Results from a Climate Strategies Model Comparison Exercise

Is a Market Stability Reserve Likely to improve the functioning of EU ETS?

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Acworth, W., Betz, R., Burtraw, D., Cludius, J., Fell, H., Hepburn, C., Holt, C., Jotzo, F., Kollenberg, S., Landis, F., Salant, S., Schopp, A., Shobe, W., Taschini, L. and Trotignon, R.

1. Background
2. Criteria to assess an efficient abatement pathway
3. Why EU ETS might not deliver an efficient abatement pathway?
4. Can an MSR move EU ETS closer to efficient abatement pathway?

1 The need for a quantitative evidence through a model comparison exercise.

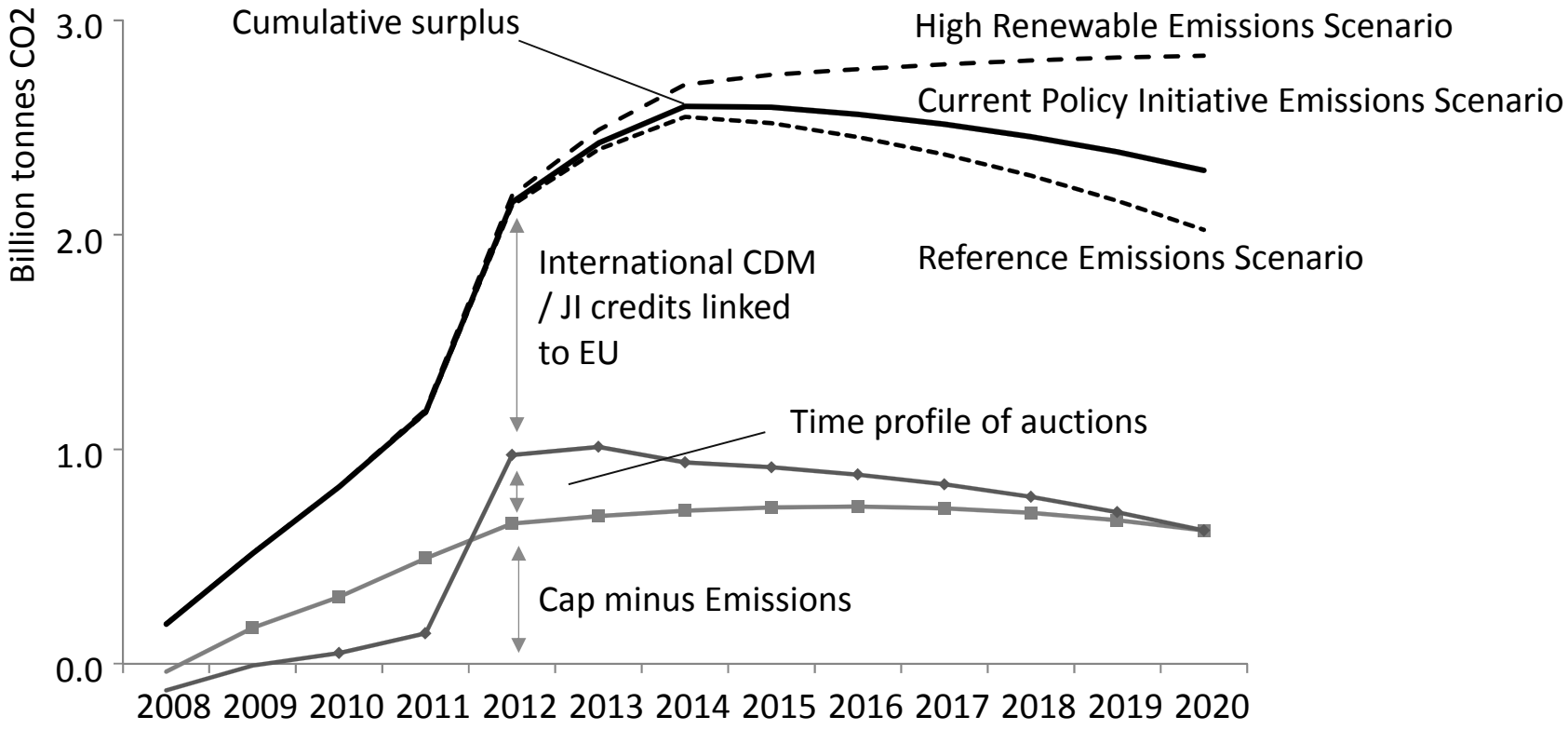
- **The project aims to provide empirical answers to the following questions**
  - What market imperfections could divert EU ETS from an efficient abatement pathway?
  - What is the empirical evidence?

- **If the EU ETS does not deliver the efficient abatement pathway**
  - How much can a stability reserve improve the situation?

- **And finally, how robust are the results to**
  - assumptions on market imperfections;
  - different parameterization of stability reserves, costs and shocks; and
  - different modelling frameworks?

