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The EU Emission Trading Scheme - Insights from the First Trading Years with a Focus on Price Volatility

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Abstract

The EU Emission Trading Scheme (EU ETS) is a key instrument in European climate policy. Evidence from the first trading period (2005-2007) and the first year of the Kyoto period 2008 dampened, however, ex-ante enthusiasm: Because of substantial over-allocation of emissions allowances in the first trading period the overall emissions cap was not stringent which caused a sharp drop in carbon prices. In 2008 a more stringent cap but still high price volatility was observed.

Based on experience from the first years of the EU ETS the design of the EU ETS will be changed for the post-Kyoto period (2013- 2020) including an EU-wide cap and the use of auctioning as the main allocation principle. So far, no measures to control price volatility are envisaged. This issue however gains in importance in the political and economic debate as prices are an important signal for investment decisions. More or less stable price signals are essential for the environmental effectiveness of an emissions trading scheme. As evidence shows, this is not necessarily guaranteed by the market process. Based on an analysis of the first trading years the paper provides an argumentation for the implementation of price stabilisation measures in the post-Kyoto period.

Keywords: climate policy, emissions trading, EU Emission Trading Scheme
JEL codes: Q54, Q58

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1 Motivation

The EU Emission Trading Scheme (EU ETS), which covers about 40% of total EU greenhouse gas emissions (60% of EU CO_2 emissions), is the biggest implementation of a cap-and-trade mechanism to curb emissions worldwide. This innovative policy instrument is both a milestone in European climate policy and a strong incentive for starting similar activities in other regions of the world.

Analyses of the pilot phase (2005-2007) dampened, however, ex-ante enthusiasm (Kettner et al. 2008; Anderson et al. 2009): Because of substantial over-allocation of emissions allowances in most EU member states the overall emissions cap was not stringent. Once this became obvious – after the publication of verified emissions for 2005 in April 2006 – a sharp drop in carbon prices occurred. Thus high price volatility was experienced which translated into uncertainty with respect to companies' decisions about their emissions policy. Lasting low prices for the remaining trading period reduced incentives for investments in low energy and low emissions technologies. In the first year of the Kyoto period, 2008, a more stringent cap was observed according to first empirical results. High price volatility was however still observed in the Kyoto period.

Price development in the EU ETS is mainly driven by the perceived stringency of the aggregate allocation cap (e.g. Alberola et al. 2008). The paper therefore provides a thorough data analysis of allocations and verified emissions for the pilot phase and the first year of the Kyoto period. Based on data available for 24 member states by July 2009 for approximately 10,000 installations evidence on two issues is investigated:

- The stringency of the aggregate EU allocation cap and differences between member states, selected emission-intensive sectors and installations are analysed.
- Results of the EU ETS pilot phase and the first year of the Kyoto period are compared.

The structure of the paper is as follows. We start with discussing the main features of the EU ETS in the first and second trading period and the new design elements of the post-Kyoto period (2013 - 2020). Subsequently, we present the methodology for the data analysis and indicators for stringency of allocations for the EU, the member states and selected emissions intensive sectors. After analyzing price volatility from an empirical and theoretical perspective, we draw conclusions on the stringency of the caps and price volatility.

2 Main features of the EU ETS

The EU ETS has a surprisingly short history. Following the Kyoto Protocol in 1997 (UNFCCC 1998) the EU started an internal process of analysing policies and measures in order to reach the set emissions reduction targets. In 2000 a green paper on emissions trading in the EU was issued (EC 2000), and several design issues for a trading system were analysed (Stewart and Sands 2000). Directive 2003/87/EC that was adopted by the European Parliament and the Council on 13 October 2003 finally established a European emissions trading scheme and defined the benchmarks and criteria used to operate the system and identifies the framework governing national legislation.

2.1 Provisions in the pilot phase and the Kyoto period

Since the beginning of 2005, the European Union regulates CO_2 emissions from energy intensive industries in the framework of the EU ETS based on Directive 2003/87/EC with the following key design elements for the first two trading periods.

Limitation to selected industrial sectors

In the pilot phase the EU ETS was limited to four emissions intensive sectors:

- Energy activities
- Production and processing of ferrous metals
- Mineral industry
- Other activities (i.e., pulp and paper).

For the second trading period France and the Netherlands unilaterally also included installations emitting nitrous oxides (Capoor and Ambrosi 2008).

Cap and Trade

Each Member State decided on the total national emissions allowances to be allocated to the installations included in its National Allocation Plan (see below). EU Allowances (EUAs) which were issued for the pilot phase were tradable between 2005 and 2007. EUAs issued for the Kyoto commitment period 2008-2012 are also tradable in the post-Kyoto period, that means from 2008 banking of allowances is allowed. At least 95% of allowances in the first trading phase and 90% in the second trading phase were allocated free of charge in

accordance with the installations' historical emissions ('grandfathering'). The rest of the certificates can be auctioned by the member states.

