

The European Emission Trading System, Overlapping Climate Policies & the Fit for 55 Package

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The European Emission Trading System & the Fit for 55 Package

European Emission Allowance (EUA) prices since 2015:

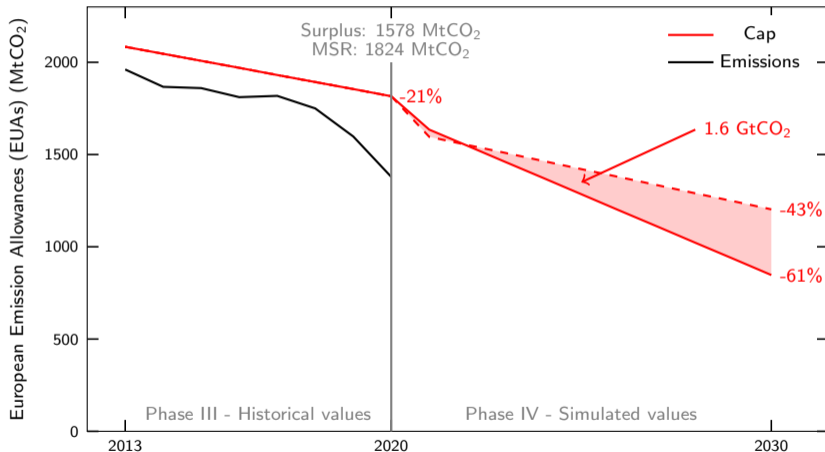


Three main messages

- 1 The level of ambition towards 2030 is unseen and exceeds '-61%', which may explain the recent EUA price hike.
- 2 Effective cumulative European emissions are highly uncertain due to the MSR's invalidation policy.
- 3 The effect of any overlapping (member state, company or individual's) policy that affects emission allowance demand on cumulative EU emissions is highly uncertain, may be counterintuitive & more-than-proportional.

1 The level of ambition towards 2030 is unseen and exceeds '-61%'

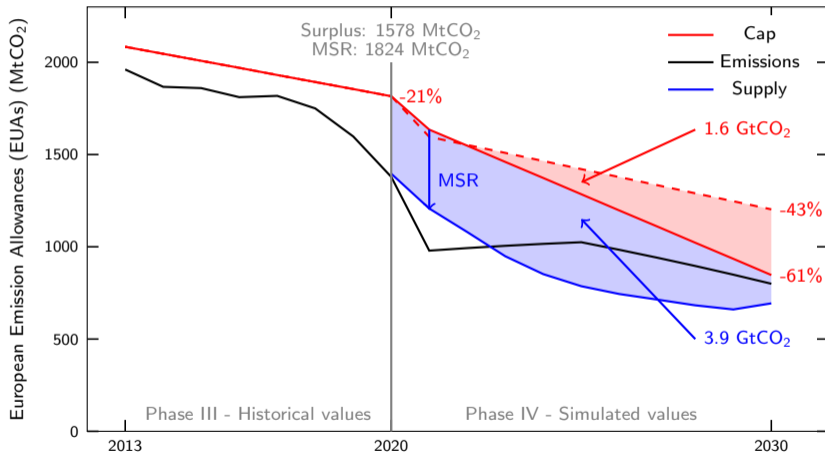
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(See appendix for the MSR mechanism to adjust the EUA supply)

