Energy Policy 98 (2016) 607–620

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Trader types and volatility of emission allowance prices. Evidence from EU ETS Phase I

Anca Claudia Balietti

Center for International Development, Harvard Kennedy School, Cambridge, MA, United States

HIGHLIGHTS

- We study the permit price volatility–trading activity link in the EU ETS Phase I.
- We focus on the contrasting roles of different market players.
- We show that the relation was overall positive, mainly due to energy providers.
- Many other players remained inactive and traded more when volatility was lower.
- Policies for the engagement of less active traders could increase market efficiency.

ARTICLE INFO

Article history:
Received 27 November 2015
Received in revised form
22 August 2016
Accepted 3 September 2016

Keywords:
EU ETS
Permit price
Volatility
Liable and non-liable participants
Market efficiency

ABSTRACT

This paper studies the relation between the trading activity of market participants and the volatility of the European Emission Allowance price during Phase I of the European Union Emission Trading System (EU ETS). We focus on the contrasting roles of different trader types.

We find evidence of a positive and significant trading activity–volatility relation, which appears to be stronger when accounting for trader type. The positive relation can be mainly attributed to energy providers. In contrast, industrial companies seem to have traded more frequently when volatility levels were lower. Finally, the non-liable players, represented by financial intermediaries, appear to have acted as a flexible counterparty, trading more with the energy sector when volatility was higher, and more with the industrial firms when volatility was lower. We discuss possible explanations for these contrasted positions.

Understanding the trading activity–volatility link is relevant for evaluating the efficiency of the EU ETS. Although the relation is generally positive, many players remained often inactive and traded mostly when volatility levels were lower. Policies targeting the engagement of less active players could lead to a smoother incorporation of information into prices and to an increase in market efficiency.

1. Introduction

Due to the pressing dangers of climate change and the low progress on international mitigation agreements, individual jurisdictions (at country or regional level) have started to develop domestic solutions to reduce emissions. The proposed regulations take different forms around the world, relying on cap-and-trade schemes, carbon taxes, subsidies for energy efficiency improvements, and setting of energy efficiency standards.

Emission allowance markets are expected to offer a cost-efficient solution to handle environmental externalities from production (Dales, 1968; Montgomery, 1972; Rubin, 1996; Cronshaw and Kruse, 1996). The European Union Emission Trading System (EU ETS) and the regional carbon markets set in China[1] are examples of existing market approaches to pollution regulation.

The EU ETS started its activity in 2005 and aims to regulate the greenhouse gas (GHG) emissions of its area.[2] It has been divided into four compliance phases so far: Phase I 2005–2007, Phase II 2008–2012, Phase III 2013–2020, and Phase IV 2021–2028. Phase I was intended to test and evaluate the performance of the emission market. Phase II imposed an emission reduction target in line with the Kyoto Protocol's first commitment period. Phase III brought along considerable revisions to the system's operational design,

E-mail address: anca_balietti@hks.harvard.edu

http://dx.doi.org/10.1016/j.enpol.2016.09.006
0301-4215/

[1] ETS schemes have opened since 2013 in six Chinese provinces, making China the second largest carbon market in the world after the EU ETS (World Bank, 2014).

[2] The EU ETS currently covers more than 11,000 installations in 31 countries: the 28 European states as well as Iceland, Lichtenstein, and Norway.

concerning, in particular, the permit allocation procedure and the imposition of an EU-wide emissions cap. The rules of Phase IV are still under development. In this paper, we focus on the (pilot) Phase I.

The EU ETS works on a *cap-and-trade* principle. The heavy polluters of the European industry are periodically assigned an overall emission limit. At the beginning of each compliance year, liable entities are allocated European Union Allowance Units (EUAs). While the allocation was done almost entirely for free in the first years of the EU ETS, auctioning has been the main method of allocation since 2013. Within the cap, liable entities can trade EUAs according to their compliance needs. For emission levels below the cap, unused permits are eligible for sale; at the end of each compliance year, penalties and additional permits need to be provided in case of uncovered emissions. On the carbon markets, both regulated (liable) and non-regulated (non-liable) entities can trade permits.

Since the opening of the EU ETS, the permit price has diverted significantly from its theoretical optimum, the marginal abatement cost. Instead, EUA prices have been fairly volatile, experiencing at times jumps, and converging to zero due to excess supply (Paolella and Taschini, 2008; Daskalakis et al., 2009; Uhrig-Homburg and Wagner, 2009; Hintermann, 2010, 2012).

An extended thread of literature has steadily evolved since the opening of the EU ETS, trying to pinpoint the drivers behind the atypical evolution of carbon prices. A first branch of literature considers that, in an efficient market, prices are related to fundamentals. For Phase I, several studies identify energy prices and weather conditions as the main drivers of carbon prices (Christensen et al., 2005; Bunn et al., 2007; Mansanet-Bataller et al., 2007). Alberola et al. (2008a) underline the additional influence played by unanticipated temperature changes during colder periods and by institutional decisions regarding permit allocation. Hintermann (2010) finds that carbon prices were more likely to reflect marginal abatement costs after April 2006, when fuel prices, temperature, and precipitation began to exercise influence over EUA prices.