National Allocation Plans

The member states are responsible for allocating emission allowances to sectors and installations in a National Allocation Plan. The EU provides guidelines (EC 2003) for the allocation process, but leaves the allocation details up to member states. Nevertheless, National Allocation Plans must be approved by the Commission, which sets criteria with respect to the allocated quantities of allowances in Annex III of Directive 2003/87/EC. These criteria include consistency of the cap with the Member State's emissions target and projected progress towards fulfilling the target, considerations of the activities' (technical) potential for reducing emissions, consistency with other Community legislation and policy instruments, avoidance of unduly favouring certain undertakings (related to State aid provisions), required information on the treatment of new entrants, and early action.

For the second trading period member states' National Allocation Plans were cut by 10.4% in the Commission review. Only the caps of four countries (Denmark, France, Slovenia and UK) were not revised. Caps proposed by the new member states were most strongly corrected downward.[1]

2.2 Provisions for the period 2013 to 2020

The evaluation of the pilot phase led to essential changes in the design of the EU emissions trading system for the period 2013 to 2020 in the context of the EU Energy and Climate Package (COM 2008/30) and the new emissions trading directive (Council Directive 2009/29/EC) respectively. The revision of the trading system accounts for lessons learnt in the first trading phase 2005-2007. Directive 2009/29 includes the following major changes compared to the first two trading periods.

[1] See e.g. Capoor and Ambrosi (2008). Nevertheless, in first instance the cuts in the national caps of Poland and Estonia demanded by the Commission were annulled by a judgment of the Court of 23 September 2009 (Case T-183/07 EC Commission v Poland (2009), Case T-263/07 EC Commission v Estonia (2009)).

An EU wide ETS cap

The overall 2020 GHG reduction target of 20% compared to 1990 is split between the sectors in the European emissions trading system - the ETS sectors - and the remaining Non-ETS sectors (COM 2008/30 final). For the Non-ETS sectors an overall emissions reduction of 14% compared to 2005 and for the EU ETS sector an emissions reduction of 21% were proposed by the Commission and adopted by the Council and the Parliament in December 2008. A major change compared to the first two trading periods is the proposed EU-wide cap from 2013 on instead of national caps to achieve the EU reduction target (Council Directive 2009/29/EC).

Allocation principles

Article 10 of Directive 2009/29/EC defines auctioning as the dominating allocation method. In the allocation of allowances sectoral differences in particular with respect to the potential exposure to carbon leakage are however taken into account. Directive 2009/29/EC differentiates between three groups of sectors and respective allocation procedures:

- *Power sector* – with full auctioning from 2013 on[2].
- *"Normal" sectors* – without potential carbon leakage and 80% free allocation in 2013which is reduced to 30% in 2020.
- *"Exposed" sectors"* – with potential carbon leakage and up to 100% free allocation.

These differences in the allocation method on the one hand reflect competitiveness concerns of the Commission and on the other hand aim at preventing GHG shifts to countries outside the emission trading system of the EU. Free allocation of allowances will be based on Community-wide benchmarks. The power sector is the only sector subject to full auctioning from 2013 on (except for some new EU member states) as it is assumed that cost increases of energy due to emissions trading can be passed on into prices. Exceptions from full auctioning are made for highly efficient cogeneration and district heating.

Exclusion of small installations

Evidence from the first trading period showed that a large number of small installations was included in the ETS that accounted only for a small share in total GHG emissions. In the third

[2] With exceptions for some new member states.

trading phase member states therefore may exclude small installations from the ETS if equivalent emissions reductions measures are applied.

An installation is considered small if it emits less than 25,000 t of CO_2e per year; for combustion installations the rated thermal input in addition has to be below 35 MW.

Provisions against excessive price increases

In Directive 2009/29 a rather weak formulation in order to insure against excessive price increases is included (Article 29a). It states that if the allowance price for more than six month exceeds the average of the last two years, member states might be allowed to bring forward the auctioning of some allowances or auction up to 25% of the allowances of the new entrants reserve.

These changes of the EU ETS for the post-Kyoto period were to a large extent motivated by the evaluation of the pilot phase (2005-2007). In the following we present our analysis of the first trading years of the EU ETS.

3 Method of data analysis

Installations covered by the EU ETS need to have an account at their national registries, which record the allocation and verified emissions per installation and every transaction between installations. Data collected by national registries are transferred to the European registry, the Community Independent Transaction Log (CITL).

Since April 2009, data on verified emissions and allocated allowances of installations for the EU ETS pilot phase (2005-2007) and the first year of the second trading period (2008) are available from the CITL. Using information from National Allocation Plans, a database was set up assigning the installation data to sectors. The database for the analysis contains more than 10,000 installations for which data are available for all years. The data analysis is performed for the pilot phase (2005-2007) and the first year of the second trading period (2008) on three different levels of aggregation with indicators for the stringency of allocation:

1. the total of all EU member states
2. the individual member states and
3. a cross-country selection of emission-intensive sectors.

