LUND UNIVERSITY

Free allocation in hte 3rd EU ETS period: assessing two manufacturing sectors

Stenqvist, Christian; Åhman, Max

Link to publication

Total number of authors:
2

Free allocation in the 3rd EU ETS period: assessing two manufacturing sectors

Abstract

This paper provides an analysis of the EU ETS harmonised benchmark-based allocation procedures by comparing two energy-intensive sectors with activities in three Member States (MS); the cement industry (CEI) and the pulp and paper industry (PPI) in UK, Sweden and France. Results show that the new procedures are better suited for the homogenous CEI, for which allocation is to decrease in a consistent manner. For the heterogeneous PPI – with diverse product portfolios, technical infrastructure and fuel-mixes – the allocation procedures cause dispersed outcomes. The lack of product benchmark curves, biased reference values on fuel-mix and specific energy use as well as other issues, leads to allocations that do not represent the average performance of the 10% most GHG efficient installations. Another issue with the 3rd phase allocation procedure is that grandfathering is still present via the historically based production volumes. How to deal with structural change and provisions regarding capacity reductions and partial cessation is an issue, which is highly relevant for the PPI but less so for the CEI. In manufacturing sectors such as cement industry (CEI) and pulp and paper industry (PPI), the new banchmark-based allocation procedures have managed to reduce the EU-wide free allocation in the 3rd period compared with the 2nd period. For the homogenous CEI the outcome of stricter allocation is consistent between Member States. However, free allocation based on grandfathering of prerecession activity levels and CO_2 performances is likely to create long positions in coming years. Our results disclose differing outcomes between sectors and Member States, with cases of conspicuous supply of allowances in the heterogeneous PPI. Lack of product benchmark curves, biased reference values on fuel-mix and specific energy use etc., leads to allocations that do not represent the average performance of the 10% most GHG efficient installations.

Policy relevance

Free allocation is used for several reasons when developing emission trading schemes. Establising reliable and robust rules for free allocation that shields against high direct carbon costs, is percieved as fair and politically acceptable and still incentivices firms to take action, is a great challenge.

For the debate on structural reformation of the EU ETS, and for sharing experiences with other emerging emission trading systems, the paper contributes to a deeper understanding of the difficulties in effectively applying harmonised rules in industrial sectors that are heterogenous.

Keywords: EU ETS; Allowance allocation; Pulp and paper industry; Cement industry

1 Introduction

1.1 A background to EU ETS

The EU emissions trading system (EU ETS) was introduced in 2005 to *'promote greenhouse gas emission reductions in a cost-effective and economically efficient manner'* (EC, 2003). Since the start, EU ETS has been subject for scrutiny by different stakeholders. Some authors have called the implementation a remarkable achievement given its timing, novelty and scope, i.e. covering 11,000 power producers and energy-intensive industry installations and half of EU's CO_2 emissions (Ellerman et al., 2007). EU ETS has also been hit by criticism due to unresolved issues following the first 'trial period' (2005–2007) and the second 'Kyoto period' (2008–2012). Much of the criticism has concerned the effects and methods for free allocation of initial EU emission allowances (EUAs) (see e.g. Sandbag 2011, Hyvärinen, 2005). Allocating initial EUAs for free instead of auctioning, and thus departing from the "polluters pay principle", has been motivated for many reasons including protecting competitiveness, avoiding carbon leakage, and political acceptability from participating firms and Member States (MS).

In the 1st trading period at least 95% of the EUAs had to be allocated for free to participants (EC, 2003). No overall absolute cap on an EU-level was set a priori but the European Commission (EC) reserved the right to ex-post adjustments to ensure that the national allocation plans (NAPs) were in line with their future Kyoto commitments (EC, 2003). The decision process for free allocation of EUAs was decentralised to MS´s NAPs and based on grandfathering of historical emissions. This decentralised approach, together with the free allocation, helped to gain acceptance among MS and participating sectors and enabled a smooth implementation (Skjaerseth & Wettestad, 2009). Some national authorities were overly generous in handing out free EUAs to domestic industries (Andersson & Di Maria, 2011). When this became evident in 2006, it caused a major EUA price drop that was further enhanced by the prohibition against transferring surplus allowances between the two periods (Convery & Redmond, 2007).

In the 2nd period, the cap was set 6.5% below the level of 2005 in order to be consistent with EU's Kyoto commitment. The tightened cap influenced foremost power producers that experienced a 13% decrease in allocation (EEA, 2014). For manufacturing sectors the levels of free allocation increased due to overoptimistic growth numbers, e.g. by 8% in pulp and paper and 13% in cement and lime (EEA, 2014). Sector-level surpluses grew even larger in the 2nd period as the unanticipated economic downturn caused production declines and reduced CO_2 emissions across European manufacturing industry. For instance, cement and lime industry accumulated a surplus of 282 million EUAs in 2008–2012, which is twice as much as the sector's annual CO_2 emissions (EEA, 2014). In the first two trading periods, only a small share of EUAs was auctioned. In the 2nd period up to 10% of allowances could have been auctioned, but due to political-economic dimensions and industry lobbying a few MS auctioned altogether 3% of the cap (EC, 2013a).

In the 3rd trading period, auctioning was meant to be the main allocation method (EC, 2009). From 2013, over 40% of EUAs within the EU ETS are auctioned but predominately in the power sector. For the manufacturing sectors free allocation will continue to be applied but with altered allocation procedures. The approach with MS NAPs based on grandfathering of installations' historical emissions is replaced with a methodology based on EU-wide performance benchmark values for a number of defined products within each sectors. The free allocation via the benchmarks will decrease step-wise with an intention to be phased out by 2027 (EC, 2009). However, one important major exception is all sectors that are deemed exposed to significant risk of carbon leakage and, thus, will receive free allocation at 100% of benchmark values until 2020 (EC, 2009). Currently, 96% of manufacturing

industrial emissions are on the "carbon leakage list" and thus deemed by the EC to be exposed to a significant risk for carbon leakage (Lecourt et al., 2013). For reasons of protecting competitiveness and avoiding carbon leakage, the practice of free allocation will most likely still be used far beyond 2027 for energy-intensive industries.

