Market Responses to Global Governance: International Climate Agreements and Europe's Carbon Trading

Federica Genovese
University of Essex

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Abstract

This paper investigates how multilateral environmental governance affects private profits. Environmental agreements usually entail economic mechanisms and should receive attention from economic investors. However, the financial reaction to environmental agreements can be ambivalent, as firms may be more or less constrained by green regulation. I argue that global environmental cooperation hurts profitability if firms lack domestic economic protection that shields them from the costs of environmental adjustments. By contrast, if firms are protected with respect to international competitors, they can adjust to global environmental decisions and therefore raise market expectations on their profitability. Focusing on the EU Emission Trading Scheme (ETS), I present an event study of 38 European firms at the time of the international gatherings of the UN Framework Convention on Climate Change. The empirical analysis lends support to the view that financial markets carefully evaluate the climate change meetings. I find that EU ETS investors react positively to multilateral decisions that strengthen the purpose of green regulation and emission trading. This evidence suggests that international climate change decisions affect profit substantially, but that the repercussions are not related to compliance costs as long as firms are protected from the risk of competitive disadvantage.

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Introduction

One of the most long-standing perceptions in political economy is that there is a fundamental conflict between the interests of business and the goals of environmental regulators. A large literature argues that environmental decision makers apply policies that increase financial costs, restrict production, or constrain the economic capacity of firms. Anticipating these costs, firms adjust by either setting new prices to their unit of production or, sometimes, relocating (Greenstone, 2002; Jaffe et al., 2005). These basic claims inform the main disagreements between firms and policy makers, but much about this relationship is inevitably left unknown. First, this setup hardly disentangles the economic drivers of environmental policies from the political determinants of 'green' profits. Furthermore, it is unclear whether this conflict can denote the relationship between environmental institutions and business firms at macro levels. As climate change races to the top of the list of global public issues, there is a reasonably great concern in understanding to what extent international environmental policies impact the profitability of cross-national industries. Yet, this link between international climate change deliberations and the profits of environmentally sensitive firms is to date insufficiently explored.

In this article, I contribute to this literature by looking at whether and how financial markets evaluate the outcomes of multilateral climate change decisions. To this end I examine the financial repercussions of the intergovernmental conferences of the United Nations Framework Convention on Climate Change (UNFCCC) for firms in the domain of the European Union Emission Trading Scheme (EU ETS). The foundation of the EU ETS in 2005 marked a new level of salience of environmental and energy issues in Europe. Despite the outbreak of the Great Recession in 2008 and the European economic crisis in 2010, national governments have continued making key decisions on the EU ETS and its relations with other green market strategies across the world. As such, firms in this scheme have become subjects to (and objects of) international agreements at the UNFCCC. These characteristics make the EU ETS an ideal case for testing the connection between supranational events and economic preferences in the

context of environmental politics.

The EU ETS is also a useful exploratory case because it is mandatory and therefore truthfully represents sectoral interests across developed economies. The system includes some of the most productive global companies such as BMW and Royal Dutch Shell. Moreover, the EU ETS was conceived as an integral part of the Kyoto Protocol mechanisms. Put differently, no European emission trading scheme would have existed in the absence of previous climate change treaties (Grubb, 2010). Surely environmentally relevant markets work in function of the legal context where firms are headquartered and where trade is administered. Nonetheless, intergovernmental interactions are a crucial source of information for markets that seek to accomplish international climate change mitigation. Hence, understanding the performance of carbon trading firms in relation to the UNFCCC provides direct evidence of the economic relevance of international environmental coordination.

I argue that if international climate change meetings were to be inconclusive, short-term investments in firms directly regulated by climate policies should reflect the long-term concerns of failed political consensus. Similarly, if the international climate meetings brought to light a successful outcome related to carbon market competitiveness, stockholders would plausibly update their beliefs about the future asset value of firms under a carbon market. The key assumption is that UNFCCC events should cause a reaction on the so-called 'abnormal return', that is, the return to EU ETS firms during a UNFCCC meeting that cannot be explained by movements in other financial assets. If, as I will argue, firms under the EU ETS are winners of regulation due to free allocations and windfall profits, positive abnormal returns should follow international events that guarantee the continuity of these profits in the future.

Event study analyses suggests that decisions made at the UNFCCC meetings indeed affect the EU ETS. In line with the theoretical argument, international meetings associated with decisions to advance the competitiveness of global carbon permits or new portfolios of accredited projects triggered a significantly positive abnormal stock return even after controlling for potential counterfactuals such as the announcement of domestic energy policies or national

elections. The results demonstrate that firms and industries with small carbon caps can profit from international regulatory signals because international 'good news' generate revenue effects that are larger than costs of compliance. Moreover, the results demonstrate that the UNFCCC meetings, which have been criticized for having produced insignificant political results, can have subtle financial repercussions.

Theoretical Framework

Contributing to the discussion whether politics follows economics or vice versa, this paper focuses on how short-term market performance is influenced by political events. In what follows I present a theory for how economic preferences in environmentally sensitive markets vary and what type of responses one should expect from economic actors. I then move to what role international environmental resolutions take for these markets.

Winners and Losers of Green Regulation: The Case of Emission Trading Schemes

Environmental economists agree that, in absence of environmental regulation, firms produce in relation to a demand without integrating pollution mitigation in their cost function. If a firm becomes subject to cap-and-trade, regulation becomes a cost. This cost is proportional to the firm's total production as well as the new emission rate and the level of abatement established by the regulation (Dasgupta et al., 2002). The abatement cost can be lowered by technology, but normally it is higher than zero. However, the firm may possess allowances to which regulators attach a carbon price. If the per-unit carbon price is sufficiently manageable and the quantity of allowances are equal or less net sales, then the firm may strike a profit from carbon permits. By contrast, if the price of allowances is high and do not meet ex ante net sales, then the firm faces a loss.

This micro model of environmental market regulation suggests that for a firm, the magni-

tude of the effects of the green policy critically depends on how many permits the firm owns. Put differently, the allocation determines the net effect of the regulation.[1] So, if firms in a cap-and-trade market received a free allocation equivalent to 100 percent of their future emissions, the allowances would offset the increased regulatory burden because firms could clean up for 'free' or otherwise sell permits that were costless to begin with. This is a significantly different scenario from the one of firms invited to abate emissions voluntarily or constrained by carbon taxes or auctioned permits. As Bovenberg and Goulder (2001) show, only a relatively small allocation of emissions allowances is necessary to fully compensate industries for changes in profits due to carbon costs. Thus, revenue can increase for advantaged firms under this type of climate change regulation.

The process of allocating emissions allowances unavoidably contains an element of political maneuvering. Firms are political actors that seek protection for their private preferences. Consequently, dominant interest groups may well influence the design of policies that have repercussions on their industrial outputs. As scholars have argued (Milner, 1988; Frieden and Rogowski, 1996), the redistributive politics of economic competition determine whether firms are in the position to lobby for regulation and therefore profit from policy making. With respect to GHG mitigation strategies, industrial rent-seeking can have the power to determine permit allocation and compliance rules. This is traceable, for example, to the implementation of the sulfur market in the United States in the 1990s (Markussen and Svendsen, 2005). Similarly, in Europe grandfathering and free initial allocation were initially chosen among a number of carbon permit allocation rules to favour domestic industries (Martin et al., 2013).