The following indicators were calculated for the stringency of the caps[3]:

- the short or long position of an installation as the difference between allocated and verified emissions of an installation
- the gross long position of a country or a sector as the sum of all long positions of installations in a country or a sector
- the gross short position of a country or a sector as the sum of all short positions of installations in a country or a sector
- the net long position of a country or a sector as the difference of gross long positions and gross short positions of a country or a sector if this difference is positive
- the net short position of a country or a sector as the difference of gross long positions and gross short positions of a country or a sector if this difference is negative

With these four indicators (gross long, gross short, net short and net long) the differences between allocated allowances and actual emissions – the allocation discrepancy – were calculated in tonnes or as a percentage of allowances.

4 Stringency of the allocation caps

4.1 The overall evidence

The Commission guidelines for the National Allocation Plans (COM 2008/30) were aimed at setting a uniform framework for the member states in their preparation of the first National Allocation Plans. Assuming that all countries had a similar interpretation of the EU guidelines, one had anticipated more or less congruent National Allocation Plans that exhibit similar stringencies of allocation caps. One had therefore expected that allocation discrepancies, the difference between allocated EU Allowances (EUAs) and verified emissions, at least for the EU-15 would not show large differences between countries. This hypothesis was not supported by our analysis of the first two trading years (see Kettner et al. 2008). For 2008 our analysis finds even larger variations in allocation discrepancies.

The following analysis includes data on allocated allowances and verified emissions for the period 2005 to 2008 for 24 EU member states. Bulgaria, Cyprus and Malta were not included

[3] This method follows Kettner et al. (2008) but was applied to the entire pilot phase as well as the first trading year of the Kyoto period.

in the analysis as data on the allocated allowances or verified emissions were not yet available. As Romania joined the EU ETS in 2007, for this country data on the first trading period is based on 2007 values instead of 2005-2007 averages.

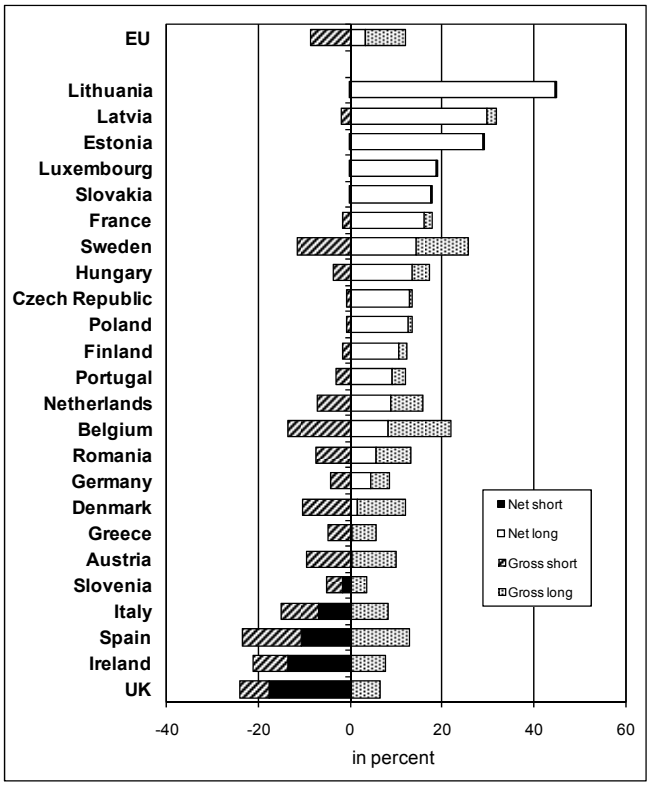
4.2 The member states evidence

As indicated in Figure 1, the market on aggregate was in a net long position in the first trading period. In the period 2005 to 2007 on average 2,145 million tonnes per annum were allocated, but only 2,077 million tonnes of emissions were verified. On average over the three years, the market was long with 69 million tonnes of EUAs corresponding to 3.2% of allocated allowances. This net long position is the balance of a 256 million tonnes (11.9%) gross long position, the relative amount of allowances allocated to installations above their verified emissions, and an 186 million tonnes (8.7%) gross short position, the relative amount of allowances below their verified emissions.

Figure 1 in addition illustrates the allocation discrepancies by member states. As indicated in Figure 1, only five out of the 24 countries were in a short position up to -17.6% (UK) in the first trading period. The remaining 19 countries were long up to 44.8% (Lithuania). The highest absolute net short position accrues to the UK with 36 million tonnes, the highest absolute net long results for Poland with 30 million tonnes.

Based on an analysis of economic activity, carbon intensity and energy intensity, Buchner and Ellerman (2008) estimate that the overall EU long position for the trading years 2005 and 2006 is the result of abatement activities of 130 to 220 million tonnes p.a. and of an annual over-allocation of up to 125 million tonnes. Anderson et al. (2009) provide an analysis of abatement and over-allocation for the whole ETS pilot phase. Based on historical CO_2 emissions, economic activity, electricity prices and climate factors they find a gross over-allocation of 109 million tonnes and gross abatement of 47 million tonnes for 2005 in the first trading period; net over-allocation and net abatement are estimated 52 and 30 million tonnes respectively.