1.2 Aim and scope

Theoretical underpinnings and practical experiences of allocation procedures in previous EU ETS periods have been subject to several studies (e.g. Cló, 2010; Demailly & Quirion, 2006; Hepburn et al., 2006). Other studies have analysed corporate responses to EU ETS including how the free allocation has influenced different sectors in terms of e.g. trading behaviour (Martin et al., 2014) and the shaping of climate strategies (Skjaerseth & Eikeland, 2013). The former find that a third of 429 interviewed manufacturing firms do not consider EUAs as a financial asset that could provide profit opportunities but rather see their permit allocation as an EU ETS compliance target (Martin et al., 2014). In particular for the pulp and paper sector there are studies of corporate responses that cover industries in countries such as Italy, Sweden, Norway and Germany (e.g. Gasbarro et al., 2013; Gulbrandsen & Stenqvist, 2013a; Rogge et al., 2011). These studies conclude that EU ETS has brought some organisational changes while the effects are limited in terms of triggering of innovative low-carbon solutions and long-term climate strategies. The carbon price tag is not fully integrated in the firm's operational practices (Rogge et al., 2011) and is anyhow a minor incentive among the many factors that underpin investment decisions in the pulp and paper industry (Gulbrandsen & Stenqvist, 2013a). The lack of stringency with a high share of free allocation, the possibility of different perceptions about real cost versus opportunity costs, and the volatile but often low EUAs price are suggested explanations for the limited effects of EU ETS so far. Thus, among over-allocated manufacturing firms, a more stringent allocation could provide an important signal for stronger abatement and innovation responses.

So far, few studies have been published about the recent implementation of the 3rd period benchmark-based free allocation to EU's manufacturing industry; exemptions are e.g. Lecourt (2013), Lecourt et al. (2013) and Sartor et al. (2014). In an extensive assessment of all benchmarked sectors in 20 MS Lecourt et al. (2013) conclude that the 3rd period allocation substantially reduces free allocation to benchmarked sectors compared with the 2nd period, reward installations with better CO_2 emission performance, and redistribute EUAs foremost between installations within MS. Sartor et al. (2014) use the example of the cement sector – one of the most homogenous industrial sectors in terms of processes and products – to assess the new allocation rules. The analysis shows that moving to benchmark-based allocation has reduced and improved the harmonization of the levels of free allocation compared to the 2nd period. However, as the free allocation is also based on historic production output levels, problems of oversupply to individual installations will remain, why the fairness of the system may become questioned by industrial representatives and the general public according to Sartor et al. (2014).

The recent studies provide valuable first insights to the benchmark-based allocation procedures and show that moving from allocation procedures with flexibility on a national level to a methodology based on EU-wide benchmarks should increase the fairness. However, the outcomes have been analysed on an aggregated EU level and not fully addressed the possible divergence between MS or within different manufacturing sectors. Interesting outcomes at sector and installation level could thus be overlooked. Our study intends to fill this research gap by an in-depth study of two sectors in three MS. The aim of the paper is to analyse and explain outcomes of the harmonised benchmark-based allocation procedures in two manufacturing sectors of different complexity in terms of heterogeneity and national

diversification. From this we draw lessons about credibility issues including the ability of the new procedures to create strong incentives for mitigation or trading and the effects from structural changes on CO_2 emissions and allocation levels.

The comparative study covers the cement industry (CEI) and the pulp and paper industry (PPI) in three different MS (i.e. UK, Sweden and France). The CEI is homogenous in terms of products (i.e. cement clinker) and processes and consists of a handful of large international firms, which supply domestic demands via their operations across EU. Its main process is highly fuel and carbon-intensive, not least in monetary terms. The PPI consists of a relatively large number of firms and is heterogeneous with a diversified product portfolio that requires different set ups with regard to processes, integration and energy as well as raw material supply. It is a highly energy-intensive but less carbon-intensive industry due to potentially large shares of biomass fuels.

The three different MS were chosen based on availability of data and by their relevance to respective sector. The main empirical material consists of the National Implementation Measures (NIMs) and the European Union Transaction Log (EUTL).[1]

2 The third trading period 2013–2020

2.1 General amendments

EU ETS in its 3rd period is characterized by some important changes (EC, 2009):

- A community-wide cap has been introduced based on the EU target of reducing total CO_2 emissions with 20% by 2020. Allowances issued each year shall be reduced by a linear factor of 1.74% compared with the 2nd period average annual amount of allowances. By 2020, the allocation to fixed installations shall be 21% below the emission levels of 2005.

- From negligible shares of auctioning in the 2nd period about half of allowances will be auctioned, primarily to power generators. For a few sub-sectors not deemed exposed to carbon leakage a gradual phase-in from 20% to 70% of auctioning will apply.

- The decentralized approach with free allocation based on past emissions via MS's NAPs is replaced by free allocation based on past production volumes and EU harmonized benchmarks for manufacturing industry and heat installations via MS's NIMs. Sectors and installations deemed exposed to a significant risk of carbon leakage receive free allowances at 100% of their benchmark values.

2.2 Benchmark-based free allocation

The benchmark methodology dates some years back when a trio of energy research and consultancy organizations (i.e. Ecofys, Fraunhofer ISI and Öko-Institut) commissioned by the EC developed a first proposal (Ecofys, 2009a). After two years and an 'unprecedented' amount of consultation with industry associations and other stakeholders the EC reached a final decision including 52 product benchmarks plus three more for fuel and heat consumption and certain process emissions (EC, 2011). In

---

[1] By September 2011, MS were required to submit their list of installations covered by the ETS directive in the 3rd period. These lists,referred to as NIMs, cover the proposed benchmark-based free allocations to concerned sectors and installations. As of April 2013 the NIMs of Sweden, France and UK were among few that were available to the authors, which confined the assessment to these three MS. The EUTL is the official registry of allowances and verified emissions under EU ETS.

determining the total amount of free allocation to an installation its different benchmark-related sub-installations are first defined. If activities are not covered by a product benchmark the alternative heat and fuel benchmarks can be applied but each sub-installation must not receive allocation according to more than one benchmark (DG CLIMA, 2011a). The general formula for determining the final free allocation to a sub-installation is:

Free allocation = BM x HAL x CLEF x CSCF

BM: product/fuel/heat specific emission intensity benchmark value.