Following this line of thinking, the process of allocating emissions allowances for free, while effectively driven by a desire to offset some costly impacts of the introduction of carbon regulation, can create a set of international winners. The reasons why I stress the international redistributive consequences of free allocation are two. First, this allocation choice creates a

[1] In contrast to a carbon tax, this net effect corresponds to the prevented deadweight loss.

financial barrier in relation to new market entrants from abroad. To compete in a system with a cap-and-trade in place, foreign companies are forced to buy all needed permits from existing firms. Consequently, the free allocation of allowances to local firms harshens rivals' costs of competition and increases revenue for regulated firms (Grubb and Neuhoff, 2006).[2]

The second reason why free allocation can create internationally winning actors is that this mechanism generates a direct channel between trading firms and foreign investors. In the carbon markets designed under the Kyoto Protocol, credits can be generated and exchanged outside the ETS. Consequently, firms under cap-and-trade systems can decide to retain their allowances or engage in mitigation abroad – something the international climate change regime encourages. As Hepburn et al. (2006, p. 151) claim, in situations of 'loose market' where supply of credits from foreign abatement projects increases, firms can gain from a lowering allowance price. Evidently, too low carbon prices can hurt the credibility of environmental policies and therefore drop markets' trust in the profitability of the firms. Nonetheless, firms are likely to welcome international efforts that strengthen emission permits while supporting their access to foreign markets, especially if they receive free allowances.

In light of this discussion, it is reasonable that industries with advantageous positions on carbon markets should be associated with more support for global climate cooperation (Bayer and Urpelainen, 2013; Johnson and Urpelainen, 2011; Andonova et al., 2007). Firms with free allowances should then profit when further allocation is to be expected, while the opposite should be true when the regulation loses value or when allowances are not longer expected to be free. The main question is what determines such expectations. Some studies show that domestic policy announcements have an impact on the profits of ETS firms (Alberola et al., 2010). Similarly, endogenous shocks to allocation volumes affect the returns of these firms (Bushnell et al., 2013). However, it is also possible that international environmental

[2]National governments play a mediating role, of course. In the case of the EU ETS, they are the ones that administer the permits allocated from Brussels. Governments can partition the national emissions budgets between trading and non-trading sectors. Empirical investigations have shown that strategic partitioning occurs, although it has small effects on the effectiveness of the permits for either type of sectors (Boehringer and Rosendahl, 2009).

deliberations affect investors' belief of the profitability of carbon-efficient firms. If the current value of industrial shares mirrors the investor expectations on the future profitability of an industry (Howells and Bain, 2001), then any information suggesting the state of the portfolios of carbon trading companies in the future should lead to more or less investments in these stocks.[3] In this end, deliberations at the UNFCCC may constitute the type of information that informs investors on the nature of these returns. For instance, agreements that offer opportunities to receive cheap allowances should cause abnormal increases in the order books of the European energy industry. Hence, firms protected by generous emission trading policies should profit from events related to international climate cooperation.

The Role of International Climate Meetings for the European Emission Market

The central argument of this paper is that climate meetings can cause a significant variation in investments on emission trading firms because their outcomes have direct implications for the future of global climate regulations. However, assessing the impact of international climate deliberations for the EU ETS requires a deeper understanding of the UNFCCC negotiations and, most importantly, of the way the European Union relates to these meetings, which is what I turn to in this section.

The UN Framework Convention on Climate Change was established in the 1992 Rio Earth Summit and is the main international organization involved in greenhouse gas mitigation and adaptation. The Convention coordinates global quantified reduction targets and the fungibility, security and level of global emission allowances. Intergovernmental meetings occur twice a year, once in the summer and once in the winter. Both types of meeting last roughly two weeks, but while the summer gatherings are rather technical, the winter meetings are political and comprehend a High-Level Segment where heads of state are expected to attend. This meeting

[3]This type of effect has been found for other policy areas. See for example Bechtel and Schneider (2010) on the European Security and Defense Policy and Pelc (2013) on the WTO.

also corresponds to the yearly Conference of the Parties (COPs), which is the main deliberator of the UNFCCC. Decision-making is based on consensus rule where each country has one vote. Votes are made on a long list of issues discussed in the course of the meetings. However, as part of the three Kyoto Protocol flexible mechanisms, emission trading is a fundamental point in the ordinary agenda presented at each meeting of the UNFCCC.

It is important to understand that the EU is a special type of actor at the UNFCCC, because although it is a regional organization it is also a Party to the Convention. Consequently, the EU sends its own delegation to the meetings and has the power to propose votes.[4] Against this background, there are different mechanisms in which the UNFCCC meetings influence the behavior of the European emission trading scheme. First, the UNFCCC influences the sentiments of the EU green market because the European Commission has historically attached salience to climate change, to the extent that the EU has a tradition of announcing its domestic policies at these meetings. For example, after signing the Kyoto Protocol, European countries agreed to reduce emissions of greenhouse gases by 8 percent compared to 1990 levels, but the Commission decided to outline the design of what would eventually develop into the EU ETS only at the ratification of the Kyoto Protocol (Ellerman and Joskow, 2008). The EU behaved similarly in preview of the Poznan meeting in December 2006, when the Commission decided to wait until the beginning of the COP to confirm its 20-20-20 targets. In short, investors should know that international policies are taken very seriously by the EU. Thus, one should observe economic reactions to these key events that are carefully evaluated in Brussels.

The second reason why price stocks on EU ETS companies should be reactive to decisions at the UNFCCC negotiations is that the quantity of EU ETS permits can be affected by allowances issued by the international organization. Although the European Emission Allowances, which are the central units traded in the EU, are only exchangeable within the regional market, the EU ETS allows the circulation of Certified Emission Reductions (CER) and Emission Reduction

[4]Evidently, the EU delegation has no vote per se. However, it coordinates votes with the single member states, and it is also allowed to issue independent statements.

Unit (ERU). These are the product of Clean Development Mechanisms (CDM) and the Joint Implementations (JI) supervised by the UNFCCC. Hence, UN agreements on global emission targets affect the supply of EU ETS–based credits, while EUA/CER/ERU volumes affect the EU ETS demand.[5]

The direction of markets' reactions to more permits can be ambivalent. CDM and JI create incentives for European firms to venture in developing countries to abate pollution, which generates income within the EU ETS. At the same time, too high levels of CERs and ERUs can drop the value of carbon allowances, because more allowances translate into cheaper pollution for dirtier firms. Consequently, investors may well receive UNFCCC resolutions that maintain the competitive price of carbon markets under free allocation, but if competitive prices go hand in hand with an oversupply of CERs and new advantages to foreign competitors, then the reaction in financial markets may also be ambiguous. Examples of UNFCCC decisions that tried to balance these two aspects of carbon market reforms are the meetings in Nairobi in 2006 and Bali in 2007 (see Table 1). Still, I predict that conferences that generate expectations on the longevity of the carbon markets like the one in Montreal (2005) and in Poznan (2008) should substantially increase the returns of carbon traders. It follows that for status quo conferences such as Copenhagen in December 2009 firms under the EU ETS should not experience significant abnormal returns.

