Chapter 1: The EU ETS

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Abstract

This chapter provides a brief overview of the EU ETS. It outlines the design and scope of this market, presents data on aggregate allocation as well as emissions, and summarizes the development of allowance prices between 2005 and today.

In this chapter, we provide a brief overview of the European Union Emission Trading Scheme (EU ETS), drawing from material in the EU's fact sheet (European Union, 2013) and three directives (European Union, 2003; 2004; 2009), and using data provided by the European Environment Agency and the EU Transactions Log (EUTL). For a more thorough review, which would be beyond the scope of this book, we refer the interested reader to Ellerman et al. (2010; 2014). The academic literature associated with this market is reviewed in detail by Hintermann et al. (2014) and Martin et al. (2014).

Market design and scope

The EU ETS is the world's largest emissions permit market to date and covers about 45 % of the European Union's total CO_2 emissions. The "currency" of the market is the EU allowance, or

EUA, which provides the holder with the one-time right to emit one ton of CO_2, or its equivalent of other greenhouse gases (GHGs). The institutional rules governing the market vary by market "phase". Phase I spanned the period 2005-2007 and was considered a pilot run for Phase II, which coincided with the Kyoto compliance period of 2008-2012. Pilot phase allowances could not be transferred to the second phase and lost their value if unused for compliance; however, since the start of Phase II, allowances can be banked for use in later phases. Currently, the system is in Phase III, covering the period 2013-2020.

The system applies to CO_2-emissions and equivalent amounts of nitrous oxide (N_2O) and perfluorocabons (PFCs) from installations in energy-intensive industrial sectors[1]. The scope of the EU ETS has changed somewhat over time, as more countries have entered the system either by becoming EU members (Rumania, Bulgaria and Croatia), or by linking their national systems with the EU ETS (Norway, Liechtenstein and Iceland; links with other systems are planned for the future). Because the threshold level of compulsory participation was reduced in some countries, the total number of covered installations has remained roughly constant at around

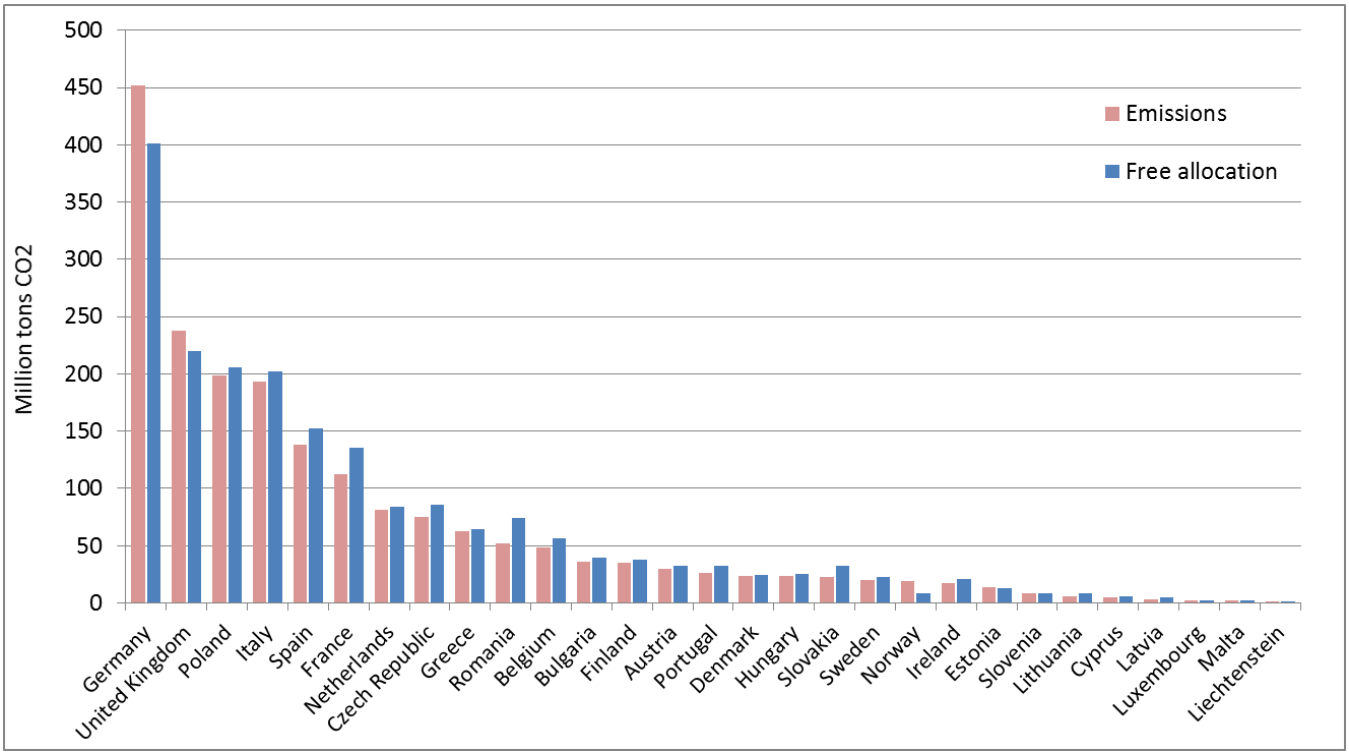
[1] In Phases I and II, the participating sectors were labeled by 10 activity codes, including: 1: Combustion installations with a rated thermal input exceeding 20 MW; 2: Mineral oil refineries; 3: Coke ovens; 4: Metal ore (including sulfide ore) roasting or sintering installations; 5: Production of pig iron or steel (primary or secondary fusion) including continuous casting; 6: Production of cement clinker in rotary kilns or lime in rotary kilns or in other furnaces; 7: Manufacture of glass including glass fibre; 8: Manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain; 9: Industrial plants for the production of (a) pulp from timber or other fibrous materials (b) paper and board; 10: Installations from other industries that opted into the system. Since Phase III, a two-digit coding system has replaced this coding, and some additional sectors (e.g., manufacture of aluminium) were included. More details can be found in the EUTL available at http://ec.europa.eu/environment/ets/.

