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Emission abatement: Untangling the impacts of the EU ETS and the economic crisis

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ABSTRACT

In this study we use historical emission data from installations under the European Union Emissions Trading System (EU ETS) to evaluate the impact of this policy on greenhouse gas emissions during the first two trading phases (2005–2012). As such the analysis seeks to disentangle two causes of emission abatement: that attributable to the EU ETS and that attributable to the economic crisis that hit the EU in 2008/09. To do so, we use a dynamic panel data approach. Our results suggest that, by far, the biggest share of abatement was attributable to the effects of the economic crisis. This finding has serious implications for future policy adjustments affecting core elements of the EU ETS, including the distribution of EU emission allowances.

1. Introduction

The impact of climate change is today well known, as is its principal cause, the emissions of manmade greenhouse gases (GHGs). Indeed, this causality has been acknowledged by several national governments and various treaties have been signed to counter the trend. To achieve these goals the EU Emissions Trading System (EU ETS) was launched to cut the costs of GHG emissions by relying on market mechanisms. Since its introduction the policy has developed considerably, experiencing a number of turbulent phases as well as the impact of the 2008/09 economic crisis. Undoubtedly, the economic downturn has also affected GHG emissions. However, it is unclear how great this impact has been and what share of the reduction in emissions can be attributed to the EU ETS and what share can be attributed to the economic crisis. Untangling the effects of the EU ETS from those of the economic crisis on emission abatement is the first contribution made by this paper.

With this objective in mind, this study adopts a panel data approach to untangle the respective impacts. What distinguishes this paper from previous studies is that, instead of relying on estimated emission data, we use the verified emission data reported by each installation under the policy. As such our results are not dependent on forecasts that are subject to a certain degree of uncertainty but rather are based on actual historic data.

The study is organized as follows. First, we describe the EU's system for trading emissions and review the literature dealing with its impact on emission reduction. We then present the data used in the regression, along with an overview of GHG emissions. This section is followed by an outline of the model's specifications and the estimation technique. We then present and discuss our results. Finally, we draw the main conclusions and identify the primary policy implications for the EU ETS.

2. Policy description

The EU ETS was officially launched in 2005. It was the first and largest market-based regulation mechanism to reduce GHG emissions and can be considered the "flagship" policy of the European Commission (EC) in its fight against climate change. To date, it operates in the 28 member states of the EU, plus Lichtenstein, Norway, and Iceland. The main principle of the EU ETS is "cap and trade", where cap refers to an EU-wide cap for GHG emissions set by the EC that is progressively reduced each monitoring period. Companies under the cap are required to cover their emissions with EU emission allowances (EUAs), which are handed out free of charge or auctioned. EUAs, however, can be traded among facilities or countries enabling those that run short of allowances

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to purchase additional EUAs and so avoid penalization in the event of non-submission. More specifically, installations subject to the policy have to surrender one allowance for every ton of CO_2 that they emit; otherwise, they are subject to heavy fines.

Currently, over 11,000 installations are covered by the policy, accounting for around 45% of the participating countries' total GHG emissions (European Commission, 2013). Since the main aim of the policy is to cut industrial GHG emissions only the major emitting sectors (including, oil refineries, steel works and producers of iron, aluminum, metals, cements, lime, glass, ceramics, pulps, cardboards, acids, and bulk organic chemicals) and the energy sector are subject to the policy. However, energy production and electricity/heat production account for the lion's share of GHG emissions at around 32% of the EU-27's total GHG emissions (European Environment Agency, 2011).

EUAs are distributed by auctioning or are handed out for free. In the first two phases of the EU ETS (2005–2012) EUAs were typically given away for free with just a small number being auctioned off; however, today auctioning has become the default method for allocating allowances. This applies particularly to the power generation sector,[1] which from 2013 on is required to buy all of its allowances, because previously the sector was able to pass on its emission costs to final consumers despite receiving allowances for free creating windfall profits (Fabra and Reguant, 2014; Point Carbon, 2008). In other sectors, such as manufacturing, the number of free allowances has been reduced gradually from a free-of-charge share of 80% in 2013 to a scheduled 30% in 2020. Allowances that are not given away for free are auctioned at the European Energy Exchange (EEX) or ICE Futures Europe (ICE) which serves as the United Kingdom's platform.

Since its launch in 2005, the EU ETS has gone through a number of changes each marking the beginning of a new phase in EU policy. The first phase of the EU ETS (2005–2007) was a pilot period of "learning by doing" (The European Commission, 2014). The main achievements during this phase were the creation of an EU-wide database recording GHG emissions from all participating installations. This was essential for calculating the number of EUAs to be handed out free of charge in the following phase. Given the absence of reliable emission data prior to 2005, the initial emission cap and the corresponding amount of allowances were based on historical emission data (Georgiev et al., 2011). However, emission forecasts greatly exceeded actual emissions, which resulted in an oversupply of EUAs and meant that in 2007 the price of the EUAs fell to zero (Griffin, 2009).