Finally, the returns of EU ETS firms should change as a consequence of successful UNFCCC conferences because these meetings reveal new information on the future of carbon trading that would not otherwise be known to investors beforehand. In financial market terms, I assume that the EU ETS is informationally efficient, which means that the firms' share prices reflect all publicly available information. So, while ETS firms may know the preferences of the EU delegation or their national representatives for international climate cooperation, the final outcome established at the negotiations is unknown to the public before its release. This is plausible

[5]Article 17 of the Kyoto Protocol sets up the modalities for trading and accounting of assigned amounts, while Article 6 and Article 12 of the Kyoto Protocol defines the the credit schemes and instruments under JI and CDM.

for two reasons. First, even when the precise agenda of the meetings is known beforehand, investors cannot anticipate the final decisions because their are not present at the conference. Even if they are, they are usually not engaged in bilateral negotiations among countries before the votes. Second, while UNFCCC conferences have sometimes set up significant programs and substantial mitigation goals, they often failed to achieve steps toward global climate cooperation. In some cases, the meetings have even lasted 24 hours longer than expected before providing a final outcome as, for example, the Durban COP in 2011. This decision-making pattern makes prediction of UNFCCC outcomes a difficult task. Consequently, positive outcomes released from the the UNFCCC meetings should drive positive abnormal returns in carbon trading firms because new information improve the uncertain expectations for EU ETS firms.

Hypothesis: International climate meetings that strengthen the competitiveness of carbon markets lead to an increase in the return on stocks in EU ETS firms.

Empirical Investigation

Measurements and Data

To investigate the link between international climate meetings and financial returns of EU ETS companies, I constructed a dataset that includes daily stock prices of 38 firms among the major companies in the EU ETS. I collected the stock prices in US dollars for the period between April 2005, when the EU ETS was first launched, to December 2010, when stocks listed in Europe crashed following the Great Recession. The period I concentrate on is the years between April 27 2005 and April 28 2007, which corresponds to the first phase of operation of the EU ETS.[6]

There is a number of reasons why I primarily focus on this period. From an economic perspective, emissions allowances in these two years were quite volatile and yet stably demanded.

[6]The stock prices were collected through Datastream and are equivalent to the Dow Jones STOXX 600 market index used, among others, by Bushnell et al. (2013).

Figure 1 shows that allowance prices stayed above the threshold of 10 euros per carbon ton, which indicates the credibility of this policy for investors.[7] At the same time, prices moved enough to generate enough variance for a statistical analysis. From a political perspective, these years correspond to a time in which international climate meetings were not yet considered 'locked.' In the words of Gupta (2010, p. 646), during this phase "the EU had to renew its efforts to convince other countries to ratify the Kyoto Protocol and push implementation efforts further." As such, this is a period when leadership, and especially European positions, could really make a difference for the future of carbon regulation. It is also worth noticing that prices seem to rise after the UNFCCC COP during these years. For example, while the day before the Nairobi COP a ton of carbon was valued at 15.6 Euros, the day after the conclusion of the negotiations it was almost 18 Euros. Thus, in the analysis I take advantage of this economic and political volatility to examine the impact of international climate policies.[8]

Table 2 shows the companies included in the sample across countries and sectors of production. In 2005-06 the 38 selected firms were among the 500 largest global companies, for which the annual value of reached permits reached nearly $60 billion (Pinkse and Kolk, 2007). To visually illustrate the type of firms in the dataset, Figure 2 shows that break down by country and sectors. Notice that the sample represents companies in the twelve founding EU member states. Several companies are placed in London, which makes the United Kingdom the 'home' of one fourth of the observed firms. Otherwise, the sample reflects economic weights in the European Union, with Germany and France following the UK in terms of represented companies. Across sectors, manufacture and electricity are the two largest ISIC industries depicted in the sample.

Note that stock prices show clear signs of non-stationarity, which means that the series

[7]The data in Figure 1 is Phase 1 EUA prices up to 30 April 2006 and then Phase 2 EUA price from May 1 2006 onwards. The reason why I do not plot the rest of Phase 1 EUA prices between May 1 2006 and December 1 2006 is that the Phase 1 price fell to zero at the end of 2006. De facto, the announcements of Phase 2 national allocation plans in the spring of 2006 marked the transition to the Phase 2 carbon price.

[8]I use the rest of the daily stock prices after 2007 for robustness checks, as I describe below. However, another reason why it is preferable to concentrate on these years is that other stock prices (e.g. oil prices) before 2008 did not change dramatically.

present unit root tests and cannot be used for consistent estimation. I then log-differenced the price to obtain continuously compounded *returns*. This transformation is econometrically preferable but also theoretically useful because returns capture short-term changes better than levels. I standardize the returns to make them comparable across all 38 firms. Figure 3 illustrates the average returns for the period between April 2005 and April 2007, which indicate stationarity because the series floats around zero. The plot noticeably shows that much volatility of returns from EU ETS firms occurred in April 2006. This corresponds to the EU disclosure of overestimation of allowances and a sharp drop in carbon prices. However, the events that I am interested in investigating occur at the onset of the UNFCCC meetings, where enough variation seems to be found.

Research Design

The most effective empirical strategy to uncover how decisions at international climate meetings drive profits in the European emission trading firms is an event study research design.[9] Event studies are usually set up in two steps. First, one needs to define a firm's normal return, that is, the daily return one should expect in the absence of UNFCCC decisions. The simplest assumption to make here is that investors in the EU ETS would not deviate from trading their favorite product, e.g. allowances, unless they can profit from investing in other markets that better suit their interests. In order to estimate a normal performance that takes into account the fact that firms cannot leverage other markets and therefore engage in arbitrage, I estimate the following linear relationship:

$$R_{it} = \alpha_i + \sum_{z=1}^{Z} \beta_i R_{zt} + \epsilon_{it} \tag{1}$$

[9]For event studies related to my analysis, see Bushnell et al. (2013); Oestreich and Tsiakas (2013); Lepone et al. (2011).

where α is a constant, ϵ is the error term, R_{it} is the return to a risky alternative asset z at time t, and the β is the weight that reflects how changes in the return of asset z translate into changes in the return R_{it}. Empirically, I estimate the weight of R_{zt} with a combination of three alternative returns: a global stock market index, the NYSE American Stock Exchange Index (`Amex`), and the Renewable Energy Industrial Index (`Renixx`), to control for specific types of profits relevant to the energy industry.

In a second step I estimated the European stock market reactions to the UN meetings by calculating the returns that deviate from the normal values at the time of a UNFCCC meeting. I identify 'announcements' as relevant statements released by the UNFCCC media coverage and the watch-dog organization called the Earth Negotiation Bulletin, both of which are available online. These announcements, which include statements related to the ETS and cap-and-trade policies for climate change mitigation, are essentially a piece of the negotiations and can occur in any of the days of the international climate meetings. Hence, I calculate abnormal returns for a window that comprehends all the official negotiation days (roughly two weeks, depending on the meeting) plus two days preceding the negotiations and two days following the negotiations. Note that I calculate abnormal returns for all COPs as well as the summer meetings that occur in Bonn. I use these meetings to make sure to also test whether in-between conferences (i.e. conference where parties do not take resolutions) yield fewer profits.