11,000. Since 2012, emissions from aviation have been included as well, although this sector has a separate emissions cap.[2]

Firms can trade allowances freely within the EU, either bilaterally, through brokers, or directly on a few commodity exchanges. In fact, anyone can open what is called a "personal holding account" in one of the member country registries and buy and sell allowances; a significant share of allowance trades were handled by banks and financial institutions that themselves were not covered by the market, but that used EUAs as financial assets. By April 30 of each year, the registered firms have to surrender permits corresponding to their emissions in the previous calendar year. This is also the date where each installation's realized and externally verified emissions from the previous calendar year are made public by each EU country. There is a penalty for noncompliance for every ton of emitted CO_2 for which firms do not surrender an allowance. The penalty was €40 in Phase I, and was increased to €100 in Phase II, and to €250 in Phase III; in addition, these firms have to surrender the missing allowances in the following year. Although no borrowing is allowed between market phases, within a phase firms can borrow from the next year's free allocation, because they receive the allocation for the current year before they have to surrender allowances for the previous calendar year. Note that the no-borrowing constraint between phases is only binding if no allowances are banked; given the large allowance surplus (see below), firms can in effect "quasi-borrow" from future phases by decreasing their planned amount of banked allowances.

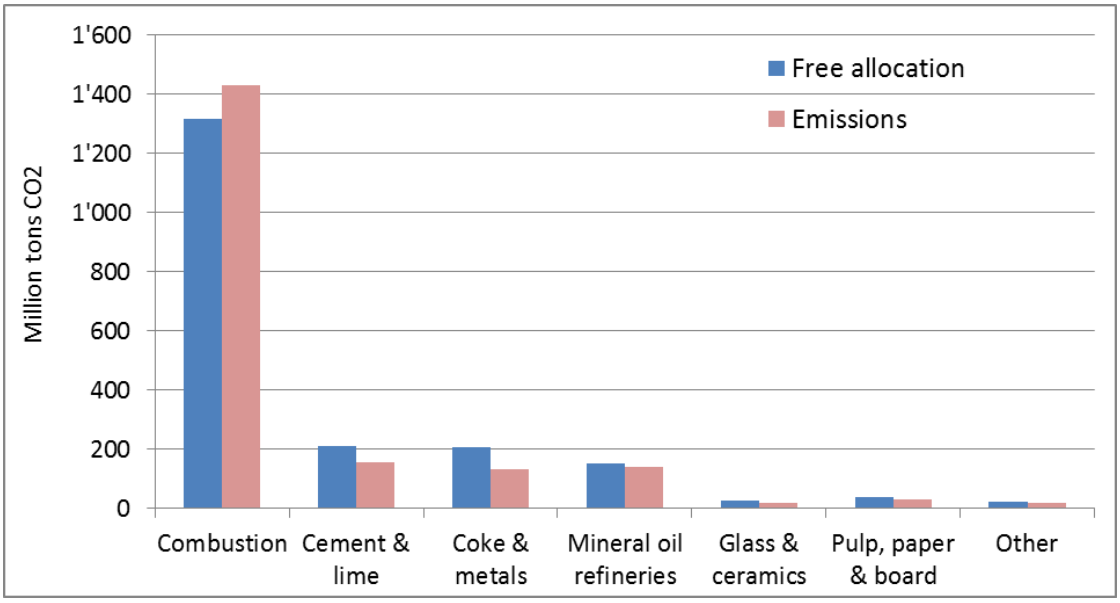
Figure 1: Annual allocation and emissions by country (average of Phase II)