HAL: historic activity level as median production volume (or heat/fuel use or production) in 2005–2008 or 2009–2010.

CLEF: carbon leakage exposure factor, which is 100% for installations deemed at risk of carbon leakage.

CSCF: cross-sectoral correction factor to adjust proposed annual preliminary amounts (PA) to the maximum amount (MA).[2]

As a starting point, the product benchmark values were to represent the average performance of the 10% most efficient installations in a sector or sub-sector in 2007–2008 (EC, 2009, Art. 10a(2)). It has been disputed if efficient should mean GHG efficient or energy efficient. Industry stakeholders have argued for the latter approach, i.e. for benchmarks values based on energy intensity levels translated to CO_2 emissions by taking the differences in fuel mix into account (Ecofys, 2009b; Ecofys, 2009c). For some sectors this has been heeded, but in general the values have been derived from benchmark curves covering the actual CO_2 emission intensities of existing installations in concerned sector (EC, 2011). The heat and fuel benchmarks, of 62.3 and 56.1 EUAs/TJ respectively, are based on natural gas as the reference fuel and a 90% fuel-to-heat conversion efficiency. Special guidelines are provided for cross-boundary heat flows, e.g. for heat transfers between two EU ETS installations the free allocation is given to the heat consuming installation but when heat is exported from an EU ETS installation to a non-EU ETS installation the heat producer receives the free allocation (DG CLIMA, 2011b).

2.3 Benchmarks for the pulp and paper industry

In the 2nd period there were about 900 pulp and/or paper installations in EU ETS. As an annual average over the 2nd period, they emitted 29.6 Mt CO_2 and were allocated 40.3 million EUAs (EEA, 2014). Thus, the aggregated average emission-to-allocation ratio has been 73%, ranging from 82% in 2008 to 68% in 2012.

European PPI has relatively low CO_2 emissions in relation to overall energy flows as more than half of fuel consumption comes from biomass sources (CEPI, 2013). However, the fuel-mix is geographically diverse; biomass fuels can account for 75–90% of the PPI's fuel consumption (e.g. in Sweden and Finland) or be negligible when natural gas accounts for 90% of fuel consumption (e.g. in Italy, Netherlands and UK) (Ecofys, 2009b). It is also a technically diverse industry that produces numerous products with different degrees of process integration between pulp grades (i.e. virgin or recovered

---

[2] In the assessment of MS's NIMs the EC had to ensure that the PAs of free allowances did not exceed the linearly decreasing MA as dictated by the community-wide cap (EC, 2009, Art. 10a(5)). If so, a CSCF should adjust the sum of PAs to the MA, which determines the final free allocation. The decision announced in September 2013 clarified that the CSCF implies a 5.7% reduction in 2013 growing to a 17.6% reduction in 2020 (EC, 2013b).

fibre) and paper and board production. Aspects like these have influenced the formulation of benchmark values for the PPI.

Though the PPI represents only 2% of the EU ETS emissions, 11 out of the total 52 product benchmarks were developed for the sector as shown in Table 1. Separate values for pulp and paper products enables allocation to stand-alone pulp mills that produce market pulp as a final product. To avoid double-counting, the allocation to pulp benchmark sub-installations is based only on the share that is exported since pumped pulp produced in integrated mills is not entitled allocation.

The EC's final decision on product benchmark values was reached after an exceptional amount of consultation and negotiation and the heterogeneous PPI involved specific challenges.

Initially, instead of constructing CO_2 emission intensity curves for selected products Ecofys (2009b) used literature values on energy intensity levels that were intended to represent the best practice specific heat consumption for production in non-integrated mills. From these values, emission intensities benchmark values were proposed based on natural gas, with an emission factor of 56.1 kg CO_2/GJ, as the reference fuel. The PPI represented by the Confederation of European Paper Industries (CEPI) was discontent with, amongst other things, the grouping of products done by the consultants where a number of products fell into categories of "other pulp" and "other papers". According to CEPI the PPI should ideally have 64 product benchmarks, but this was not politically feasible (Gulbrandsen & Stenqvist, 2013b). After negotiations a couple of product benchmarks were added and the EC's decision on 11 product benchmarks in combination with heat and fuel benchmarks could be accepted. Finally, after a sample of non-integrated single product mills had tested the values against their performance it led to modifications of some product benchmark values (Bergman, 2014, personal communication).

The final benchmark methodology for PPI implies that also biogenic CO_2 emissions have become entitled free allocation in the 3rd period, which should become evident in countries such as Sweden and Finland where biofuels (e.g. black liquor, bark etc.) dominates the PPI's fuel-mix. In addition to the physical production some mills and foremost stand-alone pulp mills will be freely allocated, via the heat benchmark for their biofuel-based district heating deliveries. In cases when there are no suitable product benchmarks the heat or fuel benchmark approach is also applied, but in this case from an installation's heat consumption perspective.

2.4 Benchmarks for the cement industry

Over the 2nd period there were around 270 cement installations in EU ETS and with 8% of total CO_2 emissions it is the second largest emitting sector (Ecofys, 2009c). As an annual average over the 2nd period, the sector emitted 129.5 Mt CO_2 and was allocated 176.5 M EUAs (EEA, 2014). The oversupply has increased from an emission-to-allocation ratio of 91% in 2008 to 64% in 2012.

The cement manufacturing process follows the three main steps of raw material preparation, clinker production, and cement grinding, of which clinker production is the most energy- and CO_2-intensive, accounting for 90% of emissions (Ecofys, 2009c).[3] A main issue in the development of product benchmarks was whether such should be formulated on the basis of clinker production or cement production. Ecofys (2009c) proposed a clinker approach as favoured by the majority of EU's CEI represented by CEMBUREAU. However, individual firms specialized in clinker substitution and composite cements argued for a cement benchmark (Raaum Christensen, 2013). From a CO_2 emission intensity curve covering a large majority of the EU-27 installations a benchmark value of 780 kg CO_2 per tonne clinker was found to reflect the average of the 10% best performing installations.

