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Benchmarking in the European Union Emissions Trading System: Abatement incentives

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ABSTRACT

This paper investigates abatement incentives for allowance allocation based on output and sector specific benchmarks, here called output based allocation or benchmarking. Special attention is given to updated allocation and we assume that allowances can be traded with other sectors (open cap). We confirm earlier studies that output based allocation based on ex-ante data provide the same abatement incentives as auction or grandfathering and also confirm that output based allocation with updated output and ex-ante benchmarks provides as high abatement incentives as auction, but constitutes a production subsidy. However, we also find that benchmarking with updated output and updated benchmarks reduces abatement incentives somewhat, but less so than updated grandfathering. An allocation rule where the sector cap is prescribed ex-ante, for instance based on historic emissions, and distributed to installations in proportion to their updated production preserves full abatement incentives and avoids some of the costs associated with the determination of benchmarks. However, this rule also constitutes a production subsidy, which decreases with industry concentration. If a sector is split into smaller groups each with one benchmark per sub-sector, benchmarking evolves toward grandfathering. Since benchmarking is conditioned on production, this allocation method protects production from leakage, i.e. migrating to areas where firms face no emissions cost. This may actually be the most compelling reason for choosing benchmarking.

1. Introduction

The EU emission trading system (EU ETS) was launched with the purpose of reaching, in a cost-effective way, the EU's climate target of reducing emissions by at least 20 per cent by 2020. The EU ETS is the first international trading system for CO_2-emissions in the world and applies to the 28 EU member states plus Norway, Iceland and Lichtenstein. It covers some 11,500 participating installations in the energy and industrial sectors which are collectively responsible for close to half of the EU's emissions of CO_2 and 40% of its total greenhouse gas emissions (European Commission, 2008 and 2009). The first trading period, 2005–2007 was a trial period; the second period coincided with the Kyoto protocol's first commitment period (2008–2012); and the third period runs from 2013 to 2020. In phases one and two emission allowances were to a large extent allocated gratis to the participating installations. National allocation plans (NAP) were developed by each member state, following a set of allocation criteria (European Commission, 2003). With few exceptions, allocation to incumbents was based on historic emissions, or a fraction thereof. This allocation method is often referred to as *emission based allocation* or *grandfathering*. For new entrants, where no historic data exists, allocation was usually based on projected emissions or output times a sector specific *benchmark* (expressed as tons of CO_2 per unit of output).

The allocation process is a process of distributing an economic asset to the covered industry free of charge. Since the value of this asset is considerable (Ellerman et al., 2007), the distributional effects may be important (see for instance Burtraw and Palmer, 2008). This makes the allocation process inherently controversial and political (Zapfel, 2007). One may then ask why the EU has predominantly chosen free allocation as opposed to auctioning in the first two phases. Free allocation reduces resistance from industry to stringent targets and serves as compensation to incumbent installations that are affected by the regulation (Åhman et al., 2007). More generally, using revenues from environmental policies in order to offset part of adjustment costs to influential industries has become a central element to the design of market based instruments (Böhringer and Lange., 2005). Harrison et al. (2007) argue that the three general approaches to allocating allowances – grandfathering, benchmarking and auctioning - achieve

Abbreviations: OBA, Output Based Allocation; EU, European Union; ETS, Emissions Trading System; NAP, National Allocation Plan.

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the same environmental objective and the same efficient (least cost) compliance result.[1] However, this holds only under certain conditions such as no updating, negligible transaction costs and perfect competition. Hence a firm has the same incentives for emission abatement regardless of how or how many allowances have been acquired as long as the allocation was determined before the firm had knowledge of the system and this allocation cannot be changed due to changed circumstances.

Although abatement incentives may be preserved, there are other potentially problematic effects with ex-ante free allocation, especially if based on historic emissions. First, if all allowances are allocated gratis to incumbents as a compensation for a new climate policy, the transferred wealth can be significantly larger than the extra costs incurred on firms (Burtraw and Palmer, 2008; Fischer and Fox, 2007). Secondly, allocation based on historic emissions is often perceived as unfair as it rewards large emitters rather than rewarding firms that already have invested in carbon efficient processes. This may undermine the credibility and public support for the system and discourage early action. Thirdly is the issue of updating. Without updating the ex-ante allocation would preserve a major asset transfer to industry. As we move into the future, the data and circumstances on which the allocation was initially based will become increasingly irrelevant. Production volumes change, old installations close, new installations enter, technologies, processes and products change. At some point the allocation needs to be updated, and this creates a dilemma to the regulator. If allocation in future trading periods is based on data that can be affected by industry, this will change the firms' incentives for action. For instance, if a company knows or suspects that allocation in the second period of the trading system will be based on emissions from the first period there will be an incentive to sustain emissions in the first period in order to get a higher allocation in the second period. Harstad and Eskeland (2010) show that in a dynamic setting, anticipating the regulator's future desire to give more permits to firms that appear to need them, firms purchase permits to signal their need. This raises the price above marginal costs and thus results in an inefficient market outcome. If the social costs are high and the government intervenes frequently in the market, the distortions could potentially be greater than the gains from trade and non-tradable permits would be better. Neuhoff el al. (2006) point out that in contrast to most US allowance programs where allocation is done only once as a lump sum, the EU ETS adopts a sequential approach. Allocation plans are decided for one commitment period at a time, with repeated negotiations about the allocation for the following period. The authors conclude that if power generators anticipate that their current behaviour will affect future allowance allocation; this can distort today's decisions.