1 Background on EU Emissions Trading Scheme

Surplus has accumulated



Source: Neuhoff, Schopp, Boyd, Stelmakh, and Vasa (2012)

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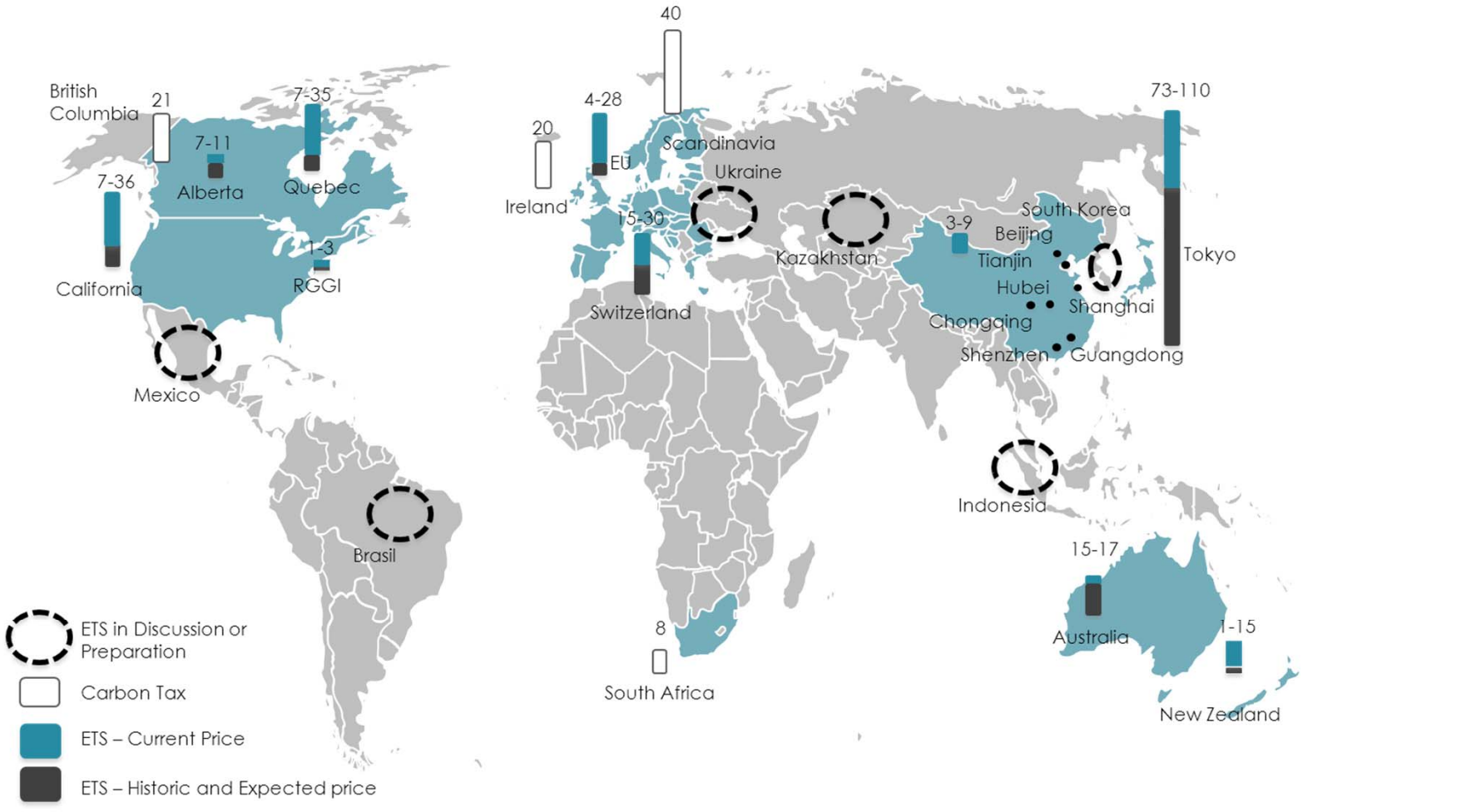
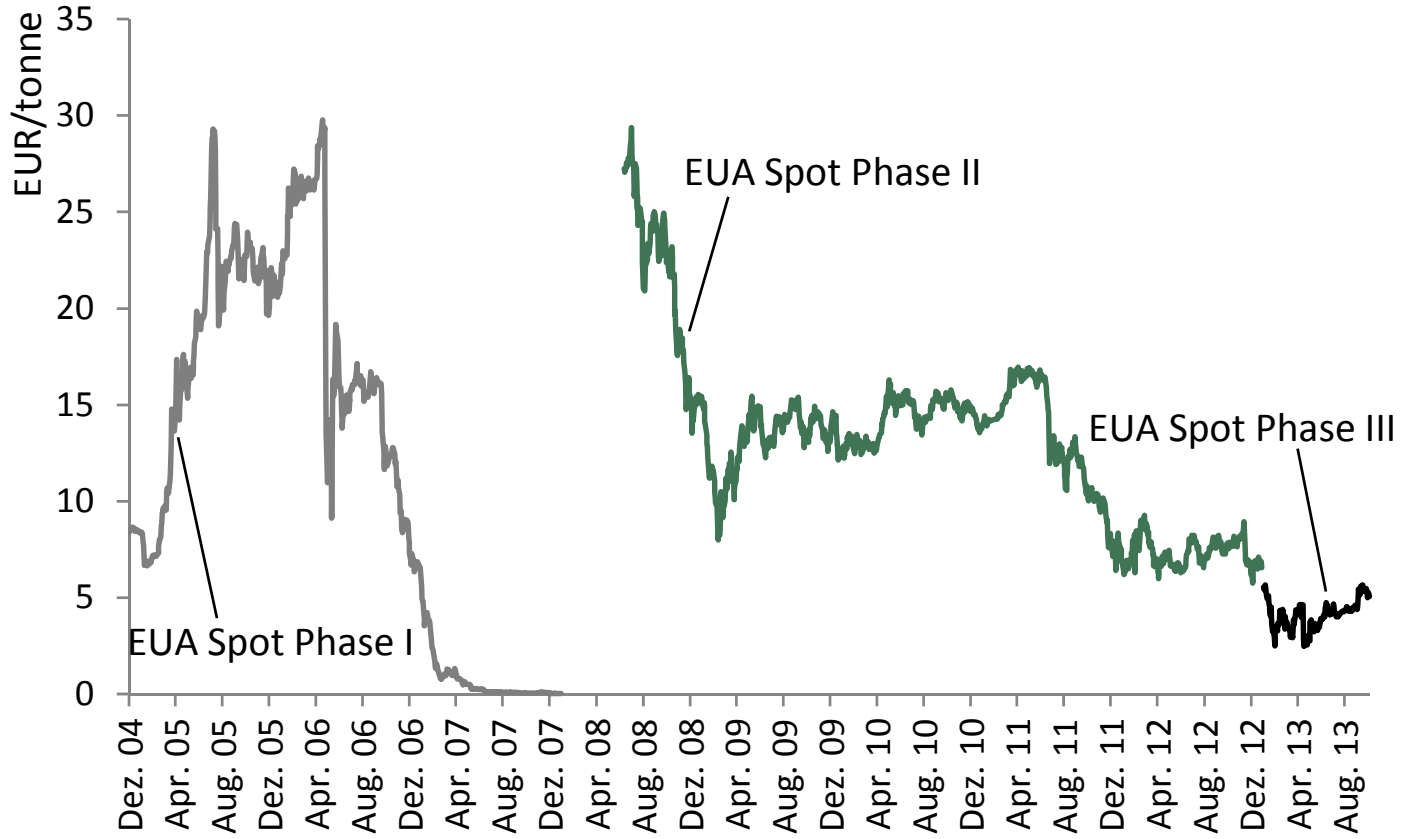
1 A leading group of countries and regions prices carbon
Example: Emission trading and carbon taxes schemes (Euros/tonne CO_2)



