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Banking and back-loading emission permits ☆

Corinne Chaton [a,*], Anna Creti [b], Benoît Peluchon [c]

[a] FiME (Finance for Energy Market Research Centre), France and CABREE (Centre for Applied Business Research in Energy and the Environment), Canada
[b] LEDA-CGEMP, Université Paris Dauphine and Ecole Polytechnique, France
[c] EDF R&D, France

HIGHLIGHTS

- Relationship between the market for permits and the output market of regulated sectors.
- Analysis of CO_2 prices and banking.
- Impact of a recent environmental policy measure (backloading) on CO_2 prices.

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ABSTRACT

In this article we focus on the so-called back-loading policy adopted by the European Commission to increase the carbon market price. This environmental measure consists of removing a share of the allowances allocated for a given period in order to reallocate some or all of them later on. To analyze the impact of the permits back-loading, we determine the CO_2 price equilibrium with and without the policy measure, considering not only the market for permits but also the output market of regulated sectors. We propose a two-period model, where the market for permits is perfectly competitive, and the output market can be either competitive or oligopolistic. First, we define the condition under which banking from one period to another is optimal. This condition, that is the absence of arbitrage opportunities (AOA), depends not only from the period initial allocation but also on production market fundamentals. When this condition is satisfied, the market for emission is shown intertemporally efficient. Second, we point out that the back-loading measure may create inefficiencies or leave unaffected the permits price, if it alters the AOA.

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1. Introduction

The European market for tradable permits (henceforth, EU-ETS) has undergone significant changes since its inception in 2005. During the first phase (2005–2007) the permit price collapsed and reached zero during the last months of 2007, when it became clear that too many allowances were issued (see Fig. A.1 in Appendix A) and banking restrictions (Alberola and Chevallier, 2009) prevented the link between the first and the second phase (2008–2012). In response, the Climate and Energy Package, adopted in December 2008, at the beginning of the second phase, has authorized the banking of permits between different phases, i.e. the possibility to use permits issued in one year (vintage) for compliance in subsequent years. Due to this intertemporal link, even if a phase is long (total emissions lower than the sum of allowances), the value of permits is positive because of the possibility to use them in the next phase. Since 2008, more EUAs have been issued each year than were used, leading to a substantial stock of allowances in circulation. Several fundamental factors are responsible for this surplus. First, industrial production in Europe was strongly affected by a strong economic recession. While production grew between 2003 and 2007 by almost three percent per year, it decreased by almost two percent per year between 2008 and 2012. In turn, demand for allowances substantially decreased. Assuming an annual decline of the allowance demand of five percent compared to the baseline, the annual demand reduction from 2008 to 2012 has been be more than 100 million t (CdC Climat (Caisse des Dépôts Climat), 2013). Second, energy efficiency policies and renewable energy promotion also lead to carbon reductions. Third, in the ETS second phase, the EU legislation allowed 1420 million t (i.e. 284 million t per year) of carbon reductions from outside the ETS, coming from the Clean Development Mechanism, to be used instead of European emission allowances. Fourth, according to the

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* Corresponding author. Fax: +33 1 47 65 37 34.

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European Commission (2014), some additional 500 million allowances from three exceptional sources have been brought to the market in 2012/2013, that is unused allowances from the second phase, national new entrants reserves and a fixed amount of allowances in order to fund a number of carbon capture and storage and innovative renewable projects (NER300 program). The permits surplus has thus reached 2100 Mt at the beginning of the EU-ETS third phase (2012–2020). In this context, the CO_2 price did not reflect the value of using allowances during Phase 2, since 2012 emissions were definitively below the cap for that year (European Commission, 2014). The carbon price has fallen at levels deemed insufficient to induce investments in cleaner production capacities. For instance, Feng et al. (2011a) have shown that the long term trend of CO_2 prices has declined gradually since 2005 from 18 to 16 euro per t.

To absorb some of the permits surplus, the EU-ETS amendment, approved on July 3rd 2013 by the European Parliament, has introduced the so-called back-loading measure. As a short term measure to mitigate the effects of this problem in the context of additional temporary imbalances caused by regulatory changes linked to the transition to Phase 3, the Commission proposed to back-load the auctioning of 900 million allowances in the beginning of Phase 3. In particular, the Commission has proposed to change the auctioning timetable provided for in Regulation (EU) No. 1031/2010 of November 12, 2010. The amendment to Regulation (EU) No. 1031/2010, approved by the Climate Change Committee on January 8, 2014, aims at reducing the auctioning of 900 million allowances from 2014 to 2016 (400 in 2014, 300 in 2015, and 200 in 2016) and at postponing their auctioning to 2019 (300), and 2020 (600). The impact assessment carried out by the Commission demonstrates that such back-loading technique will improve the market balance by slowing down the build-up of the surplus in the early years of Phase 3, increasing the carbon price and increasing governments' auction revenues (European Commission, 2012a,b).