Due to the low evidence of abatement and highly volatile prices, researchers started to look for price drivers that go beyond fundamentals related to abatement. The artificially created carbon market is susceptible to various market design properties, such as the possibility of permits transferability from one compliance period to the next (banking) and the allocation process (grandfathering). More importantly, the penalty level and the (perceived) difference between allocated permits and realized emissions have shown a strong influence on price formation (Chesney and Taschini, 2012; Hintermann, 2012).

The properties of the EUA price have also been analyzed from a time series perspective. During Phase I, the carbon price has exhibited structural breaks, jumps, and heavy tails (Paolella and Taschini, 2008; Daskalakis et al., 2009; Uhrig-Homburg and Wagner, 2009). Recent studies draw attention to the indisputable presence of jumps; Chevallier and Sévi (2014) show that, for the period 2009–2010, carbon futures prices do not seem to contain a continuous (Brownian motion) component, and can be better characterized by a centered Lévy or Poisson process.

In this paper, we examine the relation between the volatility of the EUA price and the trading activity of different types of participants in the carbon market. For mature financial markets, previous literature documents a strong and positive trading activity–olatility relation (Clark, 1973; Harris and Raviv, 1993; Shalen, 1993). The association is better explained when distinguishing between different trader types (Daigler and Wiley, 1999). The contribution of this paper is to focus on the artificially created EU ETS market, whose special setting is likely to allow for traders with significantly different characteristics.

One of the few studies that focus on different trader types in the EU ETS is Kalaitzoglou and Ibrahim (2013). The authors use high frequency data to analyse the microstructure of the carbon futures market in Phases I and II. Based on the volumes traded and the duration between consecutive trades, they identify three categories of distinct traders, which they name as: informed, fundamental, and uninformed. The authors seem not to provide, however, evidence that the trader types actually possess the characteristics of their category title, i.e. if they actually have access to different information or not. They argue that most players acted similarly to the *uninformed* type, trading low volumes of long duration, generally for compliance reasons; however, they also identify some periods of intense trading with fast information arrival, when the *informed* type, with high volumes and low duration, had a dominating behavior.

Unlike the work of Kalaitzoglou and Ibrahim (2013), we define trader types according to characteristics that go beyond the observed trading behavior; namely, we focus on the special design of the EU ETS as a compliance market. We rely on three classification criteria: (i) compliance regulation, (ii) initial endowment of permits relative to actual emissions, and (iii) players' exposure to other markets.

Our study uses the European Union Transactions Log (EUTL) to track daily permit transfers across the individual accounts of the liable and non-liable players. Relying on the procedure suggested by Bessembinder and Seguin (1993) and Daigler and Wiley (1999) for mature financial markets, we estimate the trading activity–volatility relation during Phase I of the EU ETS. The procedure consists in simultaneously estimating returns and volatility, via a series of iterations between two equations describing conditional daily price changes and volatility.

Three main findings result from our analysis. First, we show that, common to most financial markets, price volatility is persistent and clusters. Evidence of seasonality is also documented, with volatility being especially high in April. Then, under the EU ETS design, liable firms need to surrender allowances covering their cumulated emissions, and the amount of verified emissions for the preceding year is publicly disclosed. Second, more intense trading activities (larger volumes and higher number of transfers) are generally positively and significantly associated with higher price volatility. Third, the trading activity–volatility relation can be better captured when specifying the sector initiating the trade, the specific counterparty, and whether or not the player acted as a buyer or a seller. The positive association can be attributed in particular to the energy sector, which appears to have traded more during times of higher volatility. In contrast, the industrial sector tended to trade more often when volatility was lower. The non-liable players, mostly represented by financial intermediaries, seem to have acted as a flexible counterparty, answering to the differentiated needs of the liable sectors. They traded more with the energy sector when volatility levels were higher, and more with the industrial companies when volatility levels were lower.

Estimating the trading activity - volatility link can bring insights into the degree of market efficiency of the EU ETS. The aim of the EU ETS is to generate a price signal that can encourage firms to reduce their emissions (Paolella and Taschini, 2008; Bredin et al., 2014) through investments in cleaner technologies. In an efficient market, permit prices should come close to the marginal abatement cost. From a theoretical point of view, price volatility and trading activity should be positively correlated, allowing new information to be incorporated into prices and market participants to adjust their permit holdings accordingly. However, we find that a large share of market participants remained often inactive during Phase I, and tended to trade, on average, more when price volatility was lower. This indicates lower liquidity contributions by some sectors at times of intense information revelation, and could