DIW Berlin Calculations based on Ecofys, 2013; Sopher, P., Mansell, A., 2013; OECD, 2013; Jotzo, F. et al., 2013; Rudolph, S., Kawatsu, T., 2012; Ptak, M., 2010.

1 Background on EU Emissions Trading Scheme

Carbon price in Phase II did not drop to 0 because of allowance banking



Source: EEX

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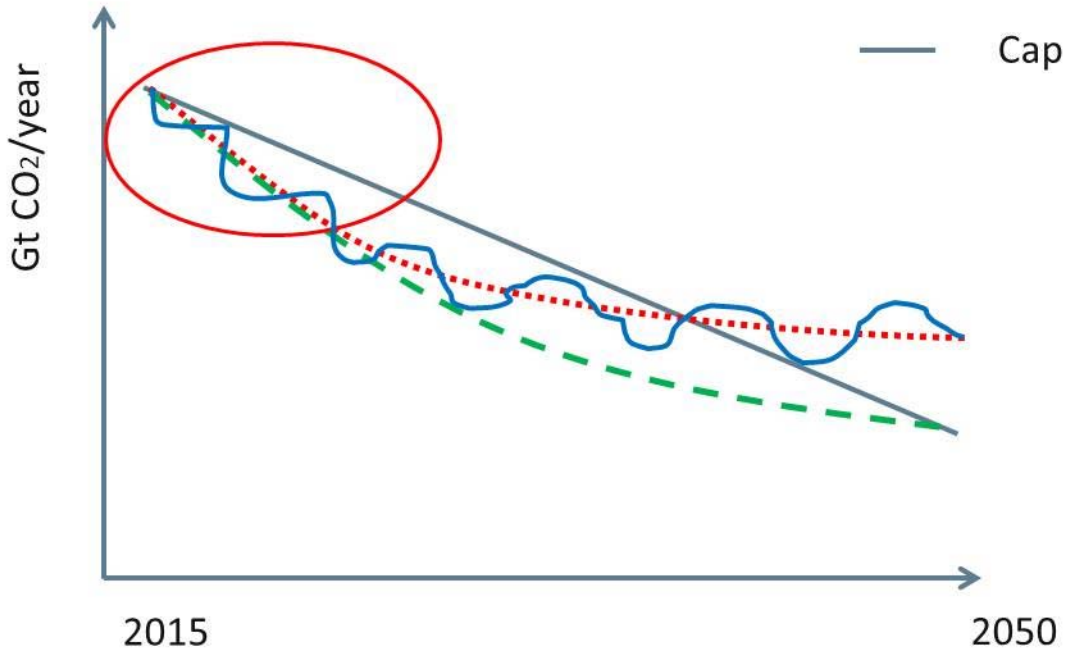
2 The efficient abatement pathway



1. Inter-temporal optimisation relative to cap trajectory
Objective: Reducing mitigation cost until 2050

2. Flexibility to accommodate economic & technological shocks
Objective: Securing cap trajectory and stabilizing carbon price

3. Securing investment (price credibility and consistency)
Objective: Investing for economic performance and low-carbon transformation