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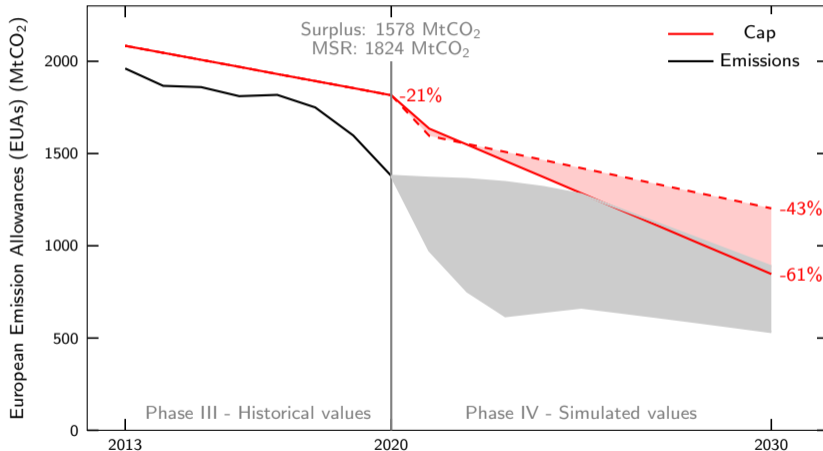
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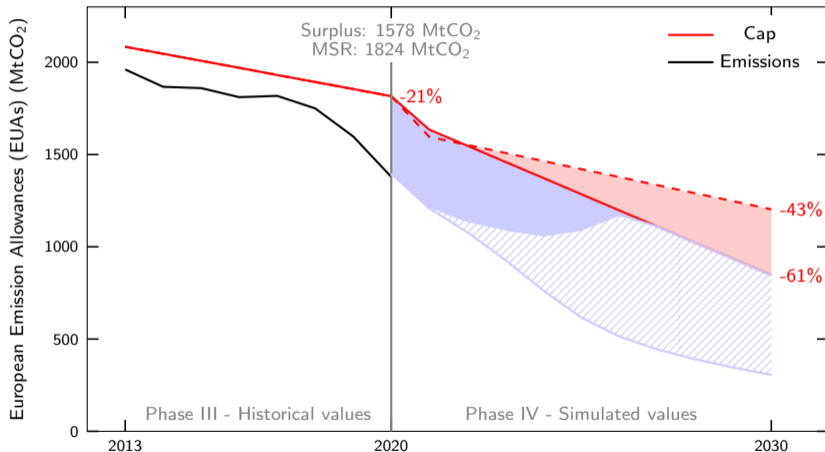
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2 Cumulative European emissions are highly uncertain due to the MSR's invalidation policy

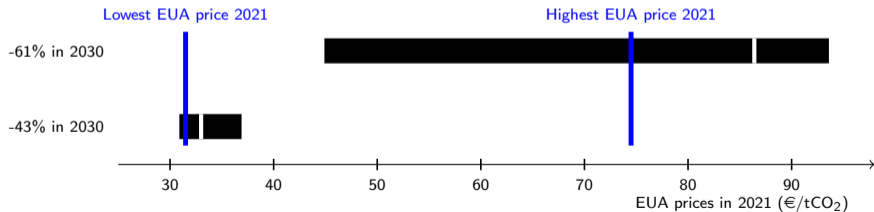
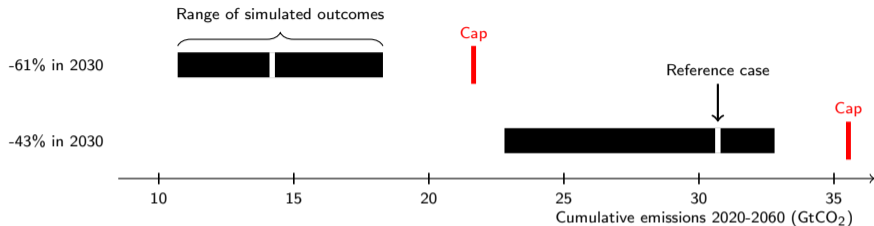
Numerical framework:

- ▶ Representative emitter, characterized by marginal abatement cost curve ($MACC_t = \beta \cdot (\bar{E} - q_t)^\gamma$), perfect foresight and intertemporally optimizing;
- ▶ EU ETS, considering supply adjustments based on MSR (current or Fit for 55 design);
- ▶ Iterative price-search algorithm to find equilibrium EUA prices, allows for *any* MACC.

Data, calibration & case study:

- ▶ Period: 2017-2060;
- ▶ Historical emissions imposed in period 2017-2019;
- ▶ Large set of MACCs: fix γ -value, tune β to reproduce average 2019 EUA prices under 2018 EU ETS & MSR design;
- ▶ Assumption: EU ETS after 2030 is governed by same rules as in Phase IV, Fit for 55 implemented as of 2021.

2 Cumulative European emissions are highly uncertain due to the MSR's invalidation policy



3 Waterbed leakage due to overlapping climate policies

Before 2018: plain vanilla cap-and-trade acts as a **waterbed** (Perino, 2018):

- ▶ Emission 'budget' fixed (\sim volume of water in waterbed);
- ▶ Exogenous shocks or policy-induced changes in emissions or demand for emission allowances (e.g., increased emissions due to phaseout policy) do not affect how much is emitted in total (assuming cumulative cap does not change);
- ▶ Emission allowance price is affected (e.g., as during 2009 financial crisis).