Technically speaking, an abnormal return is the difference between the observed return and the 'counterfactual' control set of estimations from the normal return (R_{it}). The abnormal return AR_{it} is computed with the equation

$$AR_{it} = R_{it} - E[R_{it}|x_t] \tag{2}$$

where the expected return of each firm is conditional on the set of covariates x_t. For abnormal returns, one should choose the proper estimation window where the error term can be also estimated. The climate change negotiations usually last fourteen days, preceded by at least a

week of media coverage. At least for COPs, the most crucial part is the second week, when the UN Secretary General and the Executive Secretary engage in the most important nodes of the discussion. Between the end of the first week and the closing of the negotiations, one may say, the fate of international climate regulations is revealed. Hence, I estimate the return equation in the time span between 20 days before the meeting and the estimation window of the subsequent UN meeting.[10] Based on the abnormal return series, I can compute two standard quantities that are generally used as dependent variables for event study analysis: the firm–specific abnormal return (AR_{it}) and the average (market–wide) abnormal return of EU ETS trading firms at time t (AAR_t).[11]

Estimation Strategy and Variables

In order to examine the economic repercussions of UNFCCC decisions, I use a fixed effects linear regression to model the abnormal returns described in the previous passage. The most intuitive outcome is the average abnormal return, because disaggregated ETS firms' returns compile incentives and sensitivities from very different industries. Thus, market-wide effects are less noisy and more homogeneous, which is why my estimations concentrate on the AAR variable. In its general specification, the model follows the equation:

$$\text{AAR} = \alpha_0 + \beta_1 \text{Good Outcome}_t + \beta_2 \text{X}_t + \eta_t + u_t \qquad (3)$$

where t indexes each time under investigation, while η is the estimated fixed effects and u is the error term.[12]

The variable of interest is *Good Outcome*, which is a binary indicator taking on the value 1 for the day in which the official UNFCCC Press Release or the Summary of the Earth Negotiation Bulletin report a decision that strengthens the competitiveness of the EU ETS

[10] Results are not sensitive to this estimation window.

[11] Note that UNFCCC meetings take place during weekends, but that investors do not rebalance their books on Saturday and Sunday. Following Bechtel and Schneider (2010), I shift events occurring on nontrading days to the next trading day.

[12] The Hausman test suggests that random effects estimation are suitable. While the substantive results do not change if I estimate random effects, I prefer the fixed effects specification for purposes of causal inference.

and the eligibility of allowances for mitigation. Additionally, I code as 1 the decisions that maintain the right of current traders to receive permits through free allocation. By contrast, the variable takes a value of 0 if outcomes go against the preference of current traders, including decisions of restricting future allowances or constraining mitigation projects under the EU ETS. Because it is unclear when the effect of this variable may start, I also code as 1 the day before and after the relevant announcement. Coding this variable involved a manual content analysis of official documents. As an example, on November 16 2006 the Earth Negotiation Bulletin reports[13]

> [The Parties agree that] the carbon market has tremendous potential, and the Kyoto mechanisms require continuity after the first commitment period to continue their expansion, and [that] the demand for credits generated through the mechanisms increase in future commitment periods to sustain the market value of carbon.

In this case, the agreement that ensures no gap between the ETS commitment periods is coded as 1 because it sends a signal of stability to the revenues of the EU ETS market actors. I then expect β_1 to be positive and statistically significant.

Event studies have the benefit of neutralizing spurious dynamics outside the framework of investigation. Nonetheless, alternative factors may explain the magnitude of abnormal returns during UNFCCC meetings and may confound their relationship with international deliberation. Thus, I include a set of control variables X in the econometric regression. First, international climate meetings are part of a 'two–level' game that governments play with their domestic constituents (Barrett, 1998). International policy agreements can then be driven by what is occurring in home countries, so delegations could spin the negotiations in their domestic interest. To capture this alternative mechanism, I operationalize two variables. *Domestic Policy* is a dummy that takes the value of 1 when any of the twelve EU countries represented in the sample announced a national policy related to climate change mitigation, and 0 otherwise. Information on the dates of these policies was traced in the EU countries' fifth National Communications

[13]Report of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol held at Nairobi in November 2006, `http://unfccc.int/resource/docs/2006/awg2/eng/04.pdf` p. 10-11.

to the UNFCCC. In particular, I coded the announcements of new renewable policies, energy efficiency programs, subsidies for biofuels and transportation policies.[14]

Following the same 'two–level game' logic, *National Elections* can accelerate or slow down debates at international meetings. If costs for international integration are low, then international environmental conferences can lead to efficient outcomes that profit regional investors. But if the stake is high, then elections are politicians' tool to slow down the process of integration, which then indirectly affects investors' behaviour in green markets (Jensen and Spoon, 2011). This variable takes a value of 1 for the scheduled dates of national elections in the EU countries, and 0 otherwise. Notice that I also mark with 1 the day before and the day after these events, to capture the time spillovers of domestic policy announcements and elections.[15]

Finally, I make sure to account for two additional determinants of financial returns that are perhaps endogenous to financial returns, but that risk to otherwise influence the link between international outcomes and private profits. Media expectations on UNFCCC meetings can be an important confounder, because special occasions that convince the public to closely follow international meetings may be the reason why firms benefit from temporary investments. For example, in Copenhagen the media became extensively interested in hearing President Obama giving his first speech on climate change. To control for the 'hot air' produced by non–voting masses outside of the international institutions, I include the measure *Relevant Internet Searches* of climate change issues. This is an indicator that tracks internet–users interests in international climate events. Following Pelc (2013), I use Google Insights to retrieve the volume of weekly web searches for words such as "climate change negotiations", "Kyoto Protocol" and

[14]Among the most relevant European national bills it is worth mentioning the British Climate Change and Sustainable Energy Act of April 2006 and the German adoption of the Biofuels Quota Act in July 2006. See `http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/3625.php`

[15]Financial returns may be also sensitive to National Allocation Plans as shown by the price crush in early 2006, so I additionally coded *NAP announcements* notified by the European Commission to the EU15 countries. Information on these announcements is found here: European Commission Climate Plan at `http://ec.europa.eu/clima/policies/ets/pre2013/nap/index_en.htm`. Access 08 March 2014. However, since no NAP was announced within the estimation framework chosen for my analyses, the effects are inevitably null, so I do not report this variable in the estimations.

"climate politics". I restrict my search to English queries in the EU15 countries.[16] Additionally, in alternative estimations I include the value of *Carbon Price* to make sure that changes in firms' profits are not driven by alternative mechanisms that influence the price of the CO2 market. Note that *Relevant Internet Searches* and *Carbon Price*, which are both non-stationary series, are included both as lags and rates to simultaneously account for their levels and their changes.

Results

Table 3 reports the estimated coefficients for three permutations of the model of AAR. To start with the univariate correlation in Model 1, I find that positive outcomes are positively and significantly correlated with the average EU ETS abnormal returns. The point estimate suggests that strengthening the provisions of carbon trading for firms in the EU ETS increases average profits by about 0.07 percentage points. This is not an irrelevant amount if one considers the market value of some of the EU firms. Given that the value of the total firms in the EU ETS was about 16 billion US dollars as of April 2006, a 7 percent change in sector returns due to positive signals from international climate negotiations equals a change of almost a billion of US dollars. This result is confirmed by the estimations of the less restricted models. Although I find that the occurrence of national elections and the announcement of domestic climate policies affects financial returns, the release of information from the climate negotiations remains a robust and significant covariate of firms' financial returns. The variable *Good Outcome* remains positive and statistically significant above the 95 percent confidence interval also in Model 3, which includes the effects of relevant internet searches and the trends of carbon prices.