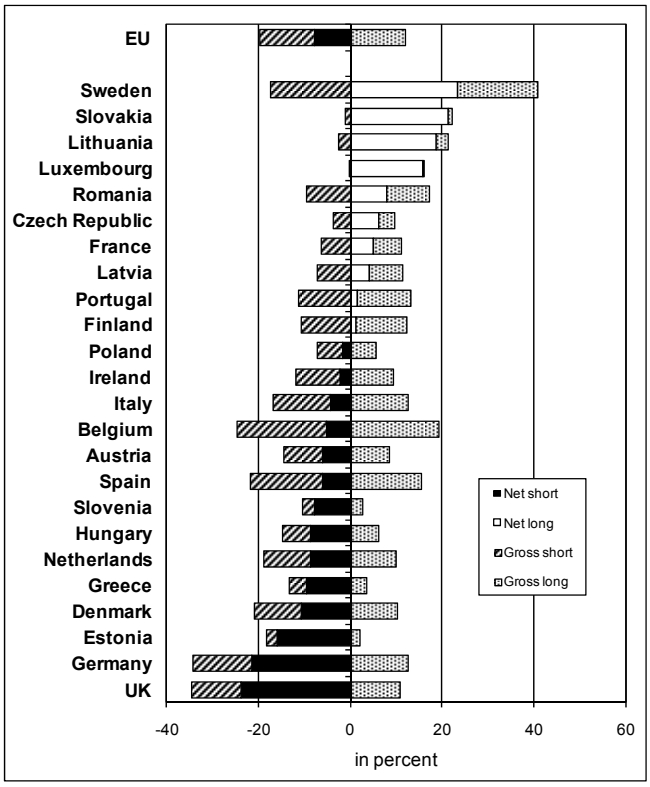
Figure 1: Short and long positions by countries (averages 2005-2007).



Source: CITL (2009); authors' own calculations.

Figure 2 illustrates the 2008 results. In 2008 1,902 million tonnes were allocated and 2,050 million tonnes were verified. The market showed a net short position of 148 million tonnes (7.8%). This was the result of a 228 million tonnes (12.0%) gross long position and a 376 million tonnes (19.8%) gross short position. 14 member states showed a net short position compared to only five in the first trading period. In addition, short positions were more pronounced compared to the previous trading period, while net long positions generally decreased.

Figure 2: Short and long positions by countries (2008).



Source: CITL (2009); authors' own calculations.

Figures 1 and 2 show that between the pilot phase and the first year of the Kyoto period major changes in allocation discrepancies can be observed for several member states: In the first trading period the Baltic States showed the highest net long positions. This changed significantly in 2008[4]. Lithuania's net long position declined from 44.8% in the first trading period to 18.7% in 2008; the Latvian net long position fell from 29.8% to 4.1%. The 29.0% net long position of Estonia changed into a net short position of 15.9%. Developments in the Baltic States reflect that these countries faced the most severe cuts in allocation caps (47%-56%) in the Commission review of National Allocation Plan (Capoor and Ambrosi 2008). Also for Germany, which accounts for the largest share of EU ETS allowances[5], the 4.4% net

[4] These results may change for some countries following the judgment of the Court of 23 September 2009 (Case T-183/07 EC Commission v Poland (2009), Case T-263/07 EC Commission v Estonia (2009)).

[5] In the first trading period 23% of EU-allocated allowances accrued to Germany which, together with Poland, Italy and the UK, accounts for more than half of the emissions covered

long position of the first trading period turned into a 21.6% net short position in 2008 which is the second highest short position in 2008. The United Kingdom exhibited the highest net short position of 17.6% in period 1 and 23.8% in 2008.

Figures 1 and 2 also visualize the extent to which the net long or the net short position is influenced by the gross long and gross short positions of the countries. In 2008 differences between gross and net positions exceeded those of the first trading period. This points at higher national allocation discrepancies on installation level. Evidence from the first two trading years showed that National Allocation Plans created substantial inequalities as to the allocation positions both on a country and installation level (Kettner et al. 2008). The analysis presented in this paper suggests that this proves even more true for the first year of the second trading period as inequalities between countries and sectors were increasing.

4.3 The sectoral evidence

While rather small allocation discrepancies were expected at country level, this would not necessarily be anticipated at the sectoral level since Criterion 11 of Annex III of Directive 2003/87/EC states that the member states' National Allocation Plans 'may contain information on the manner in which the existence of competition from countries or entities outside the Union will be taken into account'.

Kolshus and Torvanger (2005) show sectoral differences in the generosity of allocation motivated by competitiveness concerns. Regarding the vulnerability due to distorted allocations, it is common to distinguish between

- sectors not exposed to international competition (electricity, district heating, energy, cogeneration, power, heat, and steam), and
- sectors exposed to international competition (refineries, iron and steel, cement, glass, lime, ceramics, pulp and paper and others).