[2] Allowances in the aviation sector are called EU aviation allowances, or EUAA. However, EUAs can be used by airlines in lieu of EUAAs. The distinction between the "regular" and the aviation cap is presumably due to the desire to keep the former stable, whereas the latter will undergo changes once flights from and to non-EU countries are included in the system as well.



Whereas allowances were distributed mostly at no cost during the first two phases, a significant share of allowances have been auctioned since the beginning of Phase III. Importantly, electricity producers in the EU15 no longer receive any free allocation at all. The share of auctioning is planned to be increased to 70 % by 2020, and to 100 % by 2027. The rules on free allocation have been changed for Phase III as well, as discussed in more detail in Chapter 4. Figure 1 shows the average level of free allocation and realized emissions during Phase II by country. The system is dominated by Germany, the United Kingdom, Poland, Italy, Spain and France, who together account for almost 70 % of total emissions. Germany and the United Kingdom accounted for almost all of the allowance demand, whereas most other countries were net sellers.

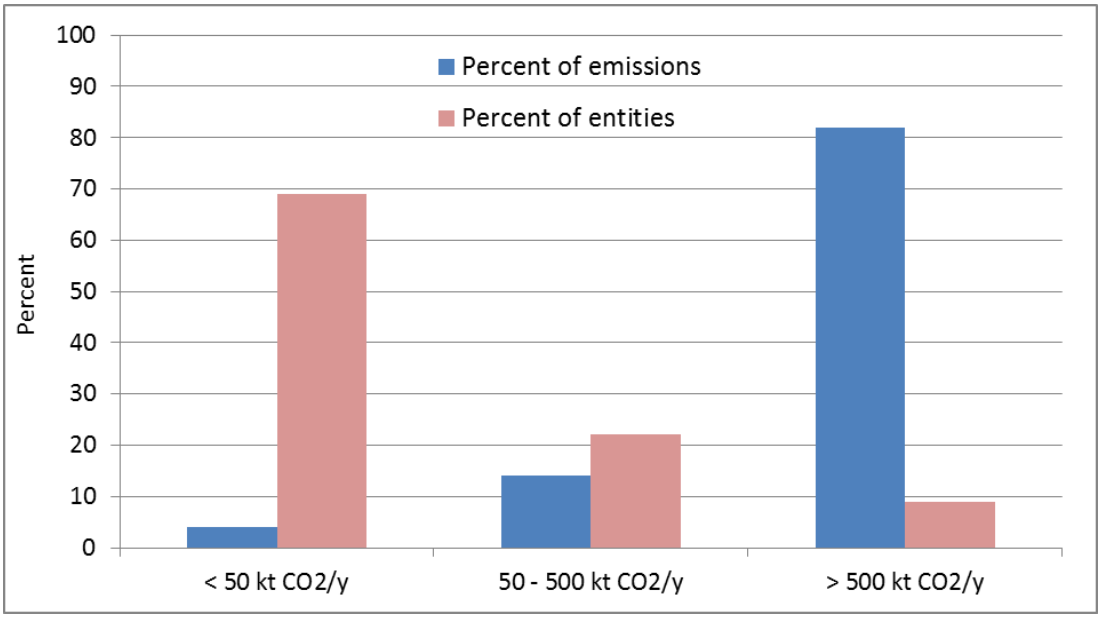
Figure 2: Annual allocation and emissions by sector (averages in Phase II)



Free allocation and actual emissions by sector in Phase II are presented in Figure 2. Combustion installations (i.e., plants that burn fossil fuels to generate power or heat) received nearly 67 % of the total allocation and were responsible for 74 % of aggregate emissions covered by the market. This was the only sector with a net shortage of allowances, whereas all other sectors, on average, acted as net allowance suppliers.

Figure 3 provides an indication for the variance in the size of the included installations. About 69 % of the covered installations are relatively small with <50,000 tons of CO_2 emissions per year, but together they emit only about 4 % of total emissions. At the other end of the spectrum, the top nine percent of the installations together account for 82 % of emissions. Most of these large emitters are power plants. The largest annual emissions caused by a single installation were recorded by a power generator in Poland with 35.2 million tons in 2012, which exceeds the national average emissions of the16 countries on the right-hand side of Figure 1.