---

[3] The high temperature calcination process converts limestone ($CaCO_3$) to lime (CaO) and releases 55% of total CO_2 emissions per tonne cement. Remaining CO_2 emissions come from fuel combustion in the cement kiln (40%) and indirectly from electricity use in raw material and clinker grinding, conveying etc. (5–10%) (Ecofys, 2009c).

CEMBUREAU defied and argued for a benchmark value of 837 kg CO_2 per tonne clinker, based on energy intensity levels and coal as reference fuel (Ecofys, 2009c). Eventually, in the final benchmark decision the EC adopted two product benchmarks, one for grey cement clinker at 0.766 EUA per tonne clinker and one for white cement clinker at 0.987 EUA per tonne clinker (EC, 2011). Despite the cost pass-through capacity due to high transport costs resulting in a regional market, the cement sector also qualified as exposed to a significant risk of carbon leakage and was assigned a CLEF of 100%.

3 Results

3.1 Pulp and paper industry

In 2013, the entire PPI in EU-28 received a free allocation of 31.5 M EUAs after the CSCF adjustment, which is clearly below the average annual allocation in the 2nd period (40 M EUAs) (EEA, 2014). However, the 2013 free alloation is on a par with the record high emission level in 2008 (32 Mt CO_2) and the projected free allocation in 2020 (28 M EUAs) is slightly above the current 2013 emission levels of 27.5 Mt CO_2. For the European PPI there is so far no evidence of sector-level improvement in specific CO_2 emissions since the start of EU ETS; production of pulp and paper decreased by 7% in 2005–2012, which correlates with the decrease in CO_2 emissions over the same period (CEPI, 2013; EEA, 2014). The following detailed assessment of PPI in UK, Sweden and France covers around 20% of the sector's installations, allocations and CO_2 emissions in EU ETS.

3.1.1 United Kingdom

The PPI in UK is Europe's 8th largest paper and board producer with 5% of production and accounts for a negligible share of the pulp production (CEPI, 2013). In the 3rd period of EU ETS, 36 installations are proposed to participate compared with 50 in the 2nd period (EUTL, 2013; UK NIM, 2012). Figure 1 shows the development of CO_2 emissions and allocation since 2008.[4] Physical production and CO_2 emissions have been reduced by 15%, i.e. without improvements in specific CO_2 emissions (EUTL, 2013; FAO, 2013).

Figure 1. *Emissions and allocations to PPI in UK, including all installations within each period. Data source: EUTL (2013) and UK NIM (2012)*

Besides shutdowns the difference in allocation between periods can be attributed to changes in allocation procedures for heat installations, as illustrated with an actual and a contra-factual situation. In the 2nd period, energy contractors – that deliver steam and electricity from natural gas fired combined heat and power plants (CHP) – have in some cases been categorised and allocated EUAs as if they belonged to the PPI. This is represented by the base case of actual allocations and emissions in period II (incl. CHP installations). However, in the 3rd period, the rules for cross-boundary heat flows between installations imply that the heat consuming installation (i.e. the paper mill) is freely allocated according to its product or heat benchmarks (see Section 2.2). The contra-factual case depicts a situation where allocations and emissions attributed to external CHP installations are subtracted from

---

[4] Since 90% of UK's PPI was excluded from the 1st period there are no records for 2005–2007.

8

the actual situation over the 2nd period, while allocations and estimated emissions for the relevant paper mills are added.[5] This exercise suggests that proposed 3rd period allocation to UK's PPI will not be reduce by 40% as it appears in the base case but rather by 25% as estimated in the contra-factual situation.

When accounting only for the 36 installations listed in the UK NIM the allocation in 2013 of almost 1.4 M EUAs, after CSCF adjustment, is a decrease by 16% compared with the allocation in 2012. For more than half of individual installations the free allcoation is reduced and for these short positions can be expected in the 3rd period.However, with the introduction of production-based allocation and the changed procedures for heat installations the free allocation to a few larger size mills will increase substantially compared with the previous period. Such mills, often newsprint or liner mills that rely on recovered paper pulp, will be generously allocated through their product benchmarks, while their direct CO_2 emissions remain low whenever steam (and electricity) is provided by external supply contracts. Though short positions can be expected transferred EUAs should provide compensation (EUTL, 2013; UK NIM, 2012).

3.1.2 Sweden

The Swedish PPI is Europe's largest pulp producer and 2nd largest paper and board producer, accounting for 31% and 12% of the respective segments (CEPI, 2013). In the 3rd period of EU ETS, 52 installations are proposed to participate compared with 58 in previous periods (EUTL, 2013; SE NIM, 2012). Figure 2 shows the development of CO_2 emissions and allocation. Between 2005 and 2012, CO_2 emissions have been reduced by half while total production volume has been almost unchanged (EUTL, 2013; FAO, 2013). Thus, there has been a clear improvement in specific CO_2 emissions.

Figure 2. Emissions and allocations to PPI in Sweden, including all installations within each period. Data source: EUTL (2013) and SE NIM (2012)

Previously, annual allocation has been around 2.5 M EUAs, which is well above current CO_2 emissions and closer to the emission levels of 2003/2004 (Stenqvist, 2014). Due to generous allocation and abatement measures the emission-to-allocation ratio reached a low level of 40% in the 2nd period and generated large amounts of transferable EUAs. Nevertheless, the 3rd period allocation will double and reach 4.5 M EUAs in 2013, which is almost five times larger than current emission level (SE NIM, 2012).

There are at least four explanations behind the conspicuous outcome in the 3rd period. Firstly, several large and integrated mills are rewarded by the product benchmarks values that are based on non-integrated single product mills. Secondly, biofuels account for more than 90% of total fuel demand in Swedish PPI whereas benchmark values are based on natural gas (Ecofys, 2009b). Thirdly, several mills are heat exporters and receive free allocations for biomass-based heat deliveries to district heating grids. Finally, when product benchmarks have not been applicable (e.g. for dissolving pulp, kraft paper etc.) the fall back approach for heat consumption have rewarded mills with large biomass-based energy flows.

---

[5] Estimates are based on mill's environmental communication or on production capacity and relevant benchmark values.