To evaluate the results for the EU ETS individual companies, I estimate the same models

[16]The language chosen to gather data on Google Insight is English. Making this choice is necessary to obtain comparable data across the EU countries. Note that Google Insight data do not include weekends and are automatically standardized for seasonality and other temporal trends. There are reasons to believe that this data is mostly reflective of searches in Germany, UK, and to a lesser extent Italy, France, Belgium and the Netherlands searches, due to the fact that many of these are the most populated EU countries. Moreover, Germany and the UK navigate in English much more than other European countries. Despite these limitations, the Google Insight series create standardized measure across countries and time.

for firm-specific abnormal returns, AR_{it}. Model 1 in Table 4 includes only fixed effects and reveals that 'good news' from the UNFCCC cause positive wealth shocks at the individual time-varying firm level. The magnitude of the point coefficient is virtually equivalent to the one for average abnormal returns. However, including the control variables weakens precision, and the variable *Good Outcome* eventually loses statistical significance. Individual firms seem to be sensitive to national elections more than any other events included in the model. Moreover, the daily volume of internet searches for climate policy news has a positive and statistically significant coefficient, to indicate that media effects may be an important explanation for how firms profit from international climate negotiations. Nonetheless, the coefficient that measure the success of international climate announcements remains consistently positive, suggesting that information from international decision makers may render investors enthusiastic about the profits of EU ETS firms.

These results support the main hypothesis of this study, but only provide an aggregate perspective of how international meetings cause short-term economic reactions. In order to investigate the heterogeneity across sectors, I break the sample into firms that belong to the same industries. Table 5 reports these models of mean returns for (1) mining firms, (2) manufacturing firms, and (3) power and electricity firms. The results from the full models indicate that the bigger profiteers of the international strengthening of carbon market regulations are manufacturers and, to a lesser extent, oil companies. This is consistent with previous findings that indicate that power firms are the biggest buyers of allowances, while manufacturers are net sellers (Oestreich and Tsiakas, 2013). Moreover, the result can be interpreted as evidence that the economic actors that would lose from a stringent carbon trading system are the ones that can feasibly relocate, e.g. manufacturers. Thus, even 'soft' decisions like international climate agreements can exacerbate – or prevent – the problem of carbon leakage (Babiker, 2005).

The empirical data presents important insights for the theory that firms that have a stake on climate regulation benefit from international climate meetings. In particular, I showed that firms that in the first phase of the EU ETS took advantage of free allowances benefited from

international events that consolidated their incentive structures. This said, it is important to recognize the some caveats could apply to these results. For example, at this time the EU ETS was a very new market, and one may question whether these results hold for later periods when more information had been provided on the effectiveness of climate meetings and the efficiency of carbon trading. To assess whether the theory holds in these circumstances, I run the same regressions on data between 2008 and 2010. This period corresponds to the second phase of the EU ETS, when 90 percent of the total European allocations were allocated for free and 10 percent through auctions. If the argument is valid, then returns should still be abnormally higher during the climate meetings but with less magnitude, because firms are now more involved in the purchase of pollution permits. Table 6 shows the results for the average abnormal returns based on this more recent set of data. I find that returns are still significant and positive in the aftermath of international climate decision related to carbon policies, although at lower levels of significance compared to the findings for 2005 and 2007. The coefficients are also positive for the AR regressions (not reported).[17]

To further examine the robustness of the results, I re-estimated the effect of UNFCCC outcomes on abnormal and average abnormal returns varying the estimation window of the event study design. One might argue that these negotiations receive attention only as the negotiations start or only up to the end day of the meeting. Therefore, I ran the models using two more constrained event windows. The result reported in the Appendix is that the coefficient of the *Good Outcome* variable remains positive and statistically significant. Thus, meetings that are associated with increased climate policy integration induce higher abnormal defense returns. I also re-estimated the models by dropping all UK companies, in light of the fact that these may behave systematically different from other companies because the UK has a special approach to EU affairs and EU economic integration. The regressions coefficients for these models show that the coefficient of *Good Outcome* only becomes more significant.

[17]Although *National Elections* for this period are coded, no election occurred in any of these event windows.

Similarly, regressions that estimate standard errors clustered on the countries maintain the substantive findings virtually unaltered.

Conclusion

Understanding how environmental politics affect economic profits is a complex and important puzzle in political economy research. Most explanations for how markets react to green regulation have so far focused on the effects of green regulation at domestic levels. However, international environmental deliberation can also have important economic repercussions, especially if economic incentives are linked to international regulation. In the case of climate change, emission trading is an example of a local policy that relies on international climate policy decisions. Therefore, in this paper I explored the possibility that international climate decisions may cause abnormal variation in returns for firms involved in international carbon trading.

I argued that global environmental cooperation should hurt profitability if firms lack domestic economic protection that shields them from the costs of environmental adjustments. By contrast, if firms are protected with respect to international competitors, they can adjust to global environmental decisions and therefore raise market expectations on their profitability. Focusing on the European Union Emission Trading Scheme, I have hypothesized that EU ETS firms should profit from further cap-and-trade integration because these obtained free allowances that give them a comparative advantage vis-à–vis foreign firms without allowances. Thus, EU ETS companies should benefit from cooperative signals from the main body of international climate policy making, the UNFCCC.

The paper leverages an event study approach to analyze stock price behavior of 38 firms during a number of international climate meetings. The empirical analysis lends support to the view that financial markets carefully evaluate the climate change meetings. I find that EU ETS investors react positively to multilateral decisions that strengthen the purpose of green

regulation and emission trading. Therefore, the data suggests that international climate change decisions affect profit substantially, but that the repercussions are not related to compliance costs as long as firms are protected from the risk of competitive disadvantage.

The finding is important because it provides new insights on the debate of industrial lobbies and firms under environmental regimes. Showing that market-based green policies are associated with heterogenous preferences and complex incentive structures, this paper suggests that economic actors are not always opposing environmental regulation and not at all conditions. The analysis suggests that understanding the mechanism behind firms' environmental behavior is crucial to understand the effects and successes of environmental agreements. At the same time, the results bring into discussion the uselessness of global governance and international organizations. If markets respond to economic events channelled through international institutions, it is possible that effective decision making within international institutions may be underestimated because systematic evidence on how these matter is often missing.