Figure 3: Distribution of allocation and emissions by size in Phase II



Aggregate allocation and emissions

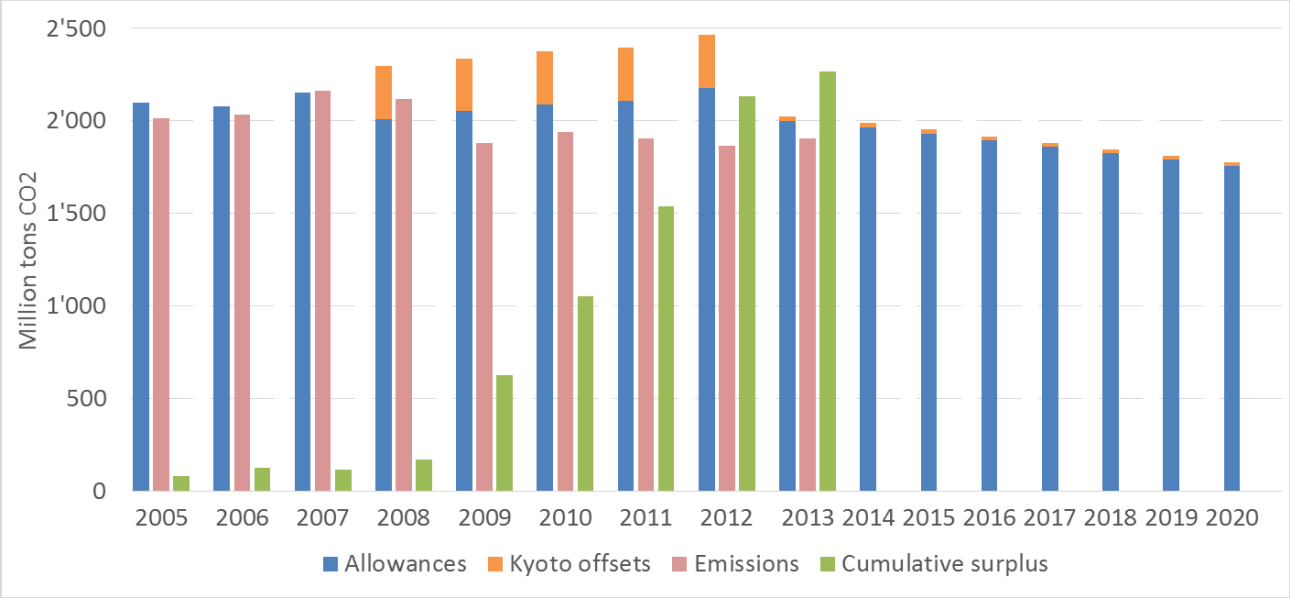
Figure 4 shows the aggregate emissions cap for the first three phases (free allocation plus auctions), along with verified emissions over the period 2005-2013; at the time of writing this chapter, emission figures for 2014 and later are not available. Starting in Phase III, the cap is melted off linearly at an annual rate of 1.74 % relative to the average of the cap in Phase II. In addition to the cap specified in EUA's, firms were allowed to use a total of 1,418 million offset units from the Kyoto Protocol flexible mechanisms during Phase II. Any unused import limits can be used in Phase III. [3] The use of these offsets by ETS firms is the subject of Chapters 10 and 11 of this book. An additional import limit was set separately for Phase III, for firms that either received no free allocation or offset their import limit during Phase II, or that significantly

[3] These offsets are certified emission reductions (CERs) through the Clean Development Mechanism (CDM), and emission reduction units (ERUs) from Joint Implementation within Annex B countries. The EU did not allow the use of Assigned Amount Units (AAUs) due to the "hot air" controversy.

increased their capacity. The total amount of additional offsets that can be expected for Phase III is estimated to be around 160 million (Delbosc et al., 2011), bringing the total import limit to just below 1,600 million over the course of 13 years. Figure 4 also shows the cumulative allowance surplus through 2013; due to the no-banking provision, the surplus from Phase I is not carried over to later phases. By 2013, the cumulative allowance surplus exceeded the total annual allocation.