This discussion is also reflected in the design elements of the post-Kyoto phase proposed in the context of the EU Energy and Climate Package (COM 2008/30 final) and taken up in the

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by the EU ETS in the pilot phase. The member states' shares in total EU allowances are roughly constant for the first trading period and the year 2008.

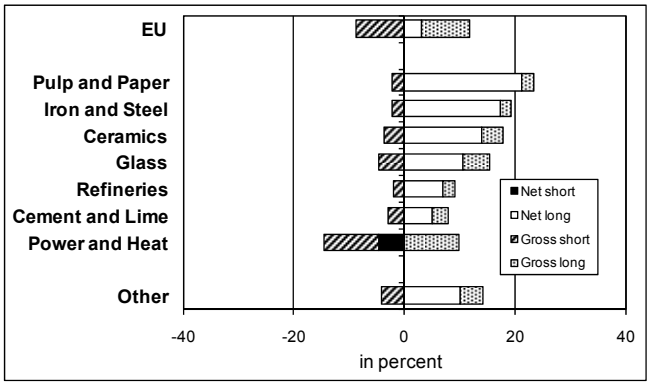
new ETS directive (Council Directive 2009/29/EC) with respect to different allocation provisions for sectors exposed to carbon leakage (see above).

The power and heat sector dominates the EU ETS with an allocation of over 40% of total EU ETS allowances in the first trading period and 2008. The sectors cement and lime and iron and steel each account for approximately 10% of EU allowances. Sectoral shares in EUAs remained roughly constant in the first trading period and 2008.

The sectoral breakdown of allocation positions signals a rather pronounced long position up to more than 20% for all sectors except for power and heat both in the pilot phase and the first year of the Kyoto period (see Figures 3 and 4). The short position of the power sector is even more pronounced in the second trading period. Refineries also face a more stringent cap in the second trading period. The opposite is true for cement and lime: In 2008 the long position of this sector has roughly doubled compared to the 2005 to 2007 average.

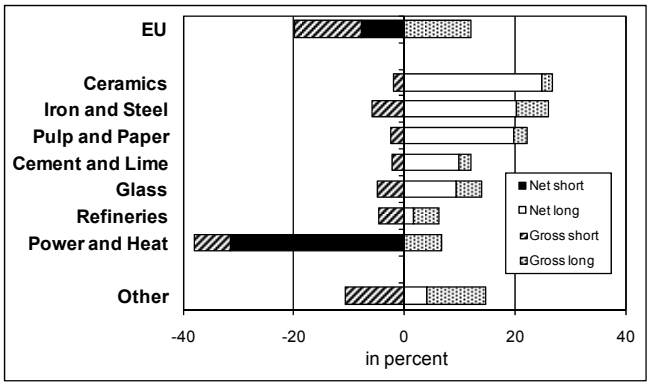
Ellerman et al. (2007) concluded that most member states explicitly allocated fewer allowances to the power sector relative to expected need compared to the other sectors because of concerns about competitiveness and a belief that the abatement potential is larger in the power sector than in the other sectors. The reason for the short position of the power and heat sector may also be linked to the observation that wholesale electricity prices echo the fluctuations of prices for EUAs because of the ability to pass on additional costs due to market power.

Figure 3: Short and long positions by sectors (averages 2005-2007).



Source: CITL (2009); authors' own calculations.

Figure 4: Short and long positions by sectors (2008).



Source: CITL (2009); authors' own calculations.

5 Distribution of installations and allocations

In the following paragraphs the distribution of verified emissions and allocation discrepancies on installation level is presented. The analysis is based on 2008 data only as no significant changes between the first trading period and the first year of the Kyoto period can be observed. For a detailed analysis of the trading years 2005 and 2006 see Kettner et al. (2008).

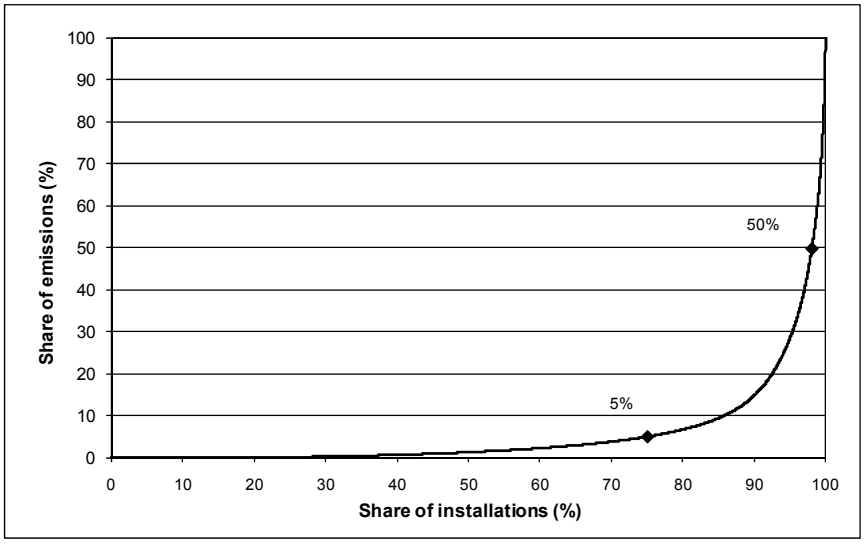
An outstanding characteristic of the EU ETS is the inclusion of a large number of small installations. Figure 5 ranks the installations according to their verified emissions and reveals striking insights about the extreme inequality in the size of installations included in the EU ETS:

