results remain consistent. In addition to the aforementioned, I also conduct another analysis where I include firms from other countries that are not part of the EU ETS such as Switzerland, Russia, and Ukraine. Despite this additional sample selection criteria, the results are unchanged. The impact of price on firm greenhouse gas emissions is negative. The result of this analysis is presented in Appendix 2.

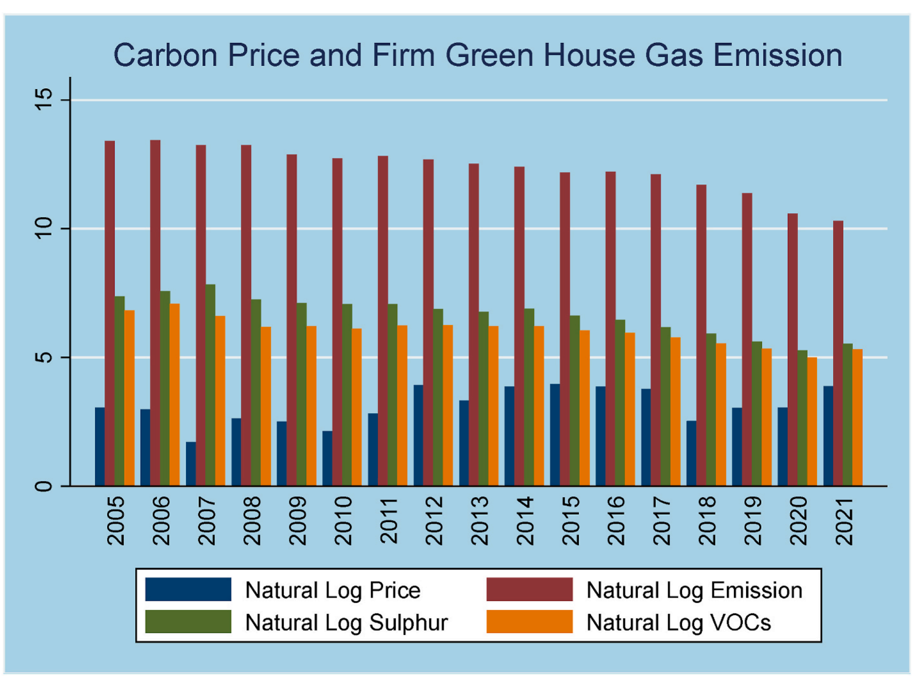

Fig. 1. Carbon price and firm greenhouse gas emissions.

Table 3
Baseline regression.

	(1)	(2)	(3)	(4)
Carbon Pricing	−0.4316***	−2.9954***	−0.2495***	−1.7056***
	(-9.23)	(-14.25)	(-8.08)	(-12.05)
ESG Score			0.0117***	0.0064***
			(8.75)	(5.54)
ROA			1.0326***	0.2613**
			(6.27)	(2.03)
Slack			0.8167***	0.7562***
			(6.78)	(7.72)
Size			0.9204***	1.0283***
			(65.42)	(74.53)
Leverage			−0.5451***	−0.0254
			(-4.90)	(-0.29)
Market to Book			−0.0501***	−0.0241***
			(-6.36)	(-3.88)
PPE			4.9026***	3.3017***
			(48.51)	(36.52)
Constant	13.3199***	25.3255***	−9.9564***	−4.4668***
	(87.17)	(31.08)	(-30.98)	(-6.78)
Industry Effect	No	Yes	No	Yes
Year Effect	No	Yes	No	Yes
Country Effect	No	Yes	No	Yes
Observations	9117	9117	9117	9117

The Table reports the result of the regression analyses that examine the relationship between firm greenhouse gas emissions and the covariates of the regression estimate. I report the T-stats in parentheses. *, **, and *** refers to significance level below 10%, 5% and 1% respectively.

Table 4
Higher pricing of carbons.

	(1)	(2)	(3)	(4)
Carbon Price^2	−0.2463***			
	(-12.05)			
Carbon Price^3		−0.0472***		
		(-12.05)		
Carbon Price^4			−0.0101***	
			(-12.05)	
Carbon Price^5				−0.0023***
				(-12.05)
ESG Score	0.0064***	0.0064***	0.0064***	0.0064***
	(5.54)	(5.54)	(5.54)	(5.54)
ROA	0.2613**	0.2613**	0.2613**	0.2613**
	(2.03)	(2.03)	(2.03)	(2.03)
Slack	0.7562***	0.7562***	0.7562***	0.7562***
	(7.72)	(7.72)	(7.72)	(7.72)
Size	1.0283***	1.0283***	1.0283***	1.0283***
	(74.53)	(74.53)	(74.53)	(74.53)
Leverage	−0.0254	−0.0254	−0.0254	−0.0254
	(-0.29)	(-0.29)	(-0.29)	(-0.29)
Market to Book	−0.0241***	−0.0241***	−0.0241***	−0.0241***
	(-3.88)	(-3.88)	(-3.88)	(-3.88)
PPE	3.3017***	3.3017***	3.3017***	3.3017***
	(36.52)	(36.52)	(36.52)	(36.52)
Constant	−7.3771***	−8.3288***	−8.7912***	−9.0582***
	(-16.00)	(-20.47)	(-22.91)	(-24.39)
Industry Effect	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
Country Effect	Yes	Yes	Yes	Yes
Observations	9117	9117	9117	9117

The Table reports the result of the regression analyses that examine the relationship between firm greenhouse gas emissions and the covariates of the regression estimate. In this Table, I include hypothesized higher levels of the carbon price and report the results in Table. T-stats are in parentheses. *, **, and *** refers to significance level below 10%, 5% and 1% respectively.

