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# Policy options to improve the effectiveness of the EU emissions trading system: A multi-criteria analysis<sup>☆</sup>

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## HIGHLIGHTS

- ▶ A multi-criteria analysis is adopted to compare policy options to improve the ETS effectiveness.
- ▶ An ETS cap reversible adjustment by a carbon central bank is the first-best option.
- ▶ The establishment of a EU-wide price floor would represent a second-best solution.
- ▶ A national price floor is the worst option but self-interest states may find it optimal.
- ▶ A post-2020 target is not a mutually exclusive option and should be set.

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## ABSTRACT

This paper considers several policy options which have been proposed to improve the functioning of the ETS. These options require an intervention either on the ETS cap (–30% target, set-aside, carbon central bank, long-term target) or on the carbon price (European and national price floor). We analyse the impact of each policy on the ETS carbon price and emissions. A multi-criteria evaluation method is applied to compare the policy options against a plurality of environmental, economic and procedural criteria. We find that the final ranking depends on the goals to be achieved, i.e., the relative weights attributed to the criteria. When policymakers want mainly to support the carbon price both in the short and long-run, while improving ETS flexibility and harmonization, the CCB and the EU price floor are, respectively ranked as first and second-best options. As the preference for environmental and implementation goals gradually increases, the position of the EU price floor and CCB options tend to invert. The –30% target should be adopted when reducing emissions is the priority goal, while a national price floor is the worst option, in this case. Nevertheless, self-interested States looking for a relatively quick, feasible solution, may find it optimal.

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## 1. Introduction

Since the launching of the ETS in 2005, the carbon price has, on several occasions, dipped beneath the expected level. Following the economic recession, the ETS cap is not stringent anymore and the resulting surplus of allowances will be carried over to future years, lowering the future carbon price. Without a high carbon price and a clear long-term price signal, the ETS may fail to induce emissions abatement by stimulating technological innovation and the adoption of low-carbon technologies (Helm, 2008; European

Commission (EC), 2010b; European Commission (EC), 2011). Against this scenario, several options to support the ETS carbon price have been proposed. They are likely to affect the carbon price and the environmental performance of the ETS in different ways. They have different juridical implications, too, in terms of necessary adjustments to the ETS normative framework and implementation procedures.

This paper analyses several policy options that have been proposed to improve the functioning of the ETS: (a) increase in the European emission reduction target (–30% target); (b) ex-post ETS cap adjustment (set-aside), that could be permanent (one-off), temporary or progressive; (c) institution of a carbon central bank (CCB); (d) a carbon price floor set either at a national or European level; (e) establishment of binding reduction targets into the future (post-2020). We first analyse the impact of each policy on the ETS carbon price and emissions. Then, building up

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on Konidari and Mavrikis (2007) (hereafter KM), a multi-criteria evaluation (MCA) method is applied to evaluate and compare the policy options. The MCA is performed in four steps. *First step*: a comprehensive set of multiple criteria regarding both the economic, environmental and procedural effects of each proposal is selected. *Second step*: Each of these criteria is weighted. *Third step*: each policy option is evaluated against the weighted criteria. *Fourth step*: for any policy option the different grades are summed up, providing a single value which synthesizes its overall performance. The MCA allows for a ranking of the various policy options and makes it possible to identify the most appropriate instrument to improve the effectiveness of the ETS.

The paper is organized in the following manner. Section 2 summarizes the inefficiencies that characterize the ETS performance to date. Section 3 introduces the various policy options and analyses their different impact on the carbon price and emissions within the ETS. Section 4 introduces the MCA and describes the criteria selected to evaluate the policy options. Section 5 analyses the techniques we adopt to evaluate and rank the various policy options. Section 6 presents the grades attached to each policy option against the various criteria, while Section 7 describes the final ranking of the policy options and tests its robustness through a sensitivity analysis (SA). Section 8 concludes.

## 2. State of affairs of the ETS: Problem of price signalling

The ETS is characterized by structural rigidity on the supply side, as the ETS cap -the aggregate level of emissions that the ETS sectors can produce- is fixed at a known level, while the carbon market clearing price varies continuously and tends to react strongly to exogenous shocks on the demand side. The economic recession in 2009 caused an unexpected reduction in ETS emissions and, consequently, a structural decrease in the ETS carbon price. Since the ETS cap does not result stringent anymore due to the current surplus of allowances that will be transferred to the third trading period 2013–2020, the future carbon price will be, by all accounts, significantly lower than the expected one<sup>1</sup>. This event, coupled with the permanence of regulatory uncertainty<sup>2</sup> and the lack of a clear long-term price signal, risks negatively affecting ETS installations' confidence in the ETS and their propensity to adopt low-carbon technology<sup>3</sup> (IEA, 2011; European Commission (EC), 2011; Martin et al., 2011). This in turn risks increasing the cost of reaching the European goal of decarbonisation by 2050, since a considerable amount of the capital stock in the energy sector needs to be replaced within the current decade. Moreover, as EU-wide public auctions of allowances are to be held starting in November 2012, the structural reduction in the carbon price is likely to reduce the related

