Universität zu Köln
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The reformed EU ETS:
Intertemporal Emission Trading with Restricted Banking

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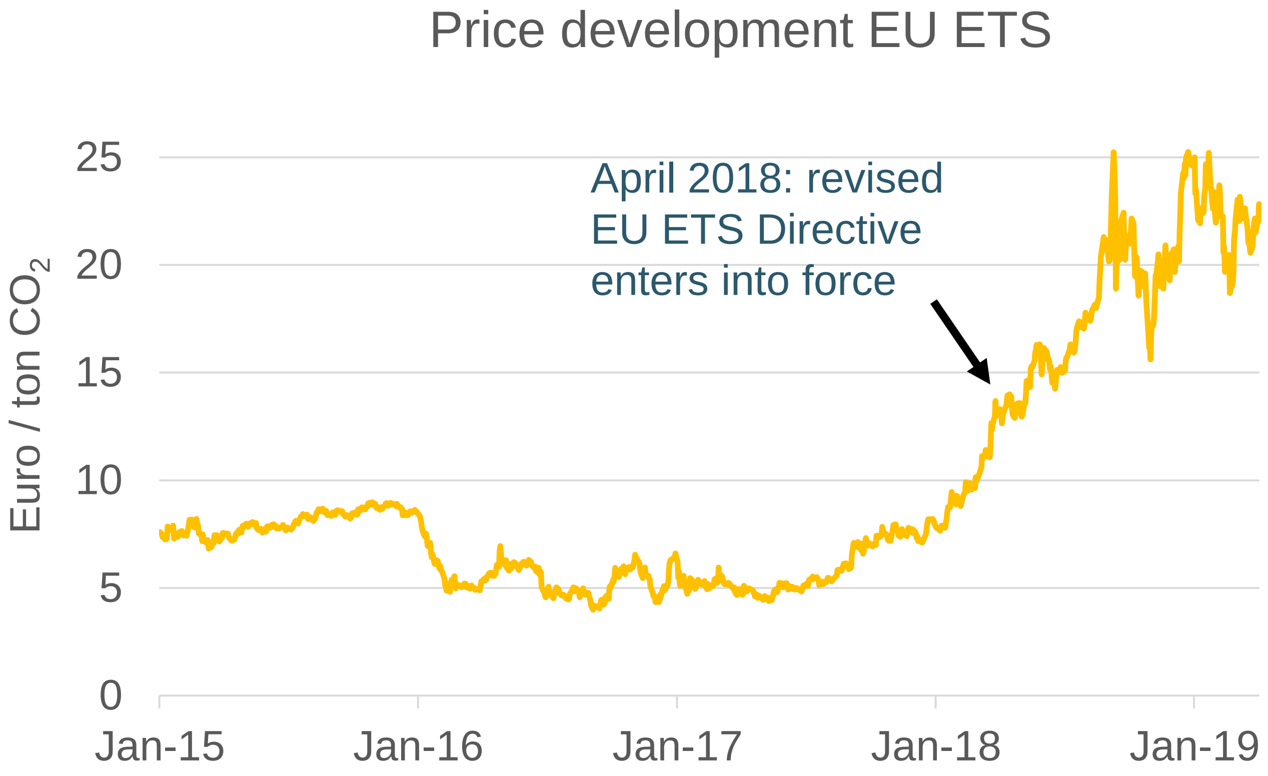
Working Paper co-researched by **J. Bocklet, M. Hintermayer, L. Schmidt** and **T. Wildgrube**

EU ETS reform: regulation for phase IV (2021-2030)



Source: ICE (2019)

Three principal amendments:

(1) Linear reduction factor of cap set to 2.2% for phase IV (phase III: 1.74%)

(2) Introduction of the **Market Stability Reserve** (MSR): corridor for allowances in circulation

(3) Cancellation mechanism: volume in MSR is limited to previous year's auction volume