4. Guiding transformation
Objective: Accommodate time-profile of technology and infrastructure investment

2 Four criteria of a functioning EU ETS

Criteria	Description	Indicator (metric)
1. Inter-temporal optimisation		
Efficiency	The degree to which emissions are reduced in a cost effective manner.	NPV of aggregated compliance costs net of the social value of permits in the reserve in 2050.
2. Flexibility		
Robustness	Ability to respond to external shocks and uncertainty.	After shock - NPV of aggregated compliance costs net of the social value of permits in the reserve in 2050.
3. Securing Investment		
Credibility	The degree of carbon price stability and hence EU ETS fosters mid to long term investment.	Average carbon price growth rate from now to 2050.
Consistency	Price trajectory consistent with market participants and policy makers expectations.	Deviation of future expected carbon price from realised carbon price.
4. Guiding Transformation		
Transformation	Whether the ETS is on track towards the long-term trajectory.	Deviation of emissions in 2050 from the cap.

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3 Can the EU ETS deliver the efficient abatement pathway?

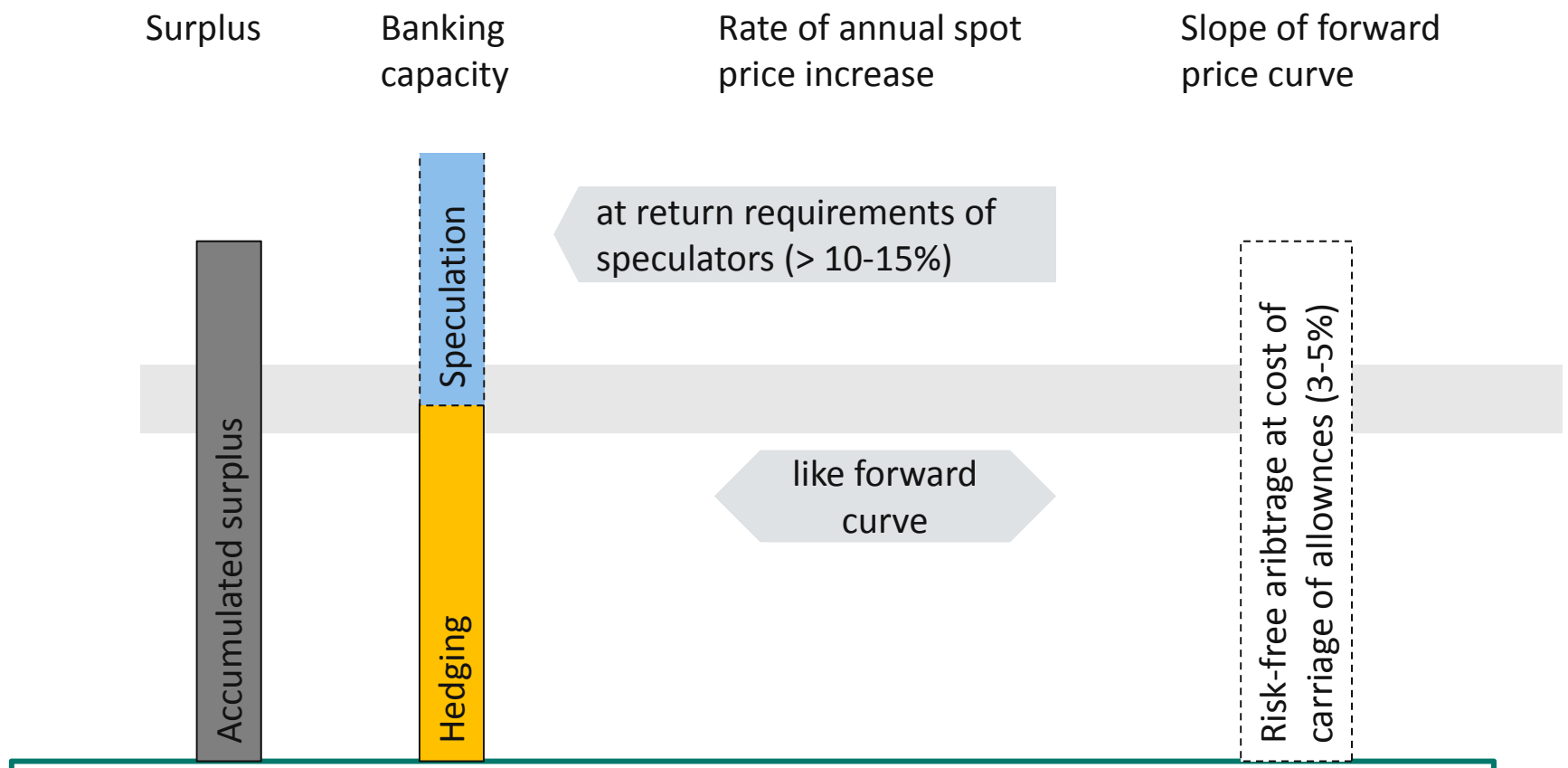
Aspects that could undermine the effectiveness of EU ETS?

1. The market may have a **limited capacity to bank** permits at rate of return requirements compatible with an efficient abatement pathway.
2. The market may suffer **regulatory uncertainty and myopia** (excessive focus on the short term) and thus not implement full inter-temporal optimization.
3. Market participants may **respond imperfectly to uncertainty and complexity**.

What direct measures exist to address these concerns?