- 75% of all installations (8,126 installations) contribute only 5% of the verified emissions.
- The biggest 1.9% of all installations (205 installations) account for 50% of the emissions.
- The biggest 20 installations (0.5%) emit 25% of all emissions.
- The 1,000 biggest installations (9.2%) are responsible for 83.1% of the EU ETS emissions.
- For 6,742 installations (62%), 2008 emissions were below 25,000 tonnes of CO_2.

This extreme inequality in the size distribution of installations suggests a need to differentiate between large and small installations in the framework of the EU ETS. Small installations complained about excessive transaction costs for reporting, monitoring and the registry account. In addition, the large number of small installations clogs the administrative capacities of the EU ETS. Big installations, in contrast, often expressed concern about

unequal treatment in the allocation procedures of different member states. In the design of the ETS post-Kyoto phase, these concerns were considered. On the one hand small installations (below 35 MW and 25,000 tonnes CO_2 emissions) can be excluded (see above). On the other hand for the remaining installations sectoral allocation measures under an EU-wide cap will be developed.

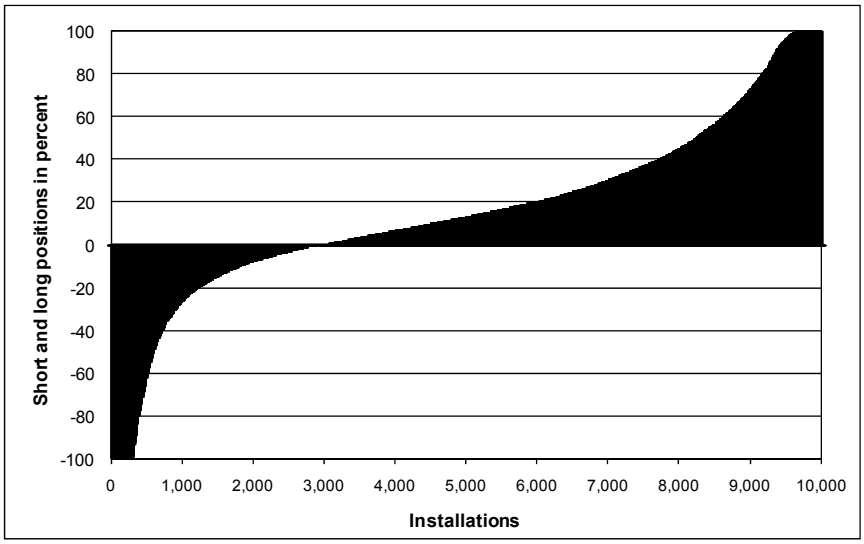
Figure 5: Distribution of size of installations with respect to verified emissions (2008).



Source: CITL (2009); authors' own calculations.

The wide dispersion of allocation discrepancies has been rather neglected in the evaluation of the EU ETS. Obviously these discrepancies reflect the actions of the allocation authorities and abatement activities by the installations. Figure 6 indicates that 2,915 out of the installations analysed were in a short position in 2008. The tails in this figure with 100% long positions refer to installations for which zero emissions were verified. With respect to short positions, 100% refers to installations with verified emissions at least twice the size of the allocation.

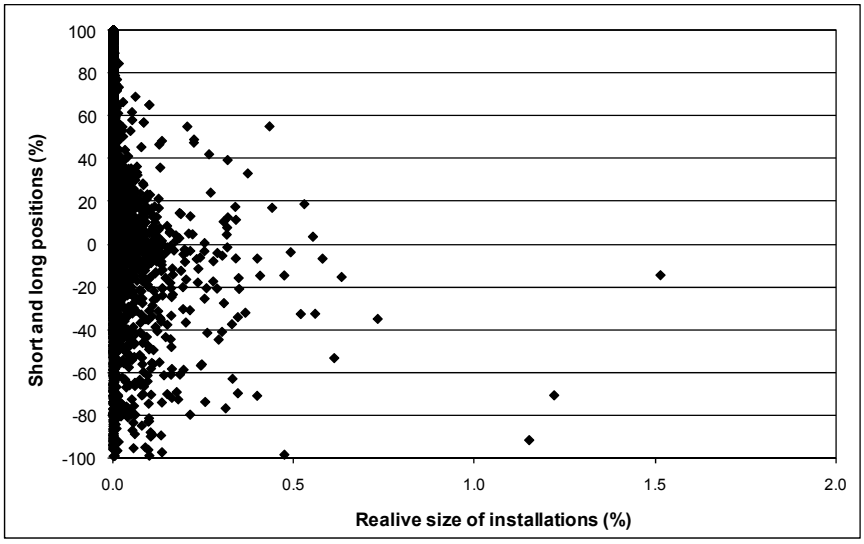
Figure 6: Distribution of allocation discrepancies of installations (2008).