In the second phase (2008–2012) the EU ETS underwent several changes. First of all, Lichtenstein, Norway, and Iceland joined the system increasing the number of participants to 30.[2] The cap was tightened by 6.5% with respect to 2005 to counter the price deterioration while EUAs from the first phase could not be transferred to the second, thus tackling the same problem. Moreover, a certain proportion of EUAs (around 10%) were auctioned off among the installations. From 2008 onwards, the policy adhered to the goals set by the Kyoto Protocol, namely, cutting its 1990 levels of GHG emissions by 8% in the period through to 2012. However, designed as it is to cut GHG emissions, the EU ETS was strongly influenced by the economic crisis that began in late 2008. The crisis led to an oversupply of EUAs and a fall in their price (see below for a more detailed discussion).

The EU ETS is currently in its third phase (2012–2020), characterized by even more radical policy changes than was the case in the transition from phase I to II. In the third phase a single EU-wide cap has been set as opposed to national caps. As discussed above, the number of allowances being auctioned has increased sharply. Finally, the cap on emissions is reduced annually by 1.74% so as to achieve an emission abatement of 21% in 2020 compared to the 2005 level.

[1] Under Article 10c of the revised EU ETS Directive Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Lithuania, Poland, and Romania can hand out a certain number of their EUAs free of charge through to 2020, albeit in a progressively decreasing manner.

[2] Romania and Bulgaria joined the EU ETS on accession to the EU in 2007.

3. Literature review

The literature discussing the EU ETS examines many facets, including evaluations of investment incentives in low-carbon technology (Martin et al., 2011; Rogge et al., 2010), competitive analyses (Graichen et al., 2009), and appraisals of its impact on profits and product prices (Point Carbon, 2008; Sijm et al., 2006). Several studies also evaluate its impact on GHG abatement and, given that this is the specific focus of the present study, only papers dealing with this question are discussed in detail below.

One of the first attempts at evaluating the effectiveness of the EU ETS in reducing GHG emissions was conducted by Ellerman and Buchner (2008). The authors artificially create a counterfactual (hypothetical emissions without the EU ETS) and compare these emissions to real emissions from sectors under the policy. They do this by using emissions from 2002 as a baseline and projecting these figures through to 2006 taking into account such factors as real GDP growth, energy intensity of the EU economy and single sectors, energy prices and the carbon intensity. The authors conclude that emissions were reduced by 130–200 megatons (MgT) in 2005 and by 140–220 MgT in 2006 by the EU ETS.

Anderson and Di Maria (2010) also seek to identify the abatement achieved by the EU ETS. In line with Ellerman and Buchner (2008), the authors forecast business-as-usual (BAU) emissions, and compare forecasts with observed emissions from participating installations for the first phase of the EU ETS. However, their approach differs from that adopted by Ellerman and Buchner as they estimate BAU-emissions using a dynamic panel approach with the baseline emission data being taken from Eurostat and matched to the participating sectors of the EU ETS. By comparing BAU-emissions to real data for the first phase, the authors estimate a GHG abatement of 247 MgT and, moreover, a year-on-year decrease in the rate of abatement.

The two studies reviewed above only examine the first phase (2005–2007) of the EU ETS. Georgiev et al. (2011), however, extend Ellerman and Buchner's (2008) approach to the first two years of the second phase (2008–2009). The main difference is that they use emissions from the first phase of the EU ETS as a baseline; specifically, they draw on the first three years of the policy as BAU-conditions for the forecast. But, as discussed in Georgiev et al. (2011), the resulting projection and, hence, the GHG abatement should be treated with caution given that the number of observations in the projection is insufficient to be robust and, moreover, they question the reliability of the BAU conditions owing to the impact of the 2008/09 economic crisis.

As the three studies discussed above evaluate the EU ETS before the 2008/09 economic crisis or by employing BAU-conditions that do not capture the impact of the latter, their results fail to account for the major economic changes experienced by the EU and obvious impacts on GHG emissions. Accordingly, the BAU conditions for the emission projections need to be adjusted to ensure forecast reliability.

Taking the influence of the economic recession into account, Declercq et al. (2011) set up a counterfactual scenario by forecasting the GHG emissions for the power sector to determine 2008 and 2009 abatement under the EU ETS. As determinants they consider the demand for electricity, the CO_2 price, and fuel prices. The estimated effect of the economic downturn results in an abatement of 150 MgT of CO_2 for the power sector over the years 2008 and 2009, with the reduction in demand for electricity accounting for a major share of abatement.

The most striking characteristic of any evaluation of the literature assessing the EU ETS and its effect on GHG emissions is that nearly all the studies[3] create counterfactuals artificially using BAU forecasts. As

[3] One exception is the firm-level research conducted by Abrell et al. (2011). To assess the impact of the EU ETS on emissions at the firm level the study uses panel data from more than 2000 participating firms for the years 2005–2008. However, the study was conducted before the economic crisis and so does not assess the effect of the recession on CO_2 emissions.