5. Concluding remarks

In response to indiscriminate anthropogenic emissions, countries all over the world have turned to carbon markets to disincentivize reliance on hydrocarbons. A key tool deployed by carbon markets is carbon pricing. In this study, I examine if pricing has been effective in incentivizing corporate transition to greener production processes. The results indicate that carbon price is negatively associated with firm greenhouse

Table 5
Carbon price and other harmful gases.

	Sulphur	VOCs
Carbon Pricing	−0.8797*	−1.2285***
	(-1.68)	(-3.08)
ESG Score	−0.0212***	−0.0188***
	(-4.27)	(-4.42)
ROA	−0.6527	0.7519**
	(-1.18)	(2.55)
Slack	0.7596	1.1842***
	(1.47)	(3.23)
Size	1.1935***	1.2483***
	(20.78)	(26.65)
Leverage	−1.5909***	0.6329**
	(-4.25)	(2.08)
Market to Book	−0.1125	−0.2041***
	(-1.41)	(-3.48)
PPE	4.5351***	2.8098***
	(10.64)	(7.91)
Constant	−17.0414***	−18.4584***
	(-6.97)	(-9.61)
Industry Effect	Yes	Yes
Year Effect	Yes	Yes
Country Effect	Yes	Yes
Observations	2187	1385

The Table reports the result of the regression analyses that examine the relationship between firm Sulphur, volatile organic compounds, and the covariates of the regression estimate. The T-stats are reported in parentheses. *,**, and *** refers to significance level below 10%, 5% and 1% respectively.

Table 6
EU ETS phases and carbon pricing.

	Phase 1	Phase 2	Phase 3
Carbon Price	−0.2850***	−1.7056***	−1.7056***
	(-3.81)	(-12.05)	(-12.05)
Phase 1 # Carbon Price	0.3213**		
	(2.57)		
Phase 1	0.1990		
	(0.57)		
Phase 2 # Carbon Price		1.5976***	
		(9.66)	
Phase 2		−5.1043***	
		(-8.44)	
Phase 3 # Carbon Price			−32.6918***
			(-858.55)
Phase 3			98.3672
			(0.00)
ROA	0.2613**	0.2613**	0.2613**
	(2.03)	(2.03)	(2.03)
Slack	0.7562***	0.7562***	0.7562***
	(7.72)	(7.72)	(7.72)
Size	1.0283***	1.0283***	1.0283***
	(74.53)	(74.53)	(74.53)
Leverage	−0.0254	−0.0254	−0.0254
	(-0.29)	(-0.29)	(-0.29)
Market to Book	−0.0241***	−0.0241***	−0.0241***
	(-3.88)	(-3.88)	(-3.88)
PPE	3.3017***	3.3017***	3.3017***
	(36.52)	(36.52)	(36.52)
Constant	−9.9745***	−4.4668***	−4.4668***
	(-24.45)	(-6.78)	(-6.78)
Industry Effect	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes
Country Effect	Yes	Yes	Yes
Observations	9117	9117	9117

The Table reports the regression analyses the evaluate the dynamic of the relationship between carbon pricing, various phases of the EU ETS and firm greenhouse gas emissions. The T-stats are in parentheses. *,**, and *** refers to significance level below 10%, 5% and 1% respectively.

Table 7
Robustness test.