This measure has an immediate impact on CO_2 prices. The Commission projected 2020 prices in the range of € 16.5–€ 25 by 2020. That same assessment also projected prices in case of back-loading allowances over Phase 3, and concluded it would increase prices to € 30 by 2020. At the beginning of 2014, when the back-loading measure has been voted by the European Parliament, the CO_2 price has risen from 5 €/t to 7 €/t, before falling back to 6 €/t, when 2013 emissions data worse than expected have been released.

To complement back-loading, the Commission is actually also considering the Market Stability Reserve mechanism, which is a specific rule triggering adjustments to the annual permits allocation, in situations where the total number of allowances in circulation is outside a certain predefined range. This mechanism will not be operational before 2017 at the earliest, if adopted. Moreover, back-loaded permits may be put into the Market Stability Reserve instead of being auctioned back. On top of these measures, propositions by the Commission to define targets for 2030 have been made in January 2014, but it may take years before they become law. In this uncertain context, the back-loading policy is a mean to prop up the carbon price before implementing deeper reforms. However, back-loading still implies a high uncertainty on the final quantity of permits effectively supplied during the last years of Phase 3, since the possibility exists that withheld permits are not completely re-injected in the market.

How do the features of back-loading affect the price dynamic in the EU-ETS? This question is all the more important than the Market Stability Reserve may be seen as an automatic back-loading (and reverse back-loading) mechanism and that carbon price fluctuations are very sensitive to regulatory rules (Feng et al., 2011b). In order to answer that question it is necessary to go beyond the analysis found in the literature and build a model in which the rules characterizing intertemporal flexibility are analyzed. Moreover such measures, often described as *capacity adjustment mechanisms* can be found in emissions markets currently being set-up in different countries (for instance Australia, California, South Korea, China). The goal of the present paper is to investigate how and when such a regulation of the allowance surplus may succeed. To this end, we link the back-loading measure to the specificities of banking, which is also one of the aspects of the EU-ETS that has not been studied so far in conjunction with stability and other regulatory mechanisms (Zhang and Wei, 2010).[1]

Our work is related to papers studying temporal flexibility in permits markets.[2] The first articles tackling this issue are Rubin (1996) and Cronshaw and Brown-Kruse (1996). While the latter shows that banking leads to the least-cost solution, provided that no firm is subject to a rate of return regulation, the former extends the model and provides a rigorous treatment allowing for the inclusion or not of borrowing. Rubin finds the necessary conditions for perfectly competitive permits market equilibrium to exist, without uncertainty. The firms must comply with a cap and each one must decide: the level of their emissions at each time, knowing that the less they emit, the more it costs (the cost function may be different between firms); the quantity of permits bought/sold at each time. The equilibrium is found by means of optimal control in continuous time and finite horizon, with a terminal condition such that if a firm holds a permit at the terminal period, its value is zero. Intertemporal flexibility allows firms to equalize their present value marginal abatement costs, and, as a consequence the permit price grows at the discount rate (Hotelling's rule). Rubin also obtains the growth path of equilibrium emissions, which allows him to conclude that banking allows for less social damages, when the cap decreases with time and the damage function is convex and cumulative damage is the integral of damages in all time periods. This helps to highlight the social benefits coming with intertemporal flexibility: firms have an incentive to reduce their emissions sooner than without banking, because they are saving their reduction in the form of permits for a future more constrained. Kling and Rubin (1997) show that this property does not necessarily imply that banking and borrowing (i.e. using the permits in advance over the allocation of the next year) are socially optimal, when taking into account the fact that lower emissions mean higher production costs for price-taking firms (the price of the good produced remaining exogenous). They propose to solve this inefficiency by modifying the banking-borrowing provisions and introducing a discount ratio for borrowed permits: firms would have to pay more when they borrow.

Schennach (2000) analyzes the equilibrium on the emission market in the same way as Rubin (1996), but in an infinite horizon model. Schennach shows that, when borrowing is not allowed and when the abatement marginal cost does not increase faster than the discount rate, the only incentive to bank allowances is the fact that there are different phases with a decreasing cap. She provides explicit solutions for the optimal emissions path and the permit price when borrowing is not allowed, by restricting abatement marginal cost to a linear function. This framework is then extended to uncertainty. This latter case implies that a kind of convenience yield exists: the expected permit price grows at a lower

[1] We neglect borrowing within a phase that is the possibility to use in advance permits allocated for the subsequent year (for a presentation of borrowing rules see Carmona et al. (2009)). Also notice that the gradual evolution towards auctioning, started in 2013, does not alter banking nor borrowing.

[2] For a survey on banking literature, see Chevalier (2012), whereas a more general review of the literature about cap and trade systems can be found in Taschini (2010).

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