- Increasing regulatory clarity and information (e.g. on hedging volumes)
- But some regulatory uncertainty is inevitable (right of future policy makers to make choices)

3 EU ETS concern 1: Market has limited capacity to bank at return requirements compatible with an efficient abatement pathway.



If accumulated surplus exceeds hedging demand:

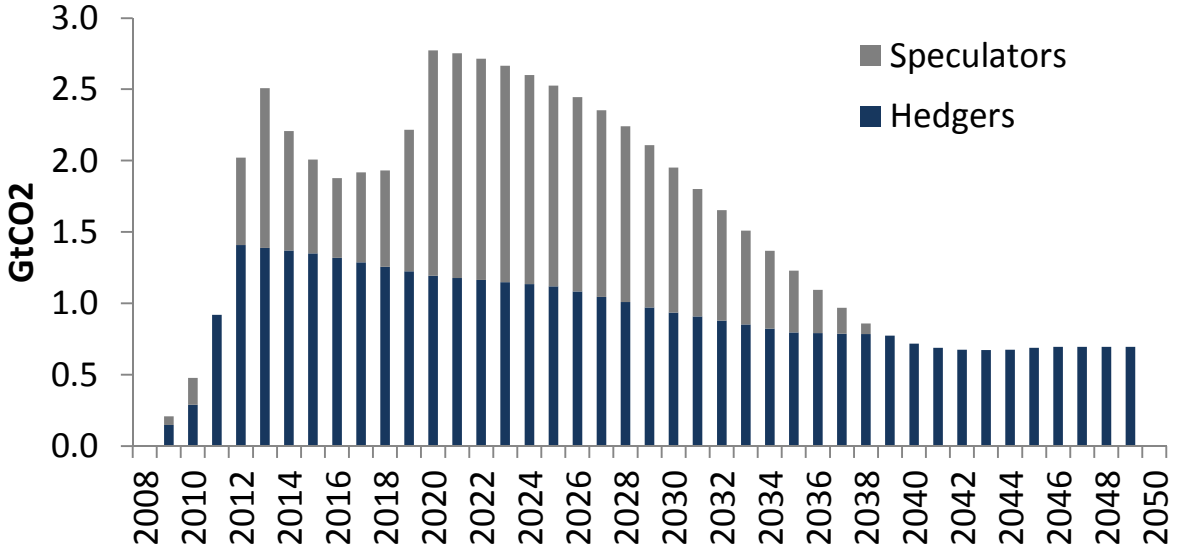
1. Price falls until expected annual price increases attract speculators
2. High rate of annual price increases not reflected in forward curve

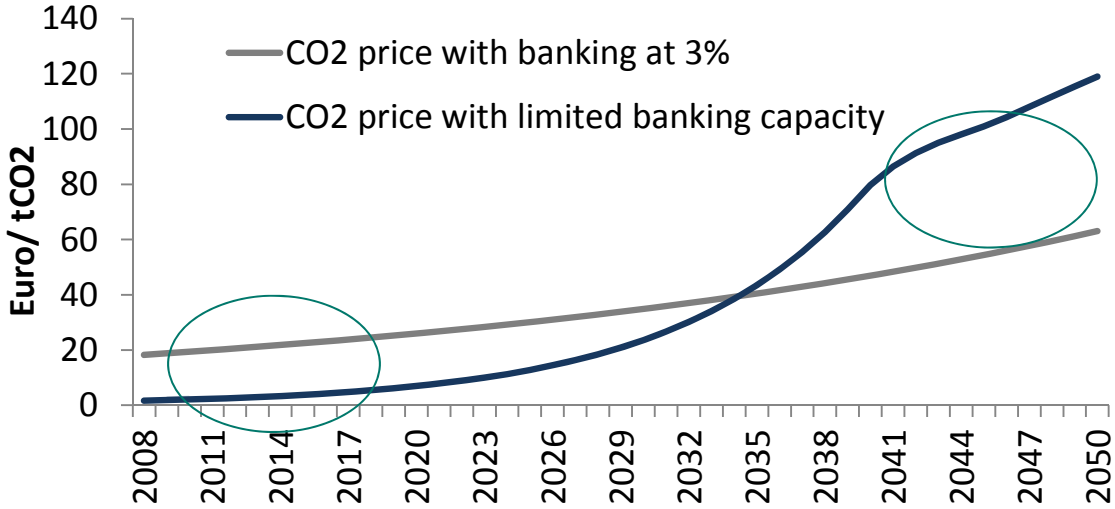
-> inconsistency undermines credibility of EU ETS

-> strategic investments are miss-guided by low spot price (ignoring future scarcity)

3

Benefit of compensating for limited capacity of market to bank at social rates of return (e.g. with market stability reserve).





1. Pursue “lower cost“ abatement in early years

2. Avoid expensive abatment in later years

3. Distribute response to shock across several years

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3 EU ETS concern 2: Market actors optimize only over a short period? (Myopia), in particular because of longer-term regulatory uncertainty

- Companies are concerned about returns in time-frames that can be observed and on which they are judged by the markets.
- The longer the time horizon considered, the higher the uncertainties and the more difficult it is to characterize possible outcomes.
- Hence for many decisions business focus on shorter time horizons:
  - In LSE model, firms highly discount all profits or losses beyond 5 years.
  - In CEC model, firms ignor everything that happens in more than 5-10 years.