3.1.3 France

France is Europe's 5th largest paper and board producer and 6th largest pulp producer, accounting for 9% and 5% of the respective segments (CEPI, 2013). In the 3rd period of EU ETS, 87 installations are proposed to participate compared with 100–120 installations in the previous periods (EUTL, 2013; FR NIM, 2012). Figure 3 shows the development of CO_2 emissions and allocation. Between 2005 and 2012, CO_2 emissions have been reduced by 40% while physical production has been reduced by 23% (EUTL, 2013; FAO, 2013). Thus, there has been some improvement in specific CO_2 emissions.

Figure 3. Emissions and allocations to PPI in France, including all installations within each period. Data source: EUTL (2013) and FR NIM (2012)

Annual allocation decreased from around 5 M EUAs in the 1st period to 4 M EUAs in the 2nd period. Besides shutdowns and decreased production output examples of outsourced heat and power supply have contributed to CO_2 emissions reductions in combination with more tangible abatement measures (EUTL, 2013). After CSCF adjustment the allocation is 3.6 M EUAs in 2013. When accounting only for operating installations listed in the French NIM it represents a reduction by 4% compared with allocation in 2012 (FR NIM, 2012). The emission-to-allocation ratio is expected to be 50–70% in the coming years, successively to some extent offset by the CSCF adjustment. A large amount of transferable EUAs is expected to increase the surplus. There will not be a short position on aggregated level but for a third of installations it could be the case over the coming years (EUTL, 2013; FR NIM, 2012).

3.2 Cement industry

For the total production of cement clinker in EU-28 the aggregated amount of free allocation in 2013 is 155 M EUAs after CSCF adjustment, which is 21% below the average annual allocation in the 2nd period (197 M EUAs) (EEA, 2014). The 2013 allocation is even 12% below the relatively high emission level recorded in 2008 (175 Mt CO_2). However, the reduced allocation does not ensure that the sector will be in a short position over the 3rd period. The emission-to-allocation ratio is currently 83% and the future outcome depends on the sector's ability to recover from its downward trend in production output since 2008 (CSI, 2013). Between 2008 and 2011 there are no evidence for sector-level improvement in specific CO_2 emissions; for the collective of installations that reported to the Cement Sustainability Initiative (CSI) the absolute CO_2 emissions reductions are in line with the production decline (CSI, 2013). The detailed assessment of the CEI in UK, Sweden and France covers 17% of the sector's installations, allocations and CO_2 emissions in EU ETS (Ecofys, 2009c).

3.2.1 United Kingdom

UK's CEI accounts for 5% of cement production in EU-27 (CSI, 2013). Twelve installations are proposed to participate in the 3rd period of EU ETS compared with 17 in the 2nd period (EUTL, 2013; UK NIM, 2012). Four cement plants have been shutdown and one gas-fired power station must no

longer receive free allocation (UK NIM, 2012).[6] Figure 4 shows the development of CO_2 emissions and allocation since 2008.[7] The CO_2 emissions have been reduced by 30% while physical production decreased by 25% (CEMBUREAU, 2013; EUTL, 2013). Thus, specific emissions have improved slightly.[8]

Figure 4. *Emissions and allocations to CEI in UK, including all installations within each period. Data source: EUTL (2013) and UK NIM (2012)*

The emissions-to-allocation ratio has been 55–80% in the 2nd period. Similar to the case of UK's PPI two scenarios are used to demonstrate allocation and emission levels with or without inclusion of records for one power station (EUTL, 2013). After the CSCF adjustment the allocation of 6.6 M EUAs in 2013 represents a reduction by one third compared with 2012. When accounting only for the twelve operating installations listed in UK's NIM the reduction is 25%, which is still 20% above the emission level in 2012. With transferable EUAs UK's CEI can recover from its downturn without facing a short position in the coming years but succesively the situation may become stricter (EUTL, 2013; UK NIM, 2012).

3.2.2 Sweden

The Swedish CEI accounts for 1–2% of cement production in EU-27. In the 3rd period, as in previous periods, three cement plants are proposed to participate in EU ETS (EUTL, 2013; SE NIM, 2012). Figure 5 shows the development of CO_2 emissions and allocations. In 2005–2012 emissions increased by 12%, which could reflect a large production output in 2012 at unchanged or increased levels of specific emissions (EUTL, 2013). However, the Swedish CEI does not report to CSI and production data is insufficient over the period.

Figure 5. *Emissions and allocations to Swedish CEI, including all installations within each period. Data source: EUTL (2013) and SE NIM (2012)*

From emission-to-allocation ratios around 100% in the 1st period increased allocation caused ratios of 80–90% in the 2nd period (EUTL, 2013). In 2013, after CSCF adjustment, the allocation is reduced by 25% and even 20% below the emission level in 2012. Thus, the sector is expected to experience short positions in the 3rd period.

3.2.3 France

---

[6] In the 2nd period, this power station was categorised under the cement sector and received 585,000 EUAs/year in free allocation (EUTL, 2013).

[7] Records for 2005–2007 are excluded since half of UK's CEI was exempted from the 1st period.

[8] Self-reported company data to CSI shows that fuel-mix carbon-intensity and specific gross CO_2 emissions per tonne clinker improved by 5–7% in 2008–2011 (CSI, 2013).

The French CEI is the third largest in EU-27, accounting for 11% of cement production (CSI, 2013). As in previous periods 30 cement plants are proposed to participate in the 3rd period (EUTL, 2013; FR NIM, 2012). Figure 6 shows the development of CO_2 emissions and allocations. In 2005–2012, both emissions and physical production decreased by 15% (CEMBUREAU, 2013; EUTL, 2013). Thus, there has been no change in specific CO_2 emissions.[9]

Figure 6. *Emissions and allocations to French CEI, including all installations within each period. Data source: EUTL (2013) and FR NIM (2012)*

Similar to the Swedish case, the emission-to-allocation ratio changed from around 100% in the 1st period to 80–90% in the 2nd period (EUTL, 2013). In 2013, after CSCF adjustment, the allocation is estimated to be 18% below the 2012 allocation but slightly above the emission level. With transferable EUAs the sector as a whole does not face an imminent risk to be in a short position but for one fifth of the installations it is more likely to occur (EUTL, 2013; FR NIM, 2012).