There are several reasons for the significant allowance surplus. First and probably foremost ranks the financial crisis in 2008-2009, and the following banking and euro crisis. Given the fixed emissions cap, a reduction in business-as-usual (BAU) emissions lowers the need for emissions reductions on a one-for-one basis. However, as shown in Chapter 2, emissions per unit of output decreased as well, implying that the recession alone cannot account for the decrease in emissions. BAU emissions were lowered also by the EU's additional policies aimed at increasing the share of renewable energy to 20 % by 2020. For example, the feed-in tariffs implemented in Germany led to a significant increase in the generation of electricity by wind and solar power, a part of which came at the expense of fossil generation (nuclear generation decreased as well during Phase II, largely as a result of the political response to the accident at the Fukushima plant in Japan in March 2011). The use of parallel instruments in the context of the EU's climate policy is discussed in Chapters 6 and 7.

Figure 4: Allocation and emissions in the EU ETS, 2005-2013



Another important reason for the surplus is the EU's decision to allow ETS firms to cover some of their emissions by using emission offsets generated in the context of the Kyoto Protocol. Kyoto offsets have always been cheaper than EUAs, and their price declined to almost zero by the end of 2012, such that it is optimal for firms to use up their entire import limit. This means that allowing firms to use 1,600 million Kyoto offsets in lieu of EUAs practically increased the cap by this amount.

Another possible reason for the allowance surplus, and perhaps a less obvious one, may be the way the emissions cap was set in the first two phases. The aggregate cap for Phases I and II emerged as the sum of individual caps in member countries' national allocation plans (NAPs). Since industrial emissions were not monitored prior to the start of the EU ETS, countries determined the Phase I-NAPs by relying on emissions forecasts made in collaboration with the regulated firms. Because a higher forecast would likely lead to more allowances being allocated for free, firms had an incentive to report rather high emission forecasts and to lobby for larger

country-level caps, giving them an advantage over rivals located in other countries.[4] The topic of firm lobbying for a higher amount of free allocation is the subject of Chapters 5 and 6.

To make matters worse, verified emissions recorded in 2005 were used to determine the cap and firms' free allowance allocation for Phase II. Although it is understandable from a practical point of view that the European Commission did not want to ignore information from the first actual emissions accounting in 2005, considering that it had no other reliable baseline, making free allocation in Phase II conditional on actual emissions in Phase I conflicted with firms' incentives to abate emissions in the first phase. In effect, this allocation "updating" introduced a penalty for reducing emissions in the form of a reduction in future free allocation (Böhringer and Lange 2005; Harstad and Eskeland 2010). To the extent that the cap in Phase II was set proportional to verified 2005 emissions, an increase in the latter as a consequence of allocation updating would have led to an increase in the second-phase cap as well.[5]

Allowance prices

Figure 5 shows allowance prices from January 2005 until June 2014. The EUA during Phase I was a separate commodity from the EUA in later phases due to the no-banking provision. The price crash in April 2006 was a response to the first round of emissions verifications, which revealed that emissions were well below the annual cap, which is consistent with firms providing exaggerated emission forecasts in the context of setting the cap for the first phase. A growing

[4] Holding the overall cap fixed, an increase in the national cap of one country at the expense of another country is equivalent to a transfer from the latter to the former, with the amount determined by the market price for allowances. Note that member countries' NAPs had to be approved by the European Commission (EC), and all but two NAPs were rejected in a first round and eventually adjusted downwards, but not without a large number of court cases, in which member countries (unsuccessfully) tried to defend their initial caps.

[5] For a more thorough discussion of the merits and drawbacks of different forms of allowance allocation, see Hintermann and MacKenzie (2011).

literature has focused on price determination in the EU ETS; for a review, see Hintermann et al. (2014). The fundamentals most often associated with allowance prices are fuel prices, temperature, and economic activity. Due to the significant over-allocation, the price decreased to zero at the end of the phase.

Because unused allowances in Phase II can be used to cover emissions in Phase III, the prices of these two market phases are linked by arbitrage. The infinite-time horizon introduced by unlimited banking also decreased the importance of mean-reverting weather shocks, because they are likely to be offset by shocks of a similar magnitude, but of opposite sign, later on. The most obvious price fundamental is the economic outlook. The financial crisis in 2008 led to a significant decrease in the demand for allowances, which is reflected in the sharp decline of the EUA price from nearly EUR 30 in spring 2008 to around EUR 8 in early 2009. Remarkably, the price trajectories for the EUA during Phase I, and since the start of Phase II, imply that the cost of achieving the emissions target turned out to be cheaper than anticipated.

Figure 5: EUA price in Phases I-III

Note: The price in Phase I is the OCT price recorded by Point Carbon. No single price is available for the price in Phases II and III that covers the entire period; the price shown is a combination of a two-year future from NordPool (until March 2008), and an end-of-year future from EEX thereafter.

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