Potential benefit of Markets stability Reserve:

- Support optimization of abatement decisions over longer time horizon and thus closer to efficient abatement pathway.
- Allow for the distribution of responses to shocks across longer periods closer to efficient abatement pathway.

3 EU ETS concern 3: Imperfect response to uncertainty and complexity

- Decision makers in companies might have only incomplete information about other companies and future developments.
- Decision processes (of individuals and companies) might be based on simplified representations of complex situations and instruments.
- Hence optimization models might not capture real outcomes:
  - Holt/Shobe: explore in experimental study trading and abatement behavior
  - CEC: firms proxy tomorrow‘s emissions with today‘s emissions

Implications for design of markets stability reserve:

- Market participants learn only over time to cope with complexity
  - How to limit volatility from return of back-loaded allowances?
  - What MSR response rates/speed can moderates impact of shocks?
- Could uncertainty increase hedging by compliance entities?

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4 Design proposal for MSR

Filling of MSR : If allowances in circulation (Aic)>833 Mio.
then 12% of Aic per year, 2 year lag

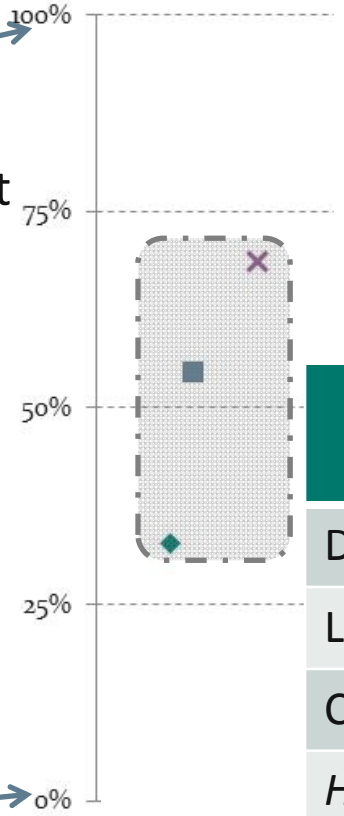
Return from MSR: If AiC < 400 Mio.
then 100 Mio returned per year

Transfer into MSR: Direct transfer of allowances from backloading and unallocated allowances

Start date: 2017-2021 – under discussion

4 How to evaluate numerical results?

Value of indicator modelling efficient abatement pathway (assuming banking without market imperfections)



Value of indicator modelling no inter-temporal flexibility (assuming no banking)

Result of indicator from different models assuming market imperfection

	Limited capacity	Myopia	Infor-mation
DIW	X		
LSE / K&T		X	
CEC/Zephyr		X	X
Holt/Shobe			*X*
Salant/Fell	*X*		*Stoch.*

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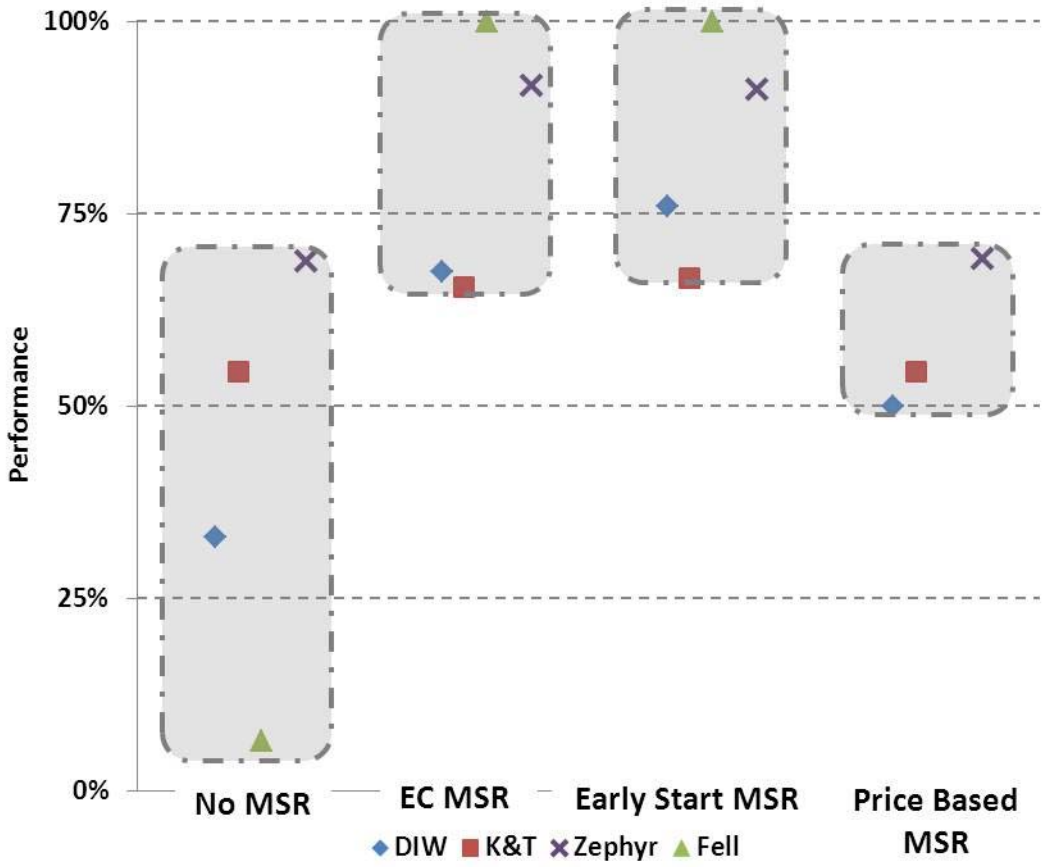
4 Can an MSR get EU ETS closer to efficient abatement pathway?