Source: CITL (2009); authors' own calculations.

The scatter diagram (Figure 7) illustrates the relationship between the size of the installation and allocation discrepancies for all installations in the EU ETS. The graph suggests that installations with a smaller amount of emissions have a higher dispersion of the allocation discrepancy in contrast to big installations. It may also be presumed from this graph that smaller installations are biased to long positions and big installations to short positions. A detailed analysis on allocation patterns and the size of installations for the first two trading years 2005 and 2006 is provided by Kettner et al. (2008).

Figure 7: Allocation discrepancy and size of installations with respect to verified emissions (2008)



Source: CITL (2009); authors' own calculations.

6 The evolution of the price volatility issue

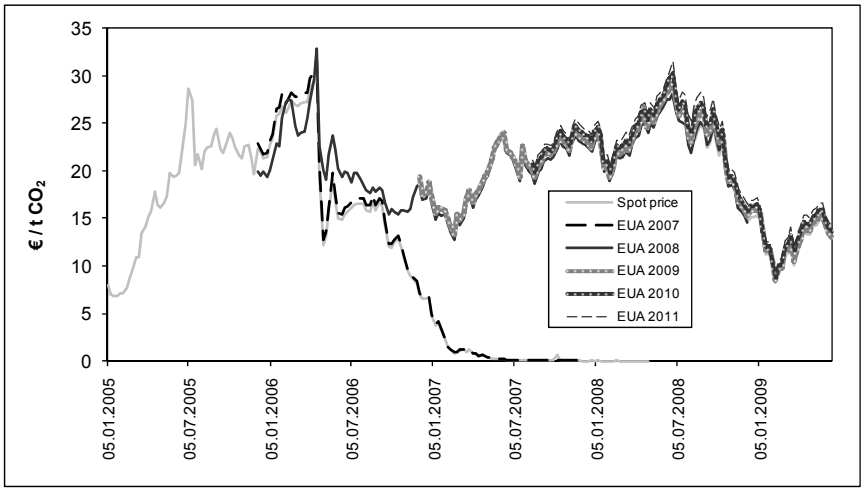
6.1 Price developments under the EU ETS

Since 2005 the development of EUA prices shows high volatility. In various empirical studies the drivers for these price developments were analysed. Based on an analysis of the first two trading years 2005 and 2006 Bunn and Fezzi (2007) highlight the importance of the energy price in carbon price developments. In addition to energy prices, Mansanet-Bataller et al. (2007) show for 2005 that extreme weather conditions also influence carbon prices. Chevallier (2009) analyses the effects of macroeconomic risk factors on the carbon futures and finds only a weak relationship between macroeconomic shocks and future prices. Institutional factors such as the stringency of the cap are, however, identified as the central price drivers. Alberola et al. (2008) identify allocation discrepancies as a main price driver besides energy prices and weather conditions. Alberola and Chevallier (2009) discuss the influence of banking provisions on the allowance price.

In the following the development of the carbon prices between January 2005 and July 2009 as depicted in Figure 12 is discussed in relation to price influencing incidences. In spring 2005 the European Commission cut the proposed national caps of the Czech Republic and Poland by 54 and 141 million tonnes respectively which caused EUA prices to rise to €20 by the end of May 2005. As oil and gas prices increased and Italy's allocated allowances were cut by 69

million tonnes the carbon price increased to €30 in the beginning of July 2005. In response to decreasing fuel prices carbon prices slightly declined in the following months. The cold and dry winter 2005/2006 and soaring energy prices caused an increase in prices which peaked at €35 in April 2006. In the last week of April 2006 – when data on the verified emissions of the first trading year became available – it became obvious that the EU ETS market was long. As a consequence prices fell to €12 within one week. This sharp break reflects that companies' initial expectations about aggregate verified emissions and thus prices were wrong. After that EUA prices increased to €20 again which might the result of a shortage in allowances in the power sector. In autumn 2006 prices for allowances of the first trading period started to decline until the end of 2007 as banking between 2007 and 2008 was not allowed. In contrast prices for allowances of the second period started to rise from October 2006 when the Commission announced that stricter caps would be applied in the second trading period. Between summer 2007 and spring 2008 spot prices fluctuated between €19 and €23. In April 2008 prices started to increase and peaked in the end of July 2009. After this peak reflects decline in prices can be observed which might be linked to firms' expectations of decreasing allowance prices due to the economic crisis. Surprisingly since the middle of February 2009 carbon prices have shown a slight upward trend although a pronounced decline in manufacturing was observed for this time span. This gives a hint that other factors also play a role as drivers of carbon prices.

Figure 12: EU ETS OTC closing prices.



Source: Point Carbon.