<sup>1</sup> At the time when the Climate Package was approved and the ETS cap was fixed for the third trading period (2013–2020), a 30 €/t carbon price was expected (European Commission, 2008), as the European economy was in an upswing, ETS emissions were expected to increase and the ETS cap for the second phase had been reduced by the EC. In particular, the 30 €/t carbon price was used in the impact assessment accompanying the revised ETS Directive.

<sup>2</sup> Differently from energy markets, the ETS is a market where firms trade an intangible good generated by the regulator. The ETS performance depends on political decisions that shape its institutional framework. Consequently, uncertainty affecting the carbon price can also be regulatory driven (regulatory uncertainty). Regulatory uncertainty concerning the ETS has arisen in a number of instances (Alberola et al. 2008a,b, Chevalier et al., 2009, Alberola and Chevalier, 2009), impacting negatively on firms' confidence in this mechanism.

<sup>3</sup> In particular, Martin et al. (2011), in a regression analysis of the effect of climate policy on innovation at firms' level, find a significant and robust positive association between firms' expectations about the future stringency of their cap and clean innovation.

public revenues. Under a political economy perspective, this factor might have also strengthened the regulator's will to support the carbon price through public intervention on the ETS.

## 3. Measures for supporting the carbon price and criteria for comparative analysis

Several policy proposals to support the ETS carbon price have emerged in the European political climate debate. This section presents these proposals and analyses their impact on the ETS in terms of carbon price and emissions.

### 3.1. A –30% emissions reduction target

The European Commission (EC) has analysed the possibility of increasing the level of ambition of the overall EU emissions target from 20% to 30% by 2020 (European Commission (EC) 2010a,b,c,d) for both ETS sectors and non-ETS sectors<sup>4</sup>. Concerning the ETS, a reduction of the cap is expected to increase the average carbon price. This effect is illustrated in Fig. 1, which describes the ETS market in equilibrium given a fixed vertical supply (ETS cap) and a negatively sloped demand, which we assume to be linear. This assumption has been adopted in similar analyses (Sijm et al., 2006; Hepburn et al., 2007; Wirl, 2007) as well as for describing demand in the energy market and in the tradable white certificates market (Sorrell et al., 2009). The results of our analysis do not depend on this assumption. Indeed, we can verify that, while the intensity of the price variation induced by any of the considered policy options depends on the shape of the demand, the ranking in terms of long-term price variation resulting from the comparative analysis among the different policy options does not depend on the shape of the demand. In fact, as the ranking does not depend on the shape of demand, our results are not assumption based. As the linearity of demand is compatible with the comparative results of this paper we can adopt this simplifying assumption. In the short term, when the demand of allowances does not vary, the reduction of the ETS cap (from  $Cap_0$  to  $Cap_1$ ) increases the price level and reduces the optimal quantity at equilibrium (from  $E_0$  to  $E_1$ ).

However, by reducing the ETS cap, the degree of market flexibility remains unchanged compared to the current framework and the carbon price is expected to continue to vary with uncertainty, depending on the variation in the demand of allowances. This effect is shown in Fig. 2: in the long-term, in spite of the lower supply, the uncertain and continuous variation of demand, within the range  $D_{2A}$  and  $D_{2B}$ , causes a variation of the equilibrium price between  $p_{2a}$  and  $p_{2b}$ . Thus, this measure is not likely to send a clear price signal.

### 3.2. Ex-post cap adjustment

This option consists in imposing an ex-post adjustment of the ETS cap, without affecting the non-ETS emissions reduction target<sup>5</sup>. This proposal can be realized by cancelling part of the amount of allowances to be sold by public auction. We can distinguish between a **permanent set-aside** (option b.1) where allowances are withdrawn as a one-off measure from the market and then definitively cancelled, and a **temporary set-aside** (option

<sup>4</sup> The effects of this option have been recently assessed for each MS (European Commission (EC), 2012).

<sup>5</sup> A general proposal along these lines was included in the legislative report of the Industry, Research and Energy Committee of the European Parliament with reference to the proposed energy efficiency directive, subsequent to its deliberations on 28/02/2012.

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