3.3 Summary of results

Our detailed analysis of allocation in the selected sample of sectors and MSs points to conspicuous outcomes in the PPI. Compared with the coherent outcomes of stricter allocation in the CEI, the assessment of the 3rd period allocation in PPI gives three distinguishable outcomes.

In UK, the allocation becomes stricter. In France, the situation is close to business-as-usual with a continued long position. In Sweden, allocation reaches a conspicuously high level, being twice as large as the 2nd period allocation and almost five times larger the actual emission level. The main explanations of the dispersed outcomes of the benchmark rules are the use of biomass fuels and the economies of scale in process integrated mills. The level of over-allocations clearly reflect the share of biomass in the PPI's fuel-mix, which is about 90% in Sweden, 50% in France and 5% in UK (Ecofys, 2009b).

4 Discussion

Auctioning is the theoretically preferred method of allocating emission allowances as it corresponds to the "polluters pay principle", reduced administrative costs, greater transparency and perceived fairness (e.g. Hepburn et al., 2006). Despite this, free allocation of emission allowances will most likely continue to be used for reasons of protecting competitiveness and avoiding carbon leakage. Establising reliable and robust rules for free allocation that shields against high direct carbon costs, is percieved as fair and politically acceptable and still incentivices firms to take action, is a great challenge.

In view of the annually decreasing cap, currently at -1,74%/year, the issue of free allocation could be viewed as minor issue for the overall effectiveness of EU ETS with the argument that the economic incentive, via the opportunity CO_2-cost, is equal to all participants on the margin. However, arguments from business economics and bottom-up studies on firm behaviour suggest that free allocation and firm-level oversupply of EUAs could dampen firm responses in terms of innovation and investments in

---

[9] Self-reported company data shows that fuel-mix carbon-intensity and specific gross CO_2 emission per tonne clinker is almost unchanged in 2005–2011 (CSI, 2013).

low-carbon solutions and thereby decrease the efficiency of the system (Abrell et al., 2011, Gulbrandsen & Stenqvist, 2013a; Martin et al., 2014; Rogge et al., 2011; Skjaerseth & Eikeland, 2013). Furthermore, allocation substantially more compared to expected emissions could damage the perception of the system among stakeholders such as NGOs and competing industries see e.g. (Sandbag 2011; Hyvärinane 2005).

In the 3rd trading period, the methods used for allocating free allowances were changed to a system based on EU-wide benchmarks. Two of the most contentious issues with the previous NAPs were the use of grandfathering based on historical emissions and the lack of harmonisation across MS. Abandoning the NAPs and introducing EU-wide benchmark methodology implies a strong harmonisation which means that all installations will receive the same treatment with no national flexibility. This should mitigate previous concerns over perverse incentives and strategic behavior from national authorities and result in a more fair and acceptable allocation.

The aim with the new benchmark methodology was also, in general, to allocate less free allowances than needed putting most firms in a short position and thereby forcing them to engage actively in either trading or mitigation. Below we explain the reasons for the outcomes on firm-level allocation of our sample and discuss the consequences of a harmonised benchmark methodolygy on PPI. We also discuss the problems with the rules for managing structural change with a focus on the PPI.

The results from our sample shows that foremost the PPI will most likely continue to be in long positions during the 3rd trading period, with the Swedish PPI being an extreme example. The outcomes of the allocation to the PPI can be explained by several factors. The benchmark values for the PPI could not be determined with CO_2 emission intensity curves reflecting the 10% most efficient producers as the sector was too complicated with many products, processes and configurations. Instead, the PPI's product benchmarks were derived from literature values on energy intensity levels, with natural gas a reference fuel, and then tested on a sample of non-integrated single product mills. Regarding size and process integration, the free allocation based on benchmarks and ex ante production outputs clearly rewards large producers. Especially for large integrated mills, which are potential net producers of steam, the benchmark values based on non-integrated mills represents a windfall gain. The Swedish situation is illustrative. For the ten largest producers of which nine are integrated mills the average emission-to-allocation ratio is 20% in 2013, for outliers even 5% . For the ten smallest producers six stand-alone mills are expected to be in short positions in 2013. Sweden's favorable factor conditions for a low-carbon production of pulp and paper products (e.g. the access to raw materials and renewable energy) and the fact that its PPI started to phase-out fossil fuels already in the 1970s (Lindmark et al., 2011) are generously rewarded in the 3rd period of EU ETS. In international comparisons the Swedish PPI do stand out as the most CO_2-efficient (IEA, 2007). Seen from this perspective the new allocation procedures rewards the best performing installations in terms of specific CO_2 emissions. However, the product benchmark values for pulp and paper products do not represent the average performance of the 10% most GHG efficient installations in 2007–2008 (EC, 2009, Art. 10a(2)). For Swedish PPI, one would have to go back to the early 1980s in order to find emission levels that correspond to allocation levels determined for the 3rd period. Since then fossil fuel use and related CO_2 emissions have been reduced by 80% while physical production has increased by 50% (Stenqvist, 2014).

Long-term and reliable rules for free allocation streching over a full trading period of 5 to 8 years will always have to deal with the fundamental fact that the economy and the industrial structure constantly changes causing problems with i.e. closures, new entrants provisions, and that allocation will partly be based on historical emisson levels and mitigation actions. Managing structural changes in the economy is a general problem with the EU ETS as this can create unexpected 'bubbles' of oversupply

resulting in depressed EUA prices (Karpestam & Andersson, 2011). This problem is currently being discussed for the EU ETS in general but the effects of structural changes in the economy has also effects on the free allocation methodology, especially how to manage closures, new entrants or significant changes in capacity in existing installations.