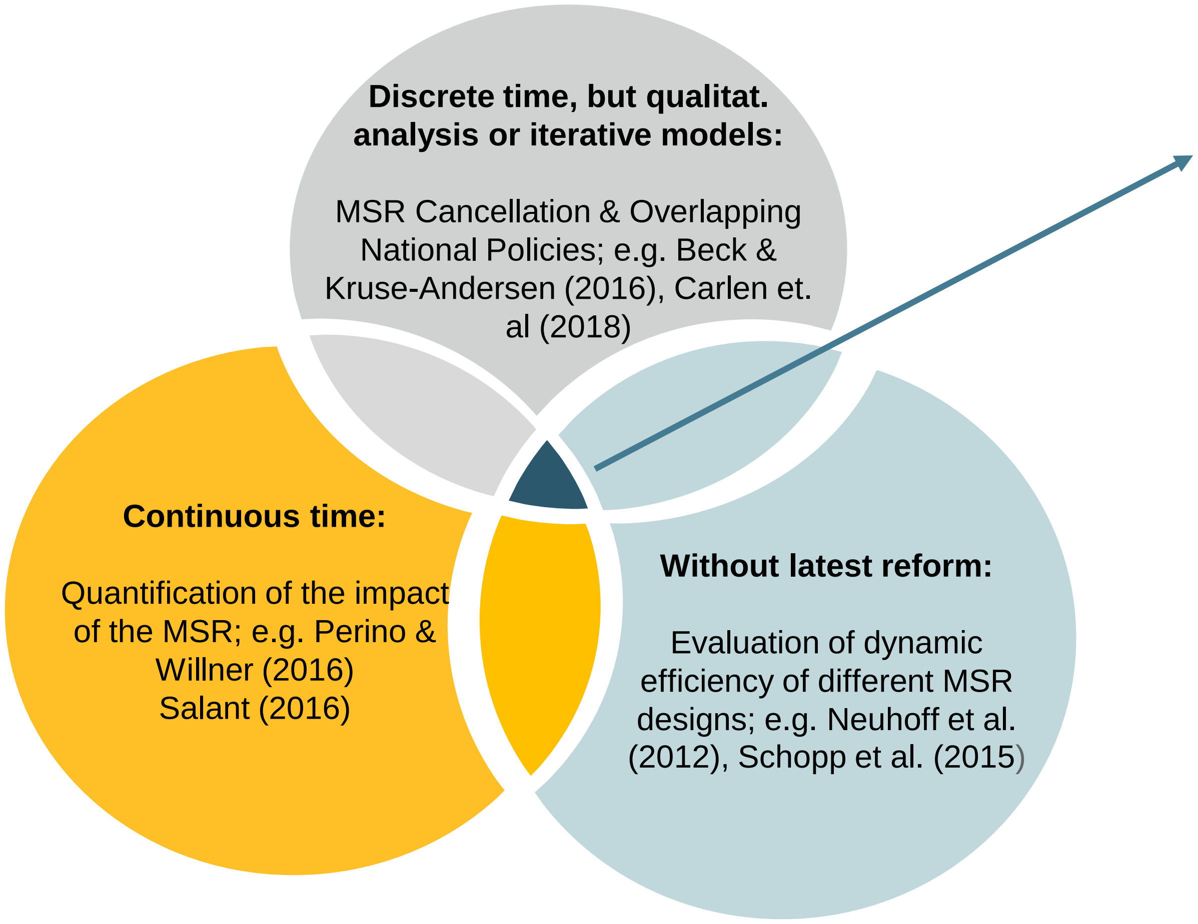
→Total cap becomes endogenous

I. Discrete dynamic optimization model

II. Results

III. Further research and discussion

Our research fills an important gap in the literature

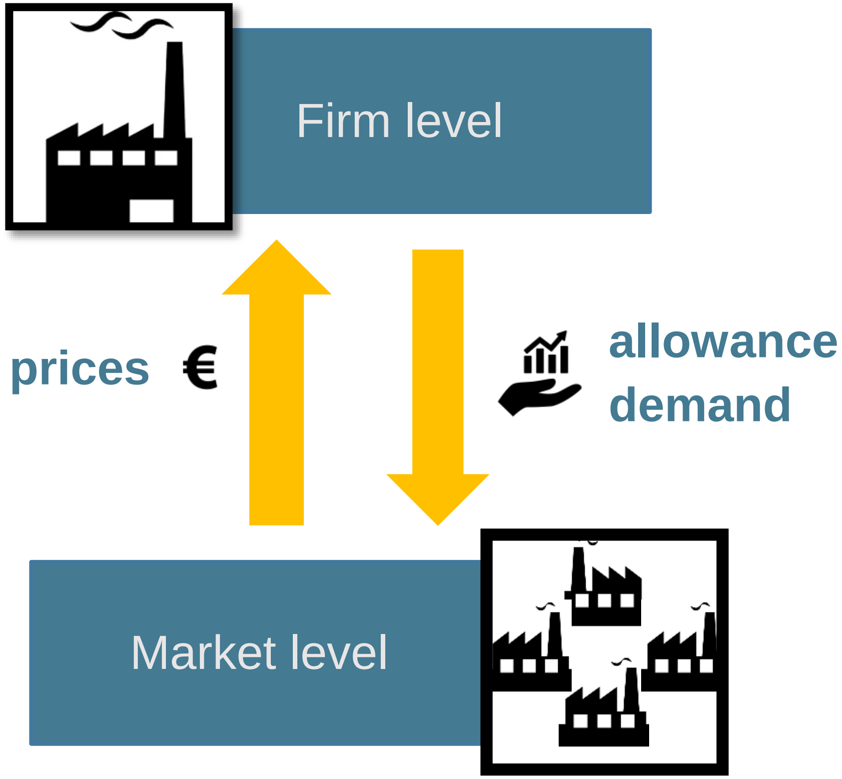


Theoretical foundation for intertemporal trading
Hotelling (1931)
Rubin (1995)
Chevallier (2012)

Our contribution:

- New EU ETS regulation accurately depicted in a discrete time model
- Modelling of the endogenous cap
- Quantification of the impact of MSR, Cancellation Mechanism and LRF
- Decomposition of the price effects of the EU ETS amendments
- Evaluation of the impact of amendments on dynamic efficiency

A market equilibrium is derived where firms minimize their costs given the new market rules



Cost minimizing, price-taking **firm with perfect foresight** decides on emissions e(t), abatement u-e(t) and banking b(t). Parameter interest (r), counterfactual emissions (u) and cost parameter (c) are exogenous:

$$\min \quad \sum_{t=0}^{T} \frac{1}{(1+r)^t}\left[\frac{c}{2}(u-e(t))^2 + p(t)x(t)\right]$$

$$s.t.\ b(t) - b(t-1) = x(t) - e(t)$$

$$b(t) \geq 0$$

Market equilibrium given individual optimality conditions, supply and regulatory rules:

$$c(u - e(t)) = p(t).$$

Icons made by Freepik from https://www.flaticon.com.

Market prices increase with the interest rate if private bank > 0

Equilibrium price path:

$$\frac{p(t+1)-p(t)}{p(t)} = r - (1+r)^{t+1}\frac{\mu_b(t)}{p(t)}.$$

=0, if b(t) > 0

- Price develops according to **Hotelling rule (1931)** for extraction of finite natural resources
- Firm is **indifferent between investment** at the capital market and **extraction** of the resource

> 0, if b(t) = 0

- Price increases **at less than the interest**
- No bank **→ all allowances issued are used** → abatement level and price level develop accordingly