6.2 Early and recent controversies

In view of the high fluctuations of the ETS carbon price in the first trading period several member states took up the issue of price volatility during the negotiations for the Energy and Climate Package.

A number of member states, in particular Poland and at a later stage the French Presidency, suggested actions for preventing excessive price volatility. These actions included regular reports about the carbon market by the Commission and a price corridor with boundaries of €15 below and above the carbon price assumed in the Impact Assessment document by the Commission (Stearns 2008).

In a memo the Commission took up the issue of price volatility in the EU ETS stating the following main positions (MEMO/08/796): Changes in allowance prices occur as a consequence of changing market fundamentals and as a result of policy uncertainty. Market interventions that disturb the adjustment to changing market fundamentals would cause distortions and therefore inefficiencies. A well designed regulatory framework avoids price volatility due to policy uncertainty.

The debate about price volatility intensified again after the December 2008 decisions in view of the rapid decline of carbon prices that started in the last quarter of 2008. EDF Energy, e.g., warned that "speculators risked turning carbon into a new category of sub-prime investment" (The Guardian, 30 January 2009). Evidence is reported from big companies that sell their carbon allowances in order to bolster their balance sheets (The Guardian, 27 January 2009). In a guest commentary in Point Carbon however Jos Delbeke (Point Carbon 2009) reiterated the position of the Commission that there is no role for public authorities to intervene in the carbon market. This was partly revised in Directive 2009/29 (see Section II).

6.3 Attempting to understand the carbon market

The persistence of the controversies about price volatility deserves another attempt to understand the carbon market. Many arguments put forward so far are based on a too simplistic paradigm of the carbon market. Starting point for this paradigm is the vision that a quantity cap and abatement costs determine the market price for emission allowances. This approach rests on a number of rather strong assumptions: All actors in the market know the marginal abatement costs and there are no barriers with respect to the necessary abatement investments and price adjustments.

The economics of emissions trading assumes that in a perfect market situation the allowance price is identical to an environmental tax. The underlying assumption for this is that all market actors have equal information and uncertainty is of minor importance. With respect to the carbon market this might be questioned due to the following arguments:

The long term cap might not be binding. This already occurred in the first trading period of the EU ETS and led to carbon prices near zero. Evidence for the current second trading period also shows that overall economic development translates rapidly into a loosening cap which already became obvious in the price movements for carbon in autumn 2008. Thus volatile prices give different abatement signals during the trading period. This can pose a problem for long term investment decisions by enterprises. In addition market actors may have different information about the carbon market. Again this can lead to more volatile carbon prices with adverse effects on abatement investments and technological change.

The assumption that all actors in the market know the marginal abatement costs is especially problematic. First of all abatement reflects investment costs which are influenced by all kinds of prices, interest rates and depreciation rates. It is highly questionable if all market participants share the same information or have the same expectations regarding aspects that determine marginal abatement costs. The perceived marginal abatement costs might vary not only between actors but also over time. Second whenever a so-called joint production structure is in place, i.e. when multiple outputs are produced, it is not possible to attribute the costs of technology changes clearly to the various outputs. An example for this phenomenon is the switch from stand-alone to cogeneration production of heat and electricity. Actors in the market may have difficulties to correctly aggregate information they observe from other actors to a total picture. An example of this potential information failure are the experiences from the first trading period.

Along these lines of argumentation a few preliminary conclusions can be drawn. There are many reasons why the observed carbon price might not reflect the long-run fundamentals. For at least two reasons this is a cause for concern:

- Market prices may lose their credibility in terms of providing signals for long-term decisions. This has a particular bearing for investment decisions that have an impact on the supply and use of energy.
- As a consequence this may lead to wrong decisions which create excessive costs.

Thus the current framework for the EU ETS in the post-Kyoto period should be reconsidered for opportunities to empower the carbon market against these potential market inefficiencies from price volatility.

7 Conclusions

In the preparations of the second trading period the European Commission played a stronger role compared to the first trading period. National Allocation Plans had to be adjusted according to the Commission's demands in order to ensure that the overall Kyoto target of the European Union, a greenhouse gas emissions reduction of 8% by 2012 compared to 1990, stays in reach.

The stronger role of the Commission is reflected in the higher overall stringency of the 2008 allocation caps compared to the first trading period. If the cap remains stringent over the whole Kyoto period, will however depend on the economic crisis' effects on the real economy. Conclusions for the whole period will not be possible until the release of the 2009 verified emissions, as the effects of the economic crisis on the real economy will be more severe in 2009 than in 2008.

Since 2005 carbon prices have shown high volatility. Price drivers included institutional factors (such as over-allocation in the first trading period), economic activity, energy prices and weather conditions. For the post Kyoto period less institutional insecurity and a tighter cap can be expected due to provisions in the new emissions trading directive. The development of the other price-driving factors, however, still is likely to cause price volatility. Since carbon prices should serve as a price signal for investment, high volatility provides an inadequate basis for decision. This argument supports the introduction of additional price stabilizing design elements in the EU Emission Trading Scheme.

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