	OLS	Driscoll-Kraay	RE	GLM	GLM	GLM	2SLS
	CO2 Natural Log	CO2 Natural Log	CO2 Natural Log	Δ CO2 Natural Log	Δ CO2 Natural Log	CO2 Natural Log	CO2 Natural Log
Carbon Price	−1.7056***	−1.0806***	−3.1712***	−0.0734*			−0.2266***
	(-12.05)	(-18.22)	(-24.10)	(-1.91)			(-6.89)
Δ Carbon Price					−0.0732*	−1.6744***	
					(-1.91)	(-12.39)	
ESG Score	0.0064***	0.0042***	0.0064***	−0.0016***	−0.0016***	0.0065***	0.0089***
	(5.54)	(5.75)	(3.93)	(-4.39)	(-4.39)	(4.91)	(5.79)
ROA	0.2613**	0.1209**	0.2613	0.0666*	0.0666*	0.0458	0.6097***
	(2.03)	(2.31)	(1.46)	(1.74)	(1.74)	(0.34)	(3.27)
Slack	0.7562***	0.3216***	0.7562***	−0.0574*	−0.0574*	0.6791***	0.7930***
	(7.72)	(3.76)	(7.75)	(-1.87)	(-1.87)	(6.26)	(6.22)
Size	1.0283***	0.8070***	1.0283***	0.0098**	0.0098**	1.0130***	0.9281***
	(74.53)	(49.40)	(57.24)	(2.28)	(2.28)	(66.39)	(52.56)
Leverage	−0.0254	0.0010	−0.0254	−0.0369	−0.0369	0.0826	−0.5186***
	(-0.29)	(0.02)	(-0.20)	(-1.34)	(-1.34)	(0.85)	(-4.24)
Market to Book	−0.0241***	0.0078*	−0.0241	−0.0016	−0.0016	−0.0189***	−0.0492***
	(-3.88)	(1.67)	(-1.57)	(-0.82)	(-0.82)	(-2.74)	(-4.44)
PPE	3.3017***	1.0888***	3.3017***	−0.0152	−0.0152	3.1406***	4.7143***
	(36.52)	(11.74)	(16.27)	(-0.54)	(-0.54)	(31.59)	(40.88)
Constant	−4.4668***	−0.5305	0.0000	0.1980	−0.0257	−9.1212***	−9.8514***
	(-6.78)	(-1.00)	(0.000)	(1.06)	(-0.24)	(-24.19)	(-25.22)
Industry Effect	Yes	Yes	Yes	Yes	Yes	Yes	No
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	No
Country Effect	Yes	Yes	Yes	Yes	Yes	Yes	No
Instrument							Δ Carbon Price
Observations	9117	9117	9117	7113	7113	7113	7113
R-Squared	0.749		0.751				0.577

The Table reports the result of the regression analyses that examine the relationship between Firm greenhouse gas emissions and the covariates of the regression estimate. I report the T-stats in parentheses. *,**, and *** refers to significance level below 10%, 5% and 1% respectively.

gas emissions. The findings support the view that carbon pricing is an efficient tool for modifying corporate environmental behaviour. I also examine if there is an inflexion point as regards pricing. The results suggest that at higher levels of pricing, the magnitude of the relationship reduces. In evaluating if the impact of carbon price is also evident in other harmful gases, I find that increased prices reduce the emission of sulphur and VOCs. In examining how various phases of the EU ETS have affected the relationship between carbon price and firm greenhouse gas emissions, the results indicate that it was more effective in Phase 3 of the EU ETS. In general, the results support calls for higher pricing of carbon allowance.

The figure presents the bar chart of the natural log of carbon price and the natural log of firm carbon, sulphur and VOCs emissions.

CRediT authorship contribution statement

Gbenga Adamolekun: Conceptualization, Methodology, Software, Data curation, Writing – original draft, Visualization, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix tables

Appendix 1
Variable Definition

Variable	Definition
Carbon Price	This refers to the average price of carbon emissions in the EU carbon market in a year.
Firm Greenhouse gas emissions	This is the natural log of corporate carbon emissions or its equivalent.
Sulphur	This is the natural log of a firm's sulphur emission in a year.
Volatile Organic Compounds (VOC)	This refers to the natural log of a firm's VOC emission in a year.
ESG Score	This is a Refinitiv computation of a company's ESG score. It accounts for a firm's environmental, social, and corporate governance pillars.
RoA	RoA is defined as the return on assets of a firm.
Slack	Slack refers to a company's current assets deflated by total assets.
Size	This is the natural log of a firm's total assets.
Leverage	This is defined as the total debt of a firm divided by total assets.
MTB	This is the market value of equity of a firm divided by the book value of equity.
PPE	This is property plant and equipment deflated by total assets.

The Table presents the variable definition.

Appendix 2
Robustness

	(3)	(4)
	CO2 Natural Log	CO2 Natural Log
Carbon Price	−0.2575***	−1.7561***
	(-8.48)	(-12.45)
ESG Score	0.0208***	0.0096***
	(16.71)	(8.58)
ROA	1.2608***	0.3566***
	(7.77)	(2.79)
Slack	0.6306***	0.7024***
	(5.38)	(7.29)
Size	0.8069***	0.9932***
	(65.77)	(73.52)
Leverage	−0.5955***	−0.1762**
	(-5.46)	(-2.02)
Market to Book	−0.0667***	−0.0299***
	(-8.50)	(-4.81)
PPE	4.8329***	3.4316***
	(48.78)	(38.32)
Constant	−7.8814***	−3.7471***
	(-27.34)	(-5.73)
Industry Effect	No	Yes
Year Effect	No	Yes
Country Effect	No	Yes
Observations	9885	9885

The Table reports the result of the regression analysis that examines the relationship between firm greenhouse gas emissions and the covariates of the regression estimate. I report the T-stats in parentheses. *, **, and *** refers to significance level below 10%, 5% and 1% respectively.

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