After 2018: strengthening market stability reserve & invalidation policy \rightarrow **punctured waterbed**:

- ▶ Cumulative emissions = cumulative cap - cumulative invalidation volume;
- ▶ invalidation volume is conditional on the total number of allowances in circulation ("bank"), hence, emissions;
- ▶ **Waterbed leakage**: exogenous shocks that decreases bank (i.e., increased emissions or reduced allowance supply) decreases invalidation volumes & increases cumulative emissions and vice versa;
- ▶ Exogenous shocks affect emission allowance prices & total emissions

Fit for 55-package maintains market stability reserve & invalidation policy \rightarrow **punctured waterbed**

4 Waterbed leakage due to overlapping climate policies

$$\text{Waterbed leakage} = \frac{\Delta \text{ cumulative EU ETS emissions}}{\Delta \text{ allowance demand}}$$

- ▶ Waterbed leakage is positive when a policy that increases (decreases) emissions leads to increased (decreased) cumulative emissions. It is negative when a policy backfires.
- ▶ The magnitude and sign of waterbed leakage of a policy or shock depends on three factors:
 - ▶ when the policy affects the demand for emission allowances;
 - ▶ when it is announced;
 - ▶ the year that the waterbed is sealed.

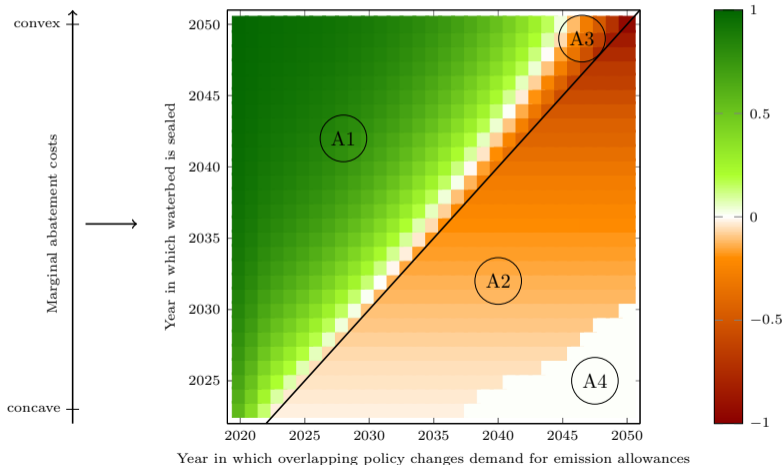
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- ▶ The magnitude and sign of waterbed leakage of a policy or shock depends on three factors:
 - ▶ when the policy affects the demand for emission allowances; → **1 MtCO₂, 2020-2050**
 - ▶ when it is announced; → **fixed to 2020 in the analysis**
 - ▶ the year that the waterbed is sealed. → **different MACCs, 2020-2050**

3 Waterbed leakage due to overlapping climate policies on the margin (2018)

What is the net effect on cumulative emissions under EU ETS (colors) of a 1 MtCO₂ change in emission allowance demand in a year (horizontal axis) announced in 2020, assuming the duration of the waterbed puncture is not affected by the change in emission allowance demand (vertical axis)?



3 Waterbed leakage due to overlapping climate policies

- ▶ **The direct effect:** the change in invalidation volumes due to the change in the "bank" directly induced by a shock or policy (Perino, 2018):

Emission reductions today reduce cumulative emissions, emission reductions in the far future have no effect.

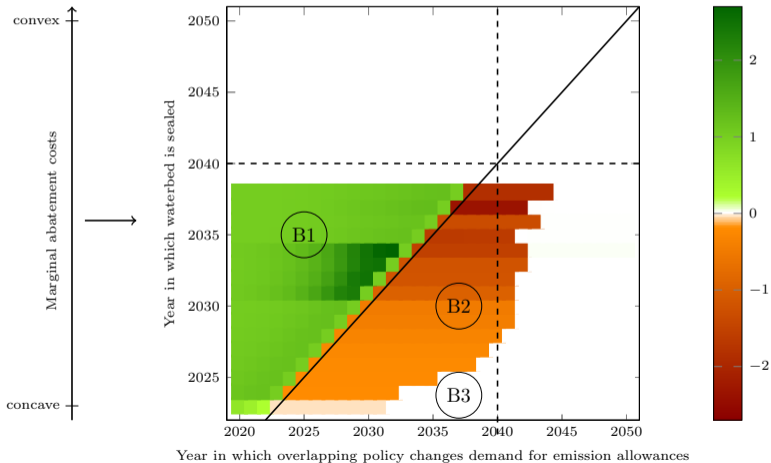
- ▶ **The indirect effect or "new green paradox":** the change in invalidation volumes due to changes in the "bank" induced by the change in emission allowance prices (Rosendahl et al., 2019a, 2019b; Bruninx et al., 2019):