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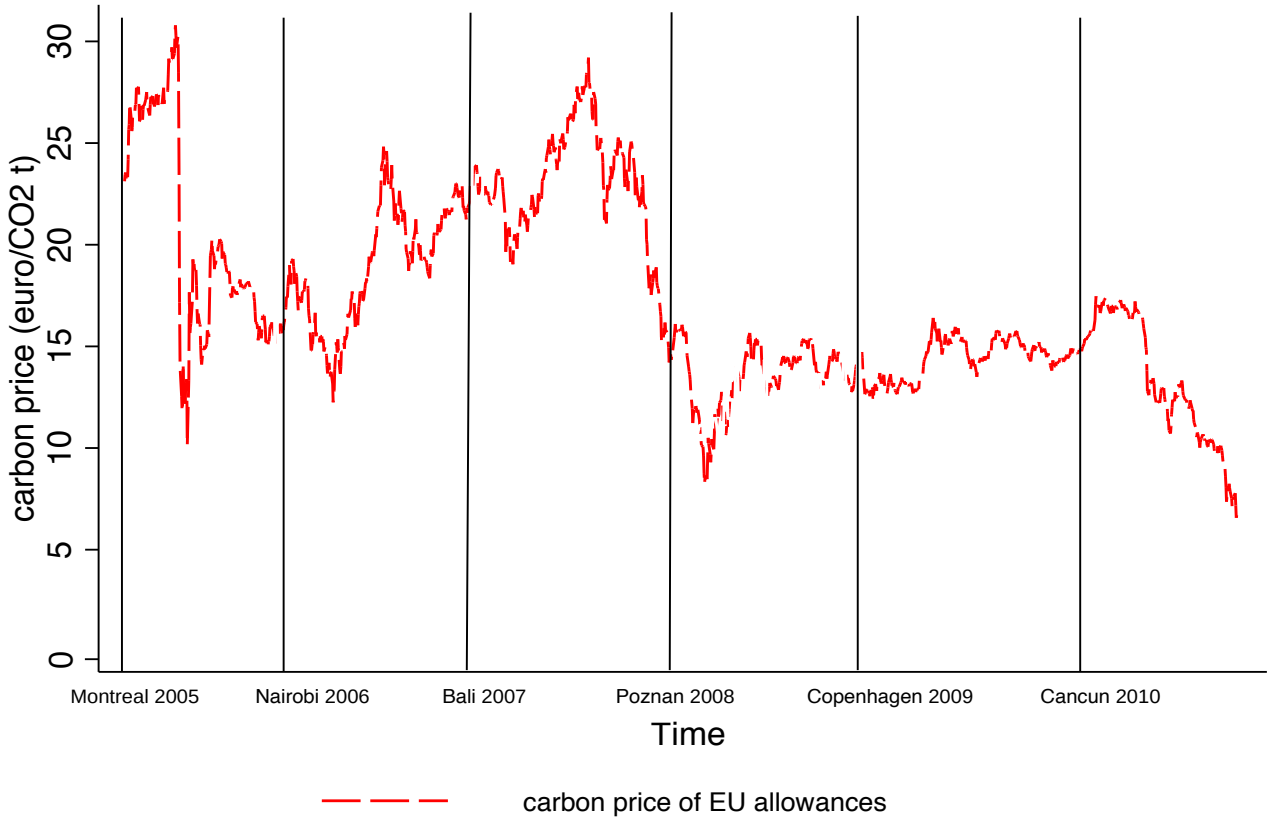
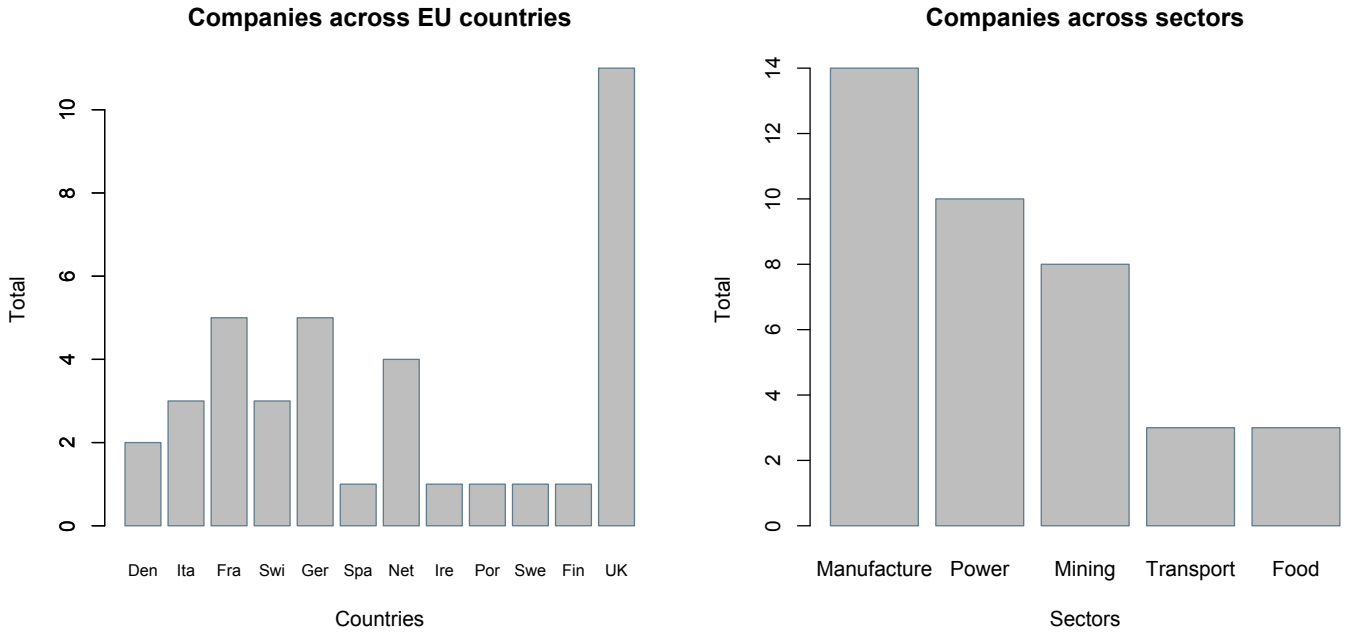
Figure 1: EU ETS price trends and international climate negotiations



European Union Allowance price is in Euros and comes from the Intercontinental Exchange (ICE). Bars corresponds to the first day of each high–level segment of the Conference of the Parties (COP).

Figure 2: EU ETS sample



Companies represent the state in which stocks are traded. Sectors are defined accordingly to the UN International Standard Industrial Classification (ISIC).

Figure 3: EU ETS average returns, 2005-2007

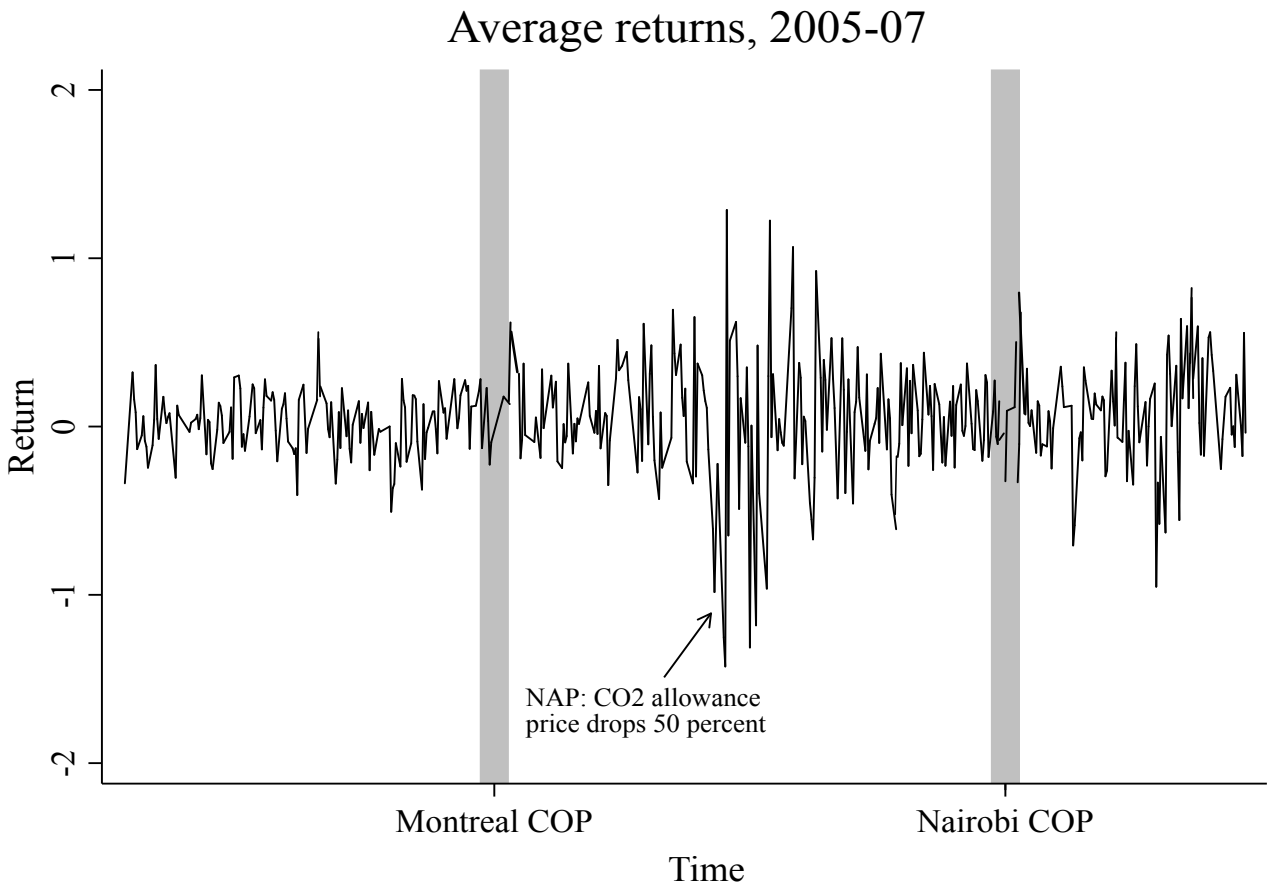


Table 1: Selected UNFCCC meeting decisions

Meeting	*Dates*	*Outcomes*
Montreal	28 Nov – 9 Dec 2005	Assigned tradable credits from land use until end of first commitment period.
Nairobi	6 Nov – 17 Nov 2006	Issuance of 18.8 million certified emission reductions and designation of 17 operational credit entities.
Bali	3 Dec – 15 Dec 2007	Annex B parties are allowed to participate in EU ETS with CERs.
Poznan	1 Dec – 13 Dec 2008	Assigned tradable credits from land use until second commitment period and EU announcement of ETS Phase III rules.

Information assembled from the Decision texts of each COP available on the UNFCCC online archives and the Earth Negotiations Bulletin's summaries published at the conclusion of each respective COP.

Table 2: Sampled EU ETS companies

ATKINS	EADS
ASTRAZENECA	ERAMET
BAE SYSTEMS	EIFFAGE
BRITISH AMERICAN TOBACCO	AKZO NOBEL
BG GROUP	ENEL
BHP BILLITON	ENI
BP	FORTUM
CENTRICA	CIMPOR
CRH	EDP ENERGIAS DE PORTUGAL
BMW	KONINKLIJKE DSM
CONTINENTAL	ABB
CLARIANT	CIBA N
E ON	SHELL
FRESENIUS	ATEL HOLDING
DIAGEO	BOLIDEN
DANISCO	MOLLER - MAERSK
ACERINOX	AIR LIQUIDE
AIR LIQUIDE	ALSTOM
ALSTOM	DANONE

Table 3: Short-run effect of UNFCCC decisions on EU ETS returns: Average Abnormal Returns

	(1)	(2)	(3)
Good Outcome	0.070***	0.054**	0.092***
	(0.019)	(0.015)	(0.025)
National Elections		0.080**	0.052**
		(0.024)	(0.015)
Domestic Policy		-0.11**	0.011
		(0.034)	(0.032)
Relevant Internet Searches δ			0.001**
			(0.000)
Relevant Internet Searches$_{t-1}$			0.004***
			(0.001)
Carbon Price δ			0.009
			(0.006)
Carbon Price$_{t-1}$			0.014^{+}
			(0.007)
Constant	-0.060***	-0.054***	-0.54**
	(0.0037)	(0.0030)	(0.17)
N	1582	1582	1094
Firms	38	38	38
Fixed effects	yes	yes	yes
R^2	0.016	0.066	0.14
ll	169.1	210.5	220.2

Linear (Generalized Least Squares) coefficients.
Robust standard errors in parentheses. Dependent variable is AAR.
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4: Short-run effect of UNFCCC decisions on EU ETS returns: Individual Firms' Abnormal Returns

	(1)	(2)	(3)
Good Outcome	0.088^{+}	0.060	0.094
	(0.050)	(0.048)	(0.065)
National Elections		-0.002	-0.30^{**}
		(0.023)	(0.089)
Domestic Policy		-0.17^{*}	-0.012
		(0.077)	(0.058)
Relevant Internet Searches δ			0.022^{+}
			(0.012)
Relevant Internet Searches$_{t-1}$			0.008^{**}
			(0.002)
Carbon Price δ			-0.030
			(0.038)
Carbon Price$_{t-1}$			0.020^{*}
			(0.0093)
Constant	-0.077^{***}	-0.048^{***}	-0.74^{**}
	(0.0070)	(0.013)	(0.22)
N	1360	1360	983
Firms	38	38	38
Fixed effects	yes	yes	yes
R^2	0.009	0.004	0.024
ll	-1920.7	-1918.5	-1404.7

Linear (Generalized Least Squares) coefficients.
Robust standard errors in parentheses. Dependent variable is AR_{it}
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5: Short-run effect of UNFCCC decisions on EU ETS returns: Average Abnormal Returns by Sector

	(1)	(2)	(3)
	Mining	Manufacture	Power
Good Outcome	0.13^{+}	0.10^{*}	0.035
	(0.07)	(0.037)	(0.045)
National Elections	0.075	0.054^{*}	0.020
	(0.040)	(0.021)	(0.027)
Domestic Policy	0.11	0.051	-0.074
	(0.12)	(0.037)	(0.063)
Relevant Internet Searches δ	0.001	0.001^{*}	0.001
	(0.001)	(0.0004)	(0.001)
Relevant Internet Searches$_{t-1}$	0.006	0.005^{*}	0.002
	(0.003)	(0.002)	(0.002)
Carbon Price δ	0.030	0.010^{+}	-0.009
	(0.024)	(0.0054)	(0.005)
Carbon Price$_{t-1}$	0.040	0.019^{*}	-0.008
	(0.031)	(0.0072)	(0.0047)
Constant	-1.15	-0.63^{**}	0.033
	(0.71)	(0.20)	(0.044)
N	232	406	282
Firms	8	14	10
R^2	0.20	0.24	0.062
ll	-41.2	173.7	130.2