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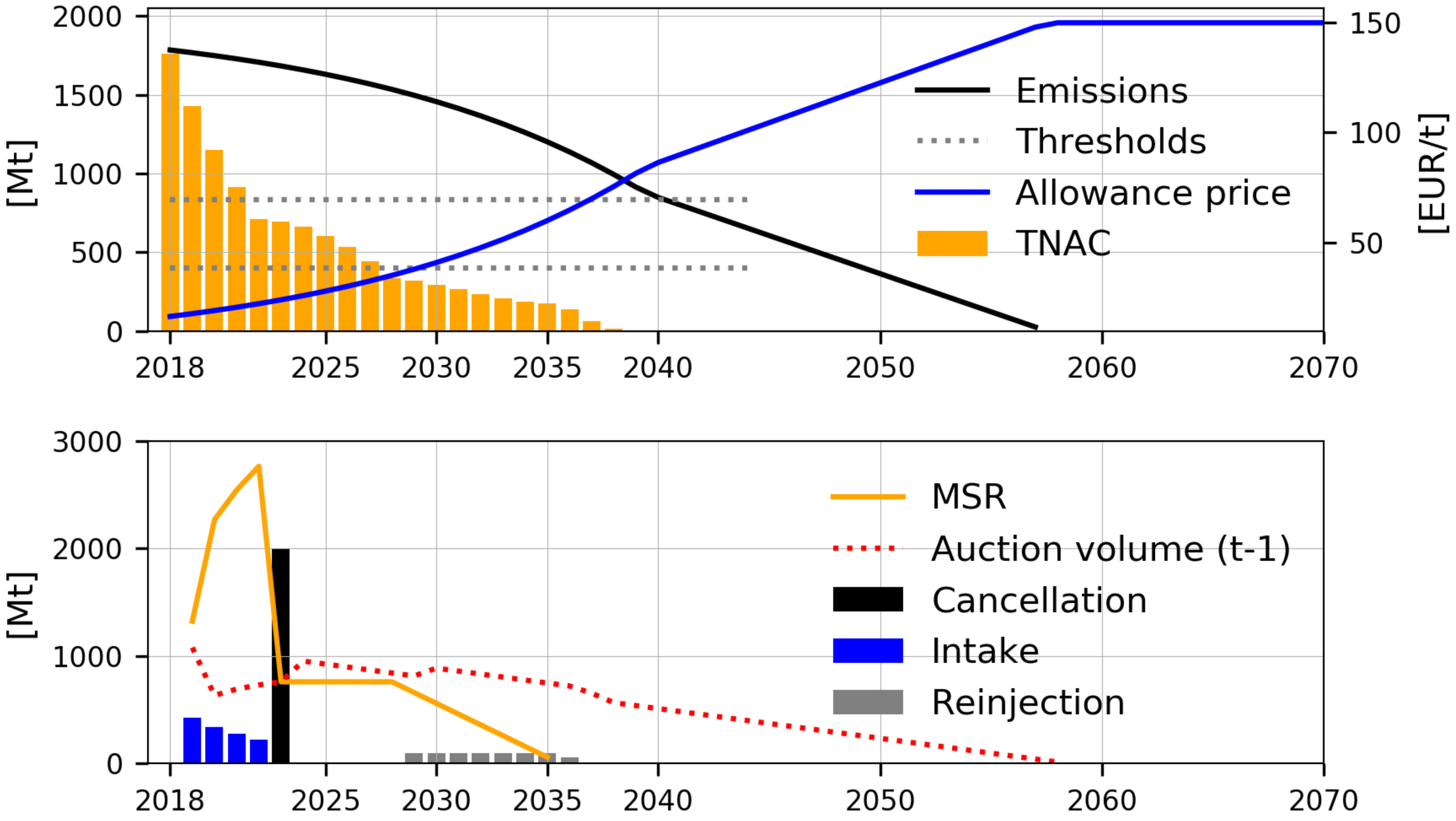
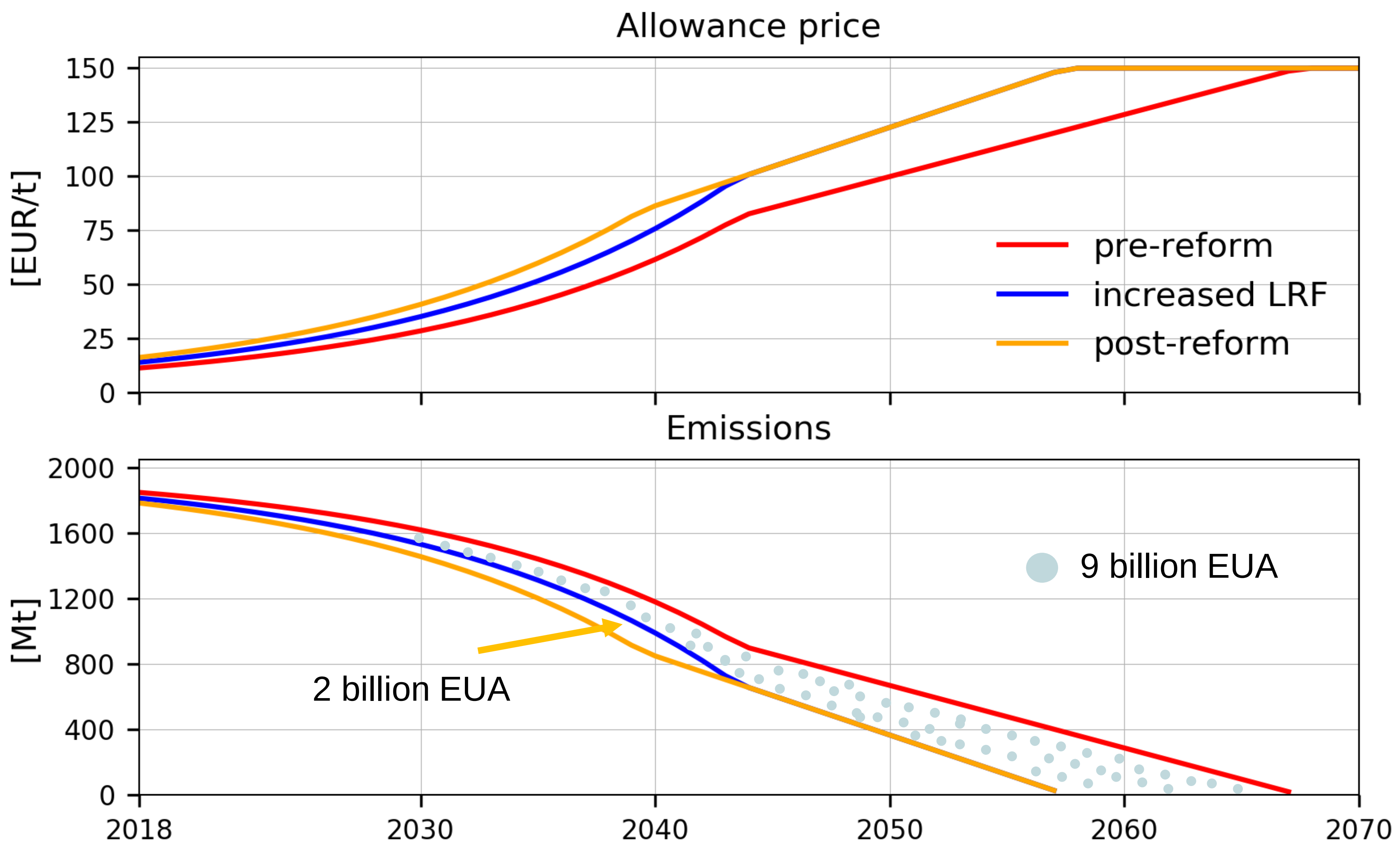
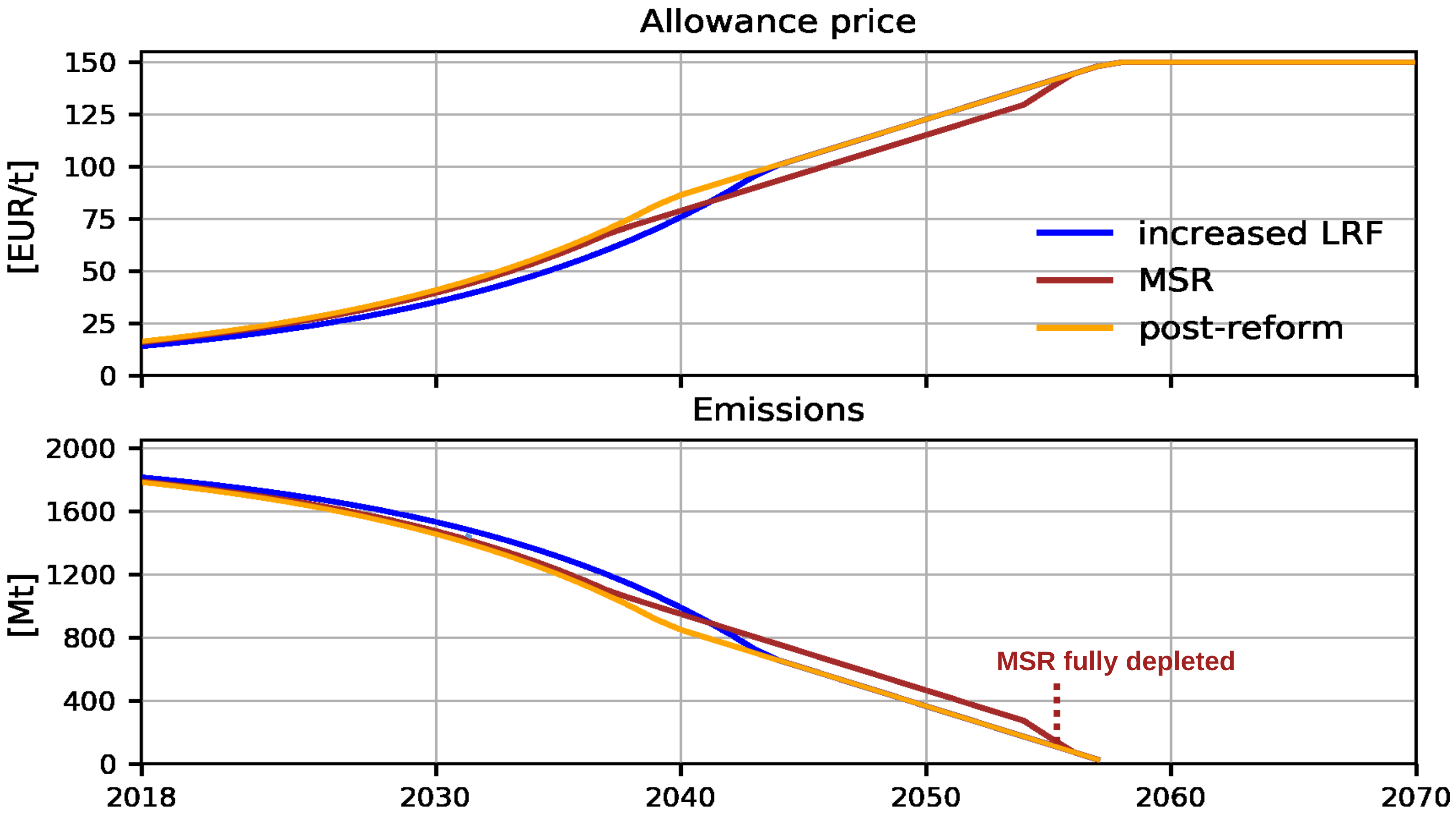
The price increases with the interest rate until 2038



The increased LRF reduces overall emissions cap by 9 billion



The MSR shifts emissions from the present to the future



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Discussion

Contribution of the research

Contribution of the model

- Accurate discrete time representation of regulation in place
- Three simple exogenous parameters; robustness check through sensitivity analysis

Insights into the EU ETS

- LRF has a stronger impact than the cancellation of allowances
- Price effects of the reform more medium term

Open questions

Why did the EUA price increase last year?

- Bounded rationality of market participants
- Regulatory uncertainty
- Other explanations?

How does the new EU ETS interact with other national or European policies?

- Combination with a EU-wide price floor
- Combination with national price floor
- Support for renewable energies (or other demand shocks)

Thank you for your attention!

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