- Both price and quantity stability reserves get EU ETS closer to efficient abatement pathway.
- Early start with the back-loaded allowances placed into the reserve gets EU ETS closer to efficient abatement pathway.

EC MSR: MSR as proposed by European Commission

Early Start MSR: introduced in 2017 with back-loaded permits placed in the reserve

Price Based MSR: starting at 10 euros in 2021 and increasing at 3% p.a.

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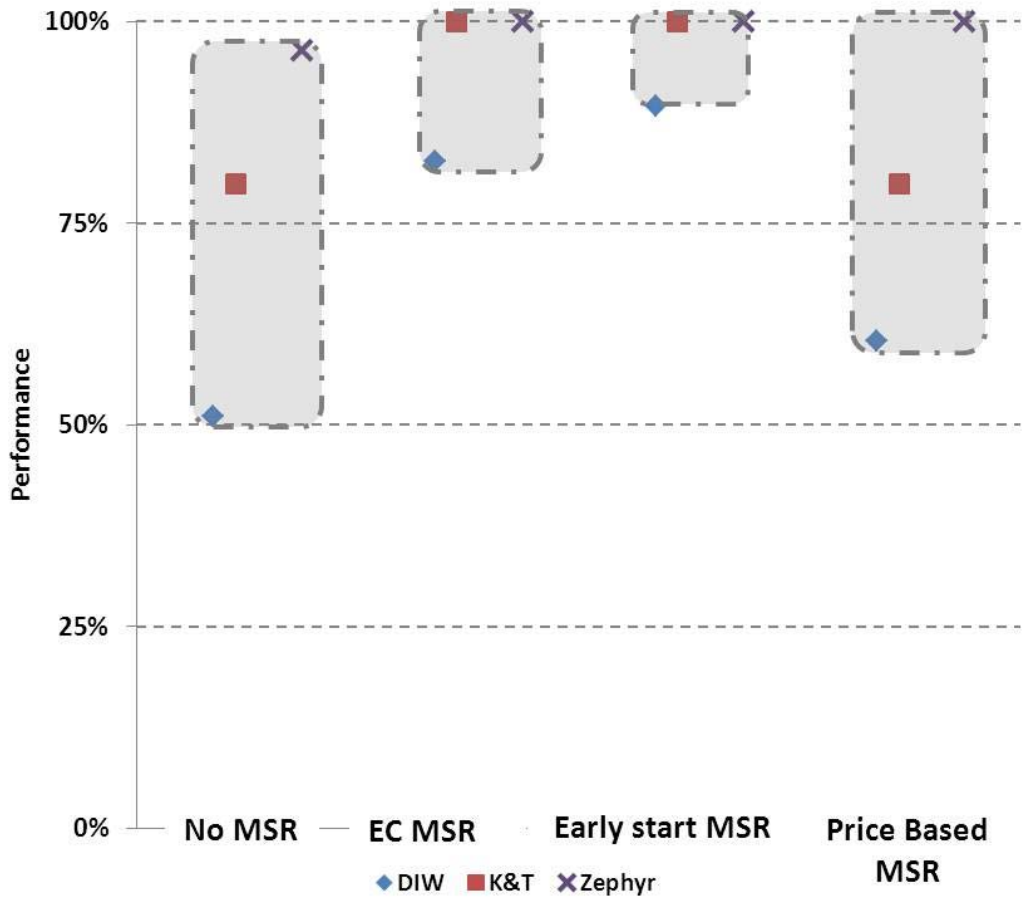
4 Can an MSR improve the robustness of the EU ETS? - example Economic shock reducing emissions by 20% from 2030-2035 -