Allocating allowances for free based on historical emissions (i.e. grandfathering) is the main concern here and this method was abandoned in the 3rd period. However, a certain degree of grandfathering is still present. Both the production volumes and CO_2-performances, either based on benchmark curves or literature values, are determined on historical prerecession records. This is especially important for the PPI which is in a transformative stage with many closures, downsizing and structural changes in production capacity that will put to test the regulated provisions for closures regarding continued free allocation (DG CLIMA, 2011c). In particular the newsprint segment has suffered from diminishing market demand and excess capacity. In Sweden and France, and generally so in Europe, newsprint production fell by 20% between 2007 and 2012 (FAO, 2013). Firms of the Swedish PPI, which accounts for one fifth of EU's newsprint production, have announced additional temporary or permanent shutdowns of paper machines in this segment (Stenqvist, 2014). For five large integrated mills expected production declines are in the range of 20 to 30% compared with the activity levels of 2007 (Danske Bank, 2013). Acknowledging the reduced demand and bleak prospect for newsprint and to some extent other publication/graphic paper grades, it appears unlikely that the historic activity level (2005–2008) will be relevant for the future production levels until 2020 (RISI, 2014). In cases like these, installations and national authorities have to decide whether reduced production is a case of partial cessation or a case of significant capacity reduction influenced by a physical change (DG CLIMA, 2011c). It is probable that the former applies in the case of planned production declines, which are related to weak market condition. Due to generously set thresholds for allocation adjustements installations can reduce their activity levels by half and still receive the full initial levels of free allocation over the 3rd period (DG CLIMA, 2011c). The implications can be described for the five Swedish newsprint mills mentioned above. Together these mills have an emission-to-allocation ratio below 20%; their verified emissions were 200,000 t CO_2 in 2012 and the free allocation is 1.25 M EUA in 2013. Despite decreased activity levels by 20-30%, from 2013 beyond, the full over-supply will remain.

To sum up, the combination of the historic activity level, the biased benchmark values and the generous rules for reduced activity levels are less suited for a sub-sector such as newsprint, which is under major structural transformation. Thus, over-allocations are likely to persist and be further enhanced in the PPI over the 3rd period.

5 Conclusions

The new allocation rules for the EU ETS have managed to reduce the allocation compared with the 2nd period, which was expected. However, this assessment shows that the new rules are not likely to put analysed sectors in short positions within the next few years, with the potential exception being the Swedish CEI. In the CEI the outcome is foremost due to the large production declines observed since 2005–2008. In the PPI the main reason for this outcome is the apparent inability of the benchmark rules to provide a stringent representation of the (fossil) CO_2 emissions intensities in this heterogeneous sector where the biomass share of fuel-mix ranges from 0 to above 90% in different MS.

The EU harmonized allocation procedures are more easily adopted in homogeneous sectors. This assessment demonstrates large differences between the homogeneous CEI and the more difficult and

diverse PPI. The outcomes of the new allocation procedures in CEI are much more coherent than in PPI; the 3rd period allocation will result in stricter allocations to CEI in all three MS compared with the 2nd period allocation.

Another problem that has been highlighted is how to deal with structural change. In the PPI the problems with structural change is very relevant, while the CEI is expected to display a stable development. The EC has issued a set of rules and procedures for the treatment (i.e. adjustment of allocation) of closures, capacity reductions and partial cessation of operations. The compliance of MS and installations in all sectors will be essential to avoid subsidies and to successively increase the share of auctioned allowances.

For the current and future debate on structural reformation of the EU ETS, and for sharing experiences with other emerging emission trading systems in the world, it should be worth looking into how to solve problems with the free allocation based on harmonized benchmarks for a selected number of industries as one might expect that free allocation will continue to be used in some ways.

References

Abrell, J., Ndoye, A., & Zachman, G. (2011). *Assessing the impact of the EU ETS using firm level data*. Bruegel Working paper 2011/08. Brussels: Bruegel.

Andersson, B., & Di Maria, C. (2011). Abatement and Allocation in the Pilot Phase of the EU ETS. *Environmental and Resource Economics,* 48, 83–103. doi: 10.1007/s10640-010-9399-9

CEMBUREAU (2013). *Activity Report 2012.* Brussels: The European Cement Association.

CEPI (2013). *Key statistics 2012 – European pulp and paper industry.* Brussels: Confederation of European Paper Industries.

Cló, S. (2010). Grandfathering, Auctioning and Carbon Leakage: Assessing the inconsistencies of the new ETS Directive. *Energy Policy*, 38, 2420–2430. doi: 10.1016/j.enpol.2009.12.035

Convery, F. J., & Redmond, L. (2007). Market and price developments in the European Union Emissions Trading Scheme. *Review of Environmental Economics and Policy,* 1, 88–111. doi: 10.1093/reep/rem010

CSI (2013). *GNR PROJECT – Reporting CO2* [Data set]. Retrieved November 20, 2013, from http://wbcsdcement.org/GNR-2011/index.html

Danske Bank (2013). *Skog & Ekonomi – Nyheter från Danske Bank.* No 2, May 2013.

Demailly, D., & Quirion, P. (2006). CO_2 abatement, competitiveness and leakage in the European cement industry under the EU ETS: grandfathering versus output-based allocation. *Climate Policy,* 6, 93–113. doi: 10.1080/14693062.2006.9685590

DG CLIMA (2011a). *Guidance on allocation methodologies. Guidance Document n°2 on the harmonized free allocation methodology for the EU-ETS post 2012.* Brussels: European Commission.

DG CLIMA (2011b). *Cross-Boundary Heat Flows. Guidance Document n°6 on the harmonized free allocation methodology for the EU-ETS post 2012.* Brussels: European Commission.

DG CLIMA (2011c). *Guidance on New Entrants and Closures. Guidance Document n°7 on the harmonized free allocation methodology for the EU-ETS post 2012.* Brussels: European Commission.

EC (2003). *Directive 2003/87/87 of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.* Brussels: European Commission.

EC (2009). *Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.* Brussels: European Commission.

EC (2011). *Commission Decision of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council.* Brussels: European Commission.

EC (2013a). *Auctioning.* Retrieved September 30, 2013, from http://ec.europa.eu/clima/policies/ets/cap/auctioning/index_en.htm

EC (2013b). *Free allocation based on benchmarks.* Retrieved September 30, 2013, from http://ec.europa.eu/clima/policies/ets/cap/allocation/index_en.htm

Ecofys (2009a). *Methodology for the free allocation of emission allowances in the EU ETS post 2012 – Report on the project approach and general issues.* Report prepared by Ecofys, Fraunhofer ISI and Öko-Institute by order of the European Commission.