Emission reductions today reduce cumulative emissions less than expected (i.e., direct effect alone), emission reductions in the far future (announced today) increase cumulative emissions.

- ▶ **The duration of the waterbed puncture:** the period over which the Market Stability Reserve absorbs emission allowances:
 - ▶ This depends on the design of the EU ETS, the underlying marginal abatement costs, shocks & overlapping policies, ...
 - ▶ Counter-intuitive, **self-reinforcing effect:** if it's more expensive to meet the cumulative cap, the waterbed remains punctured for a longer time, cumulative emissions decrease, i.e., the policy becomes more stringent (Bruninx et al., 2019, 2020).

3 Waterbed leakage due to overlapping climate policies on the margin (Fit for 55)

What is the net effect on cumulative emissions under EU ETS (colors) of a 1 MtCO₂ change in emission allowance demand in a year (horizontal axis) announced in 2020, assuming the duration of the waterbed puncture is not affected by the change in emission allowance demand (vertical axis)?



3 Waterbed leakage due to overlapping climate policies

- ▶ **The direct effect:** the change in invalidation volumes due to the change in the "bank" directly induced by a shock or policy:

Due to an interaction between the timing of supply adjustments and the MSR design, the direct effect may now exceed 1.

- ▶ **The indirect effect or "new green paradox":** the change in invalidation volumes due to changes in the "bank" induced by the change in emission allowance prices:

The direct effect is reinforced by the indirect effect if the policy affects emission allowance demand before the waterbed seals. If policy affects emission allowance demand after the waterbed seals, the indirect effect exceeds -1 due to the direct effect.

- ▶ **The duration of the waterbed puncture:** the period over which the Market Stability Reserve absorbs emission allowances:

- ▶ This depends on the design of the EU ETS, the underlying marginal abatement costs, shocks & overlapping policies, ...
- ▶ Counter-intuitive, **self-reinforcing effect:** if it's more expensive to meet the cumulative cap, the waterbed remains punctured for a longer time, cumulative emissions decrease, i.e., the policy becomes more stringent (Bruninx et al., 2019, 2020).

Key take-aways

- ▶ EU ETS remains a key policy instrument to support the cost-efficient transition to a carbon-neutral society, but recent design changes have introduced some peculiarities:
- ▶ The level of ambition in terms of emission reduction exceeds '-61%' due to the MSR's invalidation policy. By design, there exists a positive correlation between invalidation volumes and the costs to meet the emissions cap, making the policy more stringent when abatement is more expensive.
- ▶ Market Stability Reserve succeeds in stabilizing emission allowance prices (cf. emission allowance prices during COVID-19 pandemic), but at the expense of uncertainty on the cumulative emissions, which may be amplified in the Fit for 55 MSR design.
- ▶ National policies may (counter-intuitively) affect the cumulative cap of the EU ETS. If a policy counter-intuitively increases cumulative emissions, countermeasures exist: voluntary invalidation.

Thank you for your attention!

Paper: K. Bruninx & M. Ovaere, *COVID-19, Green Deal & the recovery plan permanently change emissions and prices in EU ETS Phase IV*, Nature Communications (under review), 2021.

Latest version: `kenneth.bruninx@kuleuven.be`

Code & detailed results: `GitLab`

Other publications: Energy Systems Integration Modeling Research Group's website

A The European Emission Trading System & the Market Stability Reserve (2018)

Illustration: supply adjustments due to the Market Stability Reserve for a simulated emission trajectory:

A The European Emission Trading System & the Market Stability Reserve (Fit for 55)

Illustration: supply adjustments due to the Market Stability Reserve for a simulated emission trajectory: