AN ANALYSIS OF ALLOWANCE BANKING IN THE EU ETS

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Overview

The existence of some 2 billion unused EU Allowances (EUAs) at the end of Phase II of the EU's Emissions Trading System (EU ETS) has sparked considerable debate about structural shortcomings of the EU ETS. However, there has been a surprising lack of interest in considering the accumulation of EUAs in light of the theory of intertemporal permit trading, i.e. allowance banking. In this paper we adapt basic banking theory to the case of a continuously declining cap, as is common in greenhouse gas control systems. We show that it is perfectly rational for agents to decrease emissions beyond the constraint imposed by the cap initially, accumulating an allowance bank and then drawing it down in the interest of minimizing abatement cost over time. Having laid out the theory, we carry out a set of simulations for a reasonable range of key parameters, geared to the EU ETS, to illustrate the effects of intertemporal optimization of abatement decisions on optimal time paths of emissions and allowance prices. Our simulations yield banking behavior which is broadly consistent with ex post data from the EU ETS. We conclude that bank accumulation as the result of intertemporal abatement cost optimization should be considered at least a partial explanation when evaluating the current discrepancy between the cap and observed emissions.

Methods

Existing work on emission permit banking applies the theory of the intertemporal allowance trade (Rubin, 1996; Cronshaw and Kruse, 1996; Kling and Rubin, 1997; Leiby and Rubin, 2001) to the particular cap structure of the SO_2 trading system in the U.S. (Schennach, 2000; Ellerman and Montero, 2007). Our first contribution is to adapt the theory to the smoothly declining cap of a greenhouse gas control system, as is the case in the EU ETS. For the sake of tractability we consider a parsimonious set-up of the model, namely the planner's solution, which readily extends to the decentralized solution when using the assumptions made in this literature.

Based on the theoretical solution we simulate a number of scenarios, for a range of reasonable parameter values, to consider the effects of intertemporal allowance trading on optimal paths of emissions and bank accumulation over an extended period of time. We note that the simulations are meant to be illustrative of the general effects of intertemporal trading rather than trying to precisely match underlying paremeter values. We are particularly interested in the role of business-as-usual (BAU) emissions and the discount rate on the optimal paths of emisisons and allowance banking, while assuming a slope coefficient of -1.74% for the decline of the cap, in line with current legislation, as well as a simple linear form for the marginal abatement cost function.

We compare our simulation results with descriptive data from the EU's Transaction Log (EUTL) and discuss the fit of the results with the data.

Results

We evaluate the path of optimal emissions and bank accumulation over time assuming the following range for the main parameters: 3%, 4% and 5% for the discount rate and 0.01%, 0.05%, and 0.1% annual growth rate for BAU emissions, respectively. We find that in all cases, independently of the concrete parameter values chosen, initially abatement occurs in excess of what is imposed by the cap, so that a significant bank is accumulated during the initial stage of the EU ETS. In our benchmark scenario with a discount rate of 4% and growth in BAU emissions of 0.05% per annum we find an extended banking period, projected to end in the early 2040s. We find a maximal bank of almost 2 billon permits, with the peak of bank accumulation predicted to occur at the end of the current decade.

The benchmark case of this bare-bones model setup provides a reasonable fit with the observed bank accumulation since the start of EU ETS Phase II, when open-ended banking became possible in the EU ETS. Qualitatively, the other scenarios are also similar in terms of banking accumulation. However, the path of prices cannot be matched, highlighting the need for a richer model, e.g. allowing for transitory shocks.

The precise shape of the paths of emissions and bank accumulation depend on the values assumed for the rates of discount and the rate of growth in BAU emissions in different ways. Increasing the rate of discount, i.e. placing more value on the present compared to the future, induces a smaller overall bank. It also leads to a shorter banking period, during which a positive bank is held by the agent. Changing the assumed growth rate in BAU emissions affects the maximal size of the bank but has a rather small effect on the length of the banking period. For instance, our simulations show that while increasing BAU emissions growth significantly increases the maximal size of the bank, it only marginally increases the length of the banking period.

Conclusions

Allowance banking has been a neglected subject on the research agenda concerning the EU ETS. Our hope is that this preliminary analysis will convince researchers interested in the EU ETS, or more generally in carbon markets, that the topic belongs on that agenda. As the preceding comments indicate, there are plenty of open questions. What should not be open, however, is whether allowance banking must be considered in explaining observed phenomena in the EU ETS and in particular the stock of unused allowances that has been accumulated in the course of Phase II and into Phase III. For too long, the facile explanation of « over-allocation » has been used when the reality is more complicated and involves economic choices by optimizing agents, rather than purely a failure of administrative systems, as the term over-allocation may suggest. One key lesson of this analysis of allowance banking in the EU ETS is that it is rational to decrease emissions below the cap at the start of the banking period to minimize abatement costs over time. The observed EUA bank at the end of Phase II falls within the range of values indicated by the illustrative simulations presented in this paper suggesting behavior by agents consistent with intertemporal cost minimization.

This is good news for it reveals a form of voluntary early action triggered by the particular structure of the cap in the EU ETS, namely, one that starts out near or at the level of initial business-as-usual emissions and declines steadily thereafter. This structure can be found in one form or another in other proposed and implemented CO_2 emissions trading systems and it seems likely to characterize future greenhouse gas trading systems, given the nature of the problem being addressed and the available technology. The logic of allowance banking would suggest, and the experience with the EU ETS seems to bear out, that when banking is allowed and agents are faced with a credible prospect of future scarcity, they will reduce emissions initially more than required in order to capture the gains that come from intertemporal cost minimization.

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