Ecofys (2009b). *Methodology for the free allocation of emission allowances in the EU ETS post 2012 – Sector report for the pulp and paper industry.* Report prepared by Ecofys, Fraunhofer ISI and Öko-Institute by order of the European Commission.

Ecofys (2009c). *Methodology for the free allocation of emission allowances in the EU ETS post 2012 – Sector report for the cement industry.* Report prepared by Ecofys, Fraunhofer ISI and Öko-Institute by order of the European Commission.

EEA (2014). *EU Emissions Trading System data viewer* [Data set]. Retrieved May 28, 2014, from http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer

Ellerman, A. D., Buchner, B. K. & Carraro, C. (2007). The EU ETS allocation process: an overview. In A. D. Ellerman, B. K. Buchner, & C. Carraro (Eds.), *Allocation in the European Emissions Trading Scheme Rights, Rents and Fairness* (pp. 3–12). New York: Cambridge University Press.

EUTL (2013). *European Union Transaction Log* [Data set]. Retrieved August 10, 2013, from http://ec.europa.eu/environment/ets/welcome.do

FAO (2013). *FAOSTAT: Forestry Production and Trade* [Data set]. Retrieved November 6, 2013, from http://faostat3.fao.org/faostat-gateway/go/to/download/F/FO/E

FR NIM (2012). *NIMs LIST FRANCE 09122011b xls* [Data set]. Retrieved November 12, 2012, from http://ebookbrowse.com/nims-list-france-09122011b-xls-d253574275

Gasbarro, F., Rizzi, F. & Frey, M. (2013). The mutual influence of environmental management systems and the EU ETS: findings for the Italian pulp and paper industry. *European Management Journal,* 31(1), 16-26. doi: 10.1016/j.emj.2012.10.003

Gulbrandsen, L., & Stenqvist, C. (2013a). The limited effect of EU emissions trading on corporate climate strategies: Comparison of a Swedish and a Norwegian pulp and paper company. *Energy Policy,* 56, 516–525. doi: 10.1016/j.enpol.2013.01.014

Gulbrandsen, L., & Stenqvist, C. (2013b). Pulp and Paper Industry. In J. B. Skjaerseth & P. O. Eikeland (Eds.), *Corporate Responses to EU Emissions Trading: Resistance, Innovation or Responsibility?* (pp. 127–164). Farnham: Ashgate.

Hepburn, C., Grubb, M., Neuhoff, K., Matthes, F., & Tse, M. (2006). Auctioning of EU ETS phase II allowances: how and why? *Climate Policy,* 6, 137–160. doi: 10.1080/14693062.2006.9685592

Hyvärinen E., (2005). The downside of European Union emission trading – a view from the pulp and paper industry, *Unasylva* 56 (222): 39–41.

IEA (2007). *Tracking Industrial Energy Efficiency and CO_2 Emissions – in support of the G8 plan of action.* Paris: International Energy Agency.

Karpestam, P., & Andersson, F.N.G. (2011). A flexible CO_2 targeting regime. *Economics Bulletin,* 31, 297–308. Retrieved from http://www.economicsbulletin.com/

Lecourt, S. (2013). *EU ETS Phase 3 benchmarks: Implications and potential flaws.* Climate Economic Chair, Working paper series No. 5. Paris: University Paris Dauphine.

Lecourt, S., Pallière, C., & Sartor, O. (2013). *Free allocations in EU ETS Phase 3: The impact of emissions performance benchmarking for carbon-intensive industry.* Climate Economic Chair, Working paper series No. 2. Paris: University Paris Dauphine.

Lindmark, M., Bergquist, A., & Andersson, L. F. (2011). Energy transition, carbon dioxide reduction and output growth in the Swedish pulp and paper industry: 1973–2006. *Energy Policy, 39,* 5449–5456. doi: 10.1016/j.enpol.2011.05.018

Martin, R., Muûls, M., & Wagner, U. J. (2014). Trading behavior in the EU emissions trading scheme (March 21, 2014). doi: 10.2139/ssrn.2362810

Raaum Christensen, A. (2013). Cement Industry. In J. B. Skjaerseth & P. O. Eikeland (Eds.), *Corporate Responses to EU Emissions Trading: Resistance, Innovation or Responsibility?* (pp. 165–205). Farnham: Ashgate.

RISI (2014). *European Graphic Paper Forecast – Excerpt, June 2013.* Retrieved June 11, 2014, from http://www.risiinfo.com/Marketing/forecasts/Excerpts/euro_graphic_long.pdf

Rogge, K.S., Schleich, J., Haussmann, P., Roser, A., & Reitze, F. (2011). The role of the regulatory framework for innovation activities: The EU ETS and the German paper industry. *International Journal of Technology, Policy and Management,* 11 (3/4), 250–273. doi: 10.1504/IJTPM.2011.042086

Sandbag (2011). *Carbon fat cats: the companies benefitting from the EU Emission trading Scheme.* June 2011. London: Sandbag.

Sartor, O., Pallière, C., & Lecourt, S., (2014). Benchmark-based allocations in EU ETS Phase 3: an early assessment. *Climate Policy.* doi: 10.1080/14693062.2014.872888

SE NIM (2012). *Preliminär tilldelning till stationära anläggningar [Preliminary allocation to stationary installations]* [Data set]. Retrieved November 12, 2012, from http://www.naturvardsverket.se/Start/Lagar-och-styrning/Ekonomiska-styrmedel/Handel-med-utslappsratter/Handelsperioden-20132020/Tilldelning-till-stationara-anlaggningar/

Skjaerseth, J. B., & Eikeland, P. O. (Eds.) (2013). *Corporate Responses to EU Emissions Trading: Resistance, Innovation or Responsibility?* Farnham: Ashgate.

Skjaerseth, J. B., & Wettestad, J. (2009). The Origin, Evolution and Consequences of the EU Emissions Trading System. *Global Environmental Politics, 9*(2), 101–122. doi: 10.1162/glep.2009.9.2.101

Stenqvist, C. (2014). Trends in energy performance of the Swedish pulp and paper industry: 1984–2011. *Energy Efficiency.* doi: 10.1007/s12053-014-9276-4

UK NIM (2012). *Modified UK National Implementation Measures for Phase III of the EU Emissions Trading System.* London: Department of Energy and Climate Change.