

# Europe Beyond Coal

## – An Economic and Climate Impact Assessment

Christoph Böhringer and Knut Einar Rosendahl

Presentation at Norens project meeting June 8 2020

# Introduction

- WP2: Policy and regulation on European and Norwegian levels
  - Original plan: Two deliverables
    - One policy science article by Cicero (Bang et al.)
    - One economics article by NMBU (Rosendahl) & Univ Oldenburg (Böhringer)
  - Now: Three deliverables
    1. One policy science article with some economics (Bang & Rosendahl)
    2. One economics article (Böhringer & Rosendahl)
    3. One economics article with some policy science (Böhringer, Rosendahl and Bang)
  - Common topic: Coal phaseout in European countries

# Introduction

- Paper #1: Policy science article with some economics
  - Interviews in London and Berlin fall 2019
  - First full draft finished before summer vacation
  - Presentation at ECPR conference (pol.science) in August

# Introduction

- Paper #2: Economics article
  - Focus of this presentation
  - Combination of theoretical and numerical analysis
  - Second full draft soon finished
  - Presentation at EAERE conference (env.econ.) in late June
- Paper #3: Economics article with some policy science
  - Build on paper #1&2 (use same numerical model as for paper #2)
  - Will be written in the fall

# Paper #2: Europe Beyond Coal

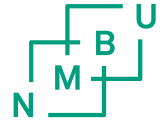
## – An Economic and Climate Impact Assessment

- Some background
  - Most European countries have decided to phase out coal in power generation
    - Most important country: Germany
  - Coal power generation already regulated by the EU ETS..
    - Why then force out coal power generation instead of leaving it to the ETS?
    - Can risk the waterbed effect: Emissions are relocated instead of reduced?
    - Germany: Will cancel emission allowances along with coal phaseout
    - New mechanism: Market Stability Reserve → Cancel emission allowances

# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- Theoretical analysis – very brief overview
  - Consider simple model with:
    - Three regions with common ETS
    - Three electricity technologies (Coal, Gas, CO<sub>2</sub>-free)
    - Two end-users of electricity (Industry, Other)
  - Examine effects of coal phaseout in one or two regions
    - With or without cancellation of allowances
    - Focus on welfare effects (economic welfare + value of emission reductions)
  - Welfare costs of phasing out coal depend e.g. on:
    - Price tag on emissions
    - Terms-of-trade effects in the ETS market (importer/exporter of allowances)



# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- Numerical analysis – brief model description
  - Computable general equilibrium (CGE) model for the European economy
    - 12 EU regions + 5 Non-EU regions
    - Norway included in “Rest of Europe and Turkey”
    - 13 sectors in each region
    - Electricity sector divided into 8 technologies
    - Bilateral trade in electricity – price responsive
  - The model is forward projected to 2030 based on EU data (JRC data)
    - Benchmark scenario (BMK) consistent with EU’s current GHG target for 2030

# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- Numerical analysis – policy scenarios for 2030
  - Reference scenario (REF): 10% emission reduction vis-à-vis BMK
    - Based on European Green Deal and current discussion in the EU
    - EU ETS price 2030: 47 Euro per ton CO<sub>2</sub>
  - Phaseout scenarios – along three dimensions:
    - Extent of phaseout (25%, 50%, 75%, 100%)
    - Regional coverage (one or several countries phase out coal)
    - Cancellation of allowances (none, unilateral or centralized)

		Cancellation of allowances		
		None	Unilateral	Centralized via MSR
Regional coverage	Unilateral	<i>UNI</i>	<i>UNI-UC</i>	<i>UNI-MSR</i>
	Coalition	<i>COA</i>	<i>COA-UC</i>	<i>COA-MSR</i>



# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