The obvious solution to the updating problem is to phase out free allocation and replace it with auctioning. The problem is that auction leads to significant costs for carbon intensive firms and may have implications on their competitiveness. For companies that can pass-through carbon related costs this may not be a problem. But for companies unable to pass through these costs phasing our free allocation completely may be problematic. If these carbon related costs are not compensated, at least in part, they may move their production to lower cost regions. This relocation, so called carbon leakage would undermine the integrity of the carbon policy.

Accordingly, the EU ETS directive has been updated (European Commission, 2009), drawing on lessons from the two first phases. In phase three, a much greater part of the emission allowances are auctioned than in phase 2 with at least 60% auctioning in 2012 and with a target of reaching 70% auctioning in the year 2020 and 100% in the year 2027. An exception will be made for installations in sectors judged to be at significant risk of carbon leakage, meaning that they could be forced by international competitive pressures to relocate production to countries outside the EU that do not impose comparable constraints on emissions (European Commission, 2008). For these sectors, the directive provides free allowances. The allocation of these free allowances is mainly based on output and sector common benchmarks, referred to as *output based allocation* or *benchmarking* (European Commission, 2009, §18). According to the Commission, the rationale for this is to *reward operators that have taken early action to reduce greenhouse gases, to better reflect the polluter pays principle and give stronger incentives to reduce emissions, as allocations would no longer depend on historical emissions* (European Commission, 2008).[2]

In light of the proposed allocation methods for ETS phase 3, there is a need to understand the consequences on cost-effectiveness of different allocation rules. The objectives of this paper are to broaden the understanding of how abatement incentives are affected by output based allocation. More specifically, we investigate abatement incentives in a dynamic setting (updated allocation) assuming that permit price is set exogenously. The rationale for this is that in the EU ETS a firm receiving free allocation through a sector specific benchmark can trade allowances with other sectors in the same ETS (open cap). We further assume that the total volume of abatement in the ETS is so large that firms' behaviour cannot influence the permit price of the whole system. This is however a simplification and is discussed further in the Discussion section.

The analysis is done using a two period analytical model, where allocation to an installation in the second period is influenced by performance in the first.

Böhringer and Lange (2005) have investigated effects on economic efficiency for alternative allocation rules in a static (one-period) setting, using emissions and output from the trading period as a basis for allocation, and where permit price is determined exogenously (open system). They conclude that the output based allocation (OBA) rule is distinctly less costly than emission based allocation rule to preserve output and employment in energy-intensive sectors. Åhman et al. (2007) propose an allocation model which is based on historic emissions, but updated by using a sliding base year 10 years back. Due to discount effects this will reduce firms' incentives to increase emissions in order to increase allocation profits since these revenues come ten years later. Rosendahl and Storrøsten (2011) show that in a closed system incentives regarding entry and exit are actually equal under updated emission based allocation and pure grandfathering. This is because the quota price is higher under updated grandfathering as firms anticipate the effect of current emissions on future allocation revenues. New firms have to pay a higher bill initially, but are better off later on when they have earned the right to receive free quotas. This holds under certain conditions, for instance that all firms have the same expectations on discount rates and future quota prices and that no banking or borrowing is allowed. Updated output based allocation has been studied by for instance Fischer (2001), Burtraw et al. (2001), Sterner and Muller

[1] The theoretical foundation regarding incentives from allowance allocation stems from Coase (1960). The "Coase theorem" forms a central part of classic economics literature (see for instance Frank, 2004; Sterner, 2003; Kolstad, 2009). The ideas by Coase have been advanced by others; for instance Montgomery (1972) showed that it is possible to achieve environmental goals cost effectively by establishing a market of tradable pollution licenses and that this could be done independent of the initial allocation among polluting firms. Ellerman et al. (2010) reformulates Coase as: *an upfront, fixed assignment of rights to emit will have no effect on the supply and demand for the good in question—in this case emissions.* The term *fixed* means that the allocation is determined ex-ante and not adjusted later.

[2] This is largely in line with the views of EU industry. Based on a series of seminars with representatives from EU industry, business associations and non-government organisations, held in 2009, The Centre for European Policy Studies (Egenhofer and Georgiev, 2010) summarises different stakeholder views on the advantages with benchmarking as opposed to grandfathering. These arguments include *incentivising emissions reductions*; *allow for updating without introducing perverse incentives*; *ensuring a non-distorted carbon price.* Some of these organisations argue that updating benchmarks based on performance in previous trading periods will set an example for other firms to follow. While these arguments relate to mitigation incentives, other arguments presented in the report are rather related to cost distribution and a perception of fairness: *Benchmarks reward greenhouse gas efficiency*; *benchmarking rewards early action*; and *benchmarking enhances public support and hereby increases the credibility for the ETS.*