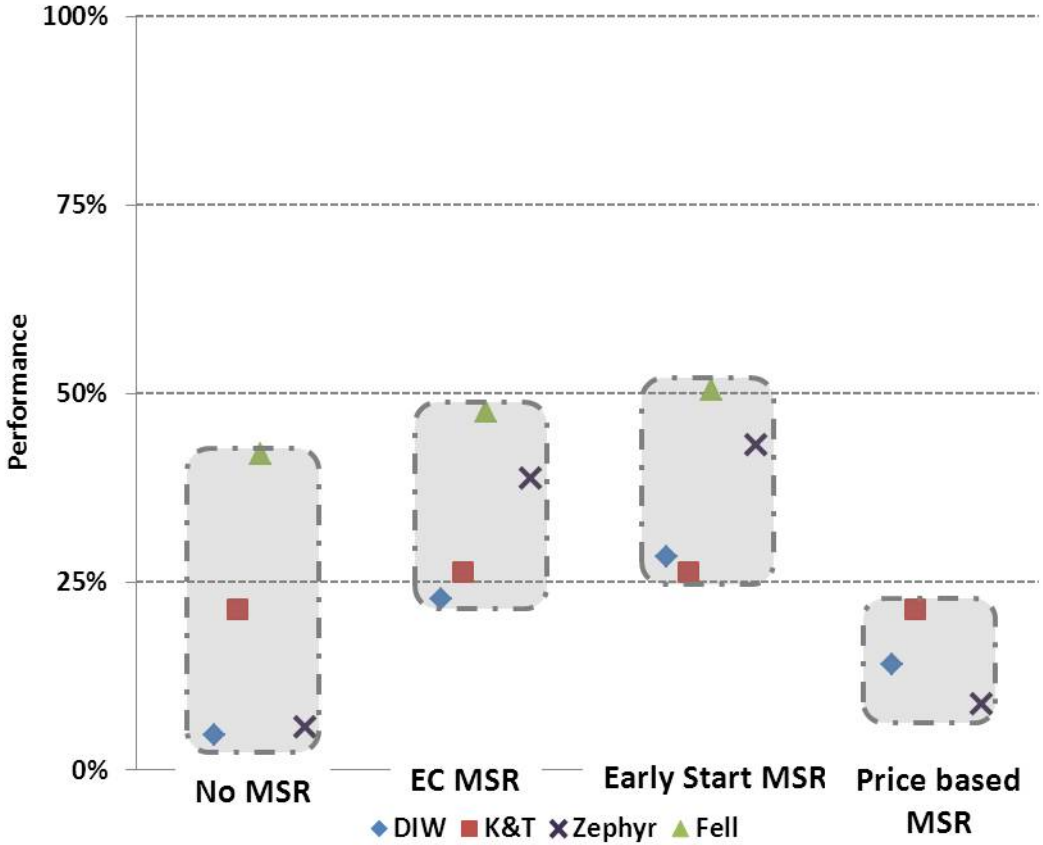
- Compensating the market failure increases the resilience against shocks in all examples

EC MSR: MSR as proposed by European Commission

Early Start MSR: introduced in 2017 with back-loaded permits placed in the reserve

Price Based MSR: starting at 10 euros in 2021 and increasing at 3% p.a

4 Can an MSR improve the price credibility of the EU ETS?



MSR results in a lower average growth rate of carbon prices:

- Highest credibility MSR with early start&transfer of backloaded allowances
- Also price collar trigger beneficial

EC MSR: MSR as proposed by European Commission

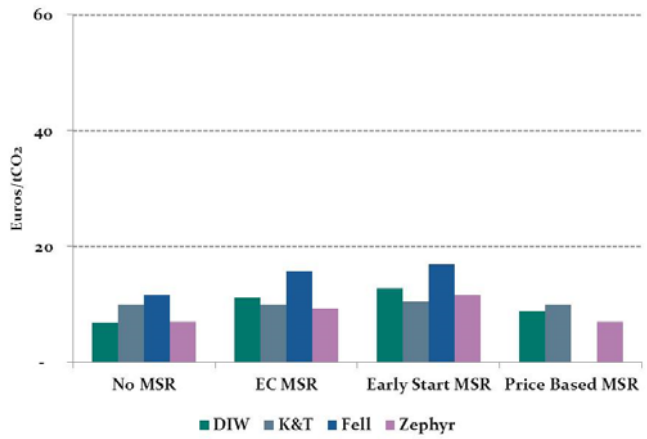
Early Start MSR: introduced in 2017 with back-loaded permits placed in the reserve

Price Based MSR: starting at 10 euros in 2021 and increasing at 3% p.a.

Note: a 3% carbon price growth rate would score 100% and a 11% growth rate scores zero.

4 What are carbon price ranges in modelled scenarios?

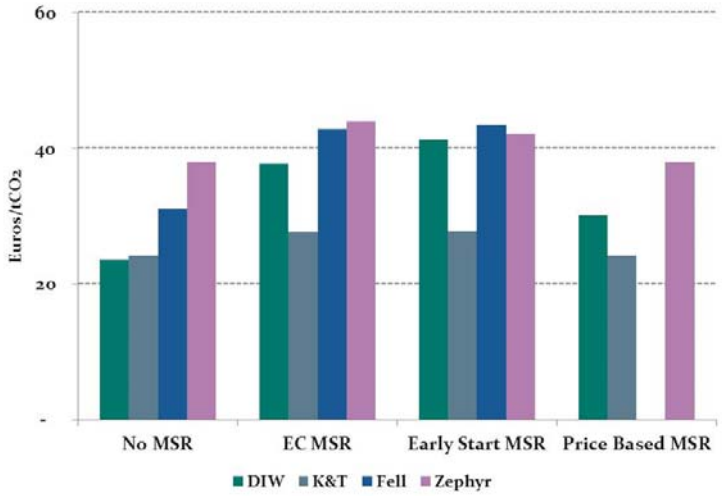
2020 carbon price



2020 carbon price remains between 10 and 20 euros across all scenarios (most models)

2030 carbon price remains between about 20 and 40 euros across all scenarios (most models)

2030 carbon price



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4 Conclusions

- Three groups of market failure identified and modelled:

  (i) Limited banking at social discount rates (ii) Myopia (iii) Imperfect response to complexity

- All three can reduce performance of EU ETS against key indicators

  (a) Efficient abatement pathway (b) Robustness (c) Credibility for investors

- Price triggered MSR improves on market failures (i) and (ii), albeit level of improvement depends on trigger level.

- Early MSR and transfer of allowances results in significant correction of market failures (i) and (ii) on all three performance indicators
- Direct transfer of backloaded and unallocated allowances into MSR responds to market failure (iii) by stabilizing allowance supply.

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