Linear (Generalized Least Squares) coefficients.
Robust standard errors in parentheses. Dependent variable is AAR.
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 6: Short-run effect of UNFCCC decisions on EU ETS returns: Average Abnormal Returns (Phase II)

	(1)	(2)	(3)
Good Outcome	0.085*	0.087*	0.080*
	(0.031)	(0.032)	(0.031)
Domestic Policy		0.087*	0.085*
		(0.032)	(0.033)
Relevant Internet Searches δ			0.00
			(0.00)
Relevant Internet Searches$_{t-1}$			-0.001
			(0.001)
Carbon Price δ			0.007
			(0.004)
Carbon Price$_{t-1}$			-0.004^{+}
			(0.002)
Constant	-0.022***	-0.024***	0.071
	(0.0017)	(0.0023)	(0.050)
N	2072	2072	1628
Firms	37	37	37
Fixed effects	yes	yes	yes
R^2	0.018	0.025	0.066
ll	1123.9	1130.8	923.6

Linear (Generalized Least Squares) coefficients.
Robust standard errors in parentheses. Dependent variable is AAR.
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Appendix

Table A.1: Short-run effect of UNFCCC decisions on EU ETS returns: Alternative Event Windows

	(1) AAR	(2) AAR	(3) AR_{it}	(4) AR_{it}
Good Outcome	0.092***	0.081***	0.071	0.14
	(0.017)	(0.018)	(0.098)	(0.11)
National Elections	0.052*	0.00083	-0.25*	-0.35*
	(0.022)	(0.028)	(0.11)	(0.15)
Domestic Policy	0.011	0.029	-0.061	0.035
	(0.025)	(0.026)	(0.12)	(0.14)
Relevant Internet Searches δ	0.001	0.001	0.008	0.023**
	(0.001)	(0.001)	(0.005)	(0.008)
Relevant Internet Searches$_{t-1}$	0.004***	0.005***	0.006*	0.010**
	(0.00058)	(0.000)	(0.003)	(0.003)
Carbon Price δ	0.0092	0.0058	0.0036	-0.013
	(0.0080)	(0.0086)	(0.040)	(0.046)
Carbon Price$_{t-1}$	0.014***	0.017***	0.020	0.026
	(0.0025)	(0.002)	(0.013)	(0.017)
Constant	-0.54***	-0.59***	-0.66**	-0.95**
	(0.052)	(0.061)	(0.25)	(0.36)
N	1094	1018	1059	907
Firms	38	38	38	38
Fixed effects	yes	yes	yes	yes
R^2	0.14	0.14	0.015	0.023
ll	220.2	199.1	-1501.9	-1315.5

Robust standard errors in parentheses.
Model 1 and 3 truncate the estimation by one day at the start of the window.
Model 2 and 4 truncate the estimation by one day at the end of the window.
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table A.2: Short-run effect of UNFCCC decisions on EU ETS returns: Excluding UK Companies

	(1) AAR	(2) AR_{it}
Good Outcome	0.13***	0.15
	(0.032)	(0.089)
National Elections	0.072***	-0.37**
	(0.019)	(0.12)
Domestic Policy	0.006	-0.019
	(0.043)	(0.085)
Relevant Internet Searches δ	0.0014**	0.029^{+}
	(0.00038)	(0.017)
Relevant Internet Searches$_{t-1}$	0.006***	0.011**
	(0.001)	(0.003)
Carbon Price δ	0.0093	-0.046
	(0.0081)	(0.053)
Carbon Price$_{t-1}$	0.017^{+}	0.026*
	(0.009)	(0.013)
Constant	-0.67**	-0.94**
	(0.23)	(0.30)
N	783	702
Firms	27	27
Fixed effects	yes	yes
R^2	0.18	0.030
ll	55.2	-1111.1

Linear (Generalized Least Squares) coefficients.
Robust standard errors in parentheses
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table A.3: Short-run effect of UNFCCC decisions on EU ETS returns: Average Abnormal Returns with Country Clustered Standard Errors

	(1) AAR	(2) AR_{it}
Good Outcome	0.092^{+}	0.094
	(0.047)	(0.080)
National Elections	0.052^{+}	-0.30^{*}
	(0.027)	(0.11)
Domestic Policy	0.011	-0.012
	(0.021)	(0.050)
Relevant Internet Searches δ	0.0010^{+}	0.022^{+}
	(0.00053)	(0.012)
Relevant Internet Searches$_{t-1}$	0.004^{+}	0.008
	(0.0023)	(0.0047)
Carbon Price δ	0.009^{+}	-0.030
	(0.004)	(0.047)
Carbon Price$_{t-1}$	0.014^{*}	0.020^{+}
	(0.0061)	(0.010)
Constant	-0.54^{*}	-0.74^{+}
	(0.22)	(0.35)
N	1094	983
Firms	38	38
Fixed effects	yes	yes
R^2	0.14	0.024
ll	220.2	-1404.7

Linear (Generalized Least Squares) coefficients.
Standard errors clustered on countries in parentheses
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table A.4: Short-run effect of UNFCCC decisions on EU ETS returns: Montreal COP

	(1)	(2)	(3)
Good Outcome	0.14**	0.14**	0.10**
	(0.040)	(0.039)	(0.030)
National Elections		0.058**	0.052**
		(0.017)	(0.016)
Domestic Policy		0.27***	0.29***
		(0.066)	(0.069)
Relevant Internet Searches δ		-0.003**	-0.009***
		(0.001)	(0.0025)
Relevant Internet Searches$_{t-1}$		-0.001^{+}	-0.017***
		(0.000)	(0.004)
Carbon Price δ		0.051***	0.049***
		(0.014)	(0.013)
Carbon Price$_{t-1}$		0.056***	0.056***
		(0.015)	(0.014)
un_climate_cop			0.36**
			(0.10)
Constant	-0.074***	-1.15***	-0.59***
	(0.0042)	(0.28)	(0.13)
N	1050	676	676
Firms	38	38	38
Fixed effects	yes	yes	yes
R^2	0.030	0.23	0.24
ll	-2.97	81.1	87.6

Linear (Generalized Least Squares) coefficients.
Robust standard errors in parentheses. Dependent variable is AAR.
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table A.5: Short-run effect of UNFCCC decisions on EU ETS returns: Nairobi COP

	(1)	(2)	(3)
Good Outcome	0.093**	0.067**	0.038**
	(0.027)	(0.020)	(0.011)
National Elections		0.088**	0.11**
		(0.026)	(0.032)
Domestic Policy		-0.14**	-0.11**
		(0.045)	(0.031)
Relevant Internet Searches δ		0.002**	0.002**
		(0.000)	(0.000)
Relevant Internet Searches$_{t-1}$		0.003**	0.003**
		(0.000)	(0.000)
Carbon Price δ		-0.023**	-0.016**
		(0.006)	(0.004)
Carbon Price$_{t-1}$		-0.026**	-0.020**
		(0.008)	(0.005)
un_climate_cop			0.054**
			(0.016)
Constant	-0.11***	0.19^{+}	0.073
	(0.0050)	(0.11)	(0.053)
N	1026	760	760
Firms	38	38	38
Fixed effects	yes	yes	yes
R^2	0.052	0.23	0.24
ll	459.4	421.7	427.0

Linear (Generalized Least Squares) coefficients.
Robust standard errors in parentheses. Dependent variable is AAR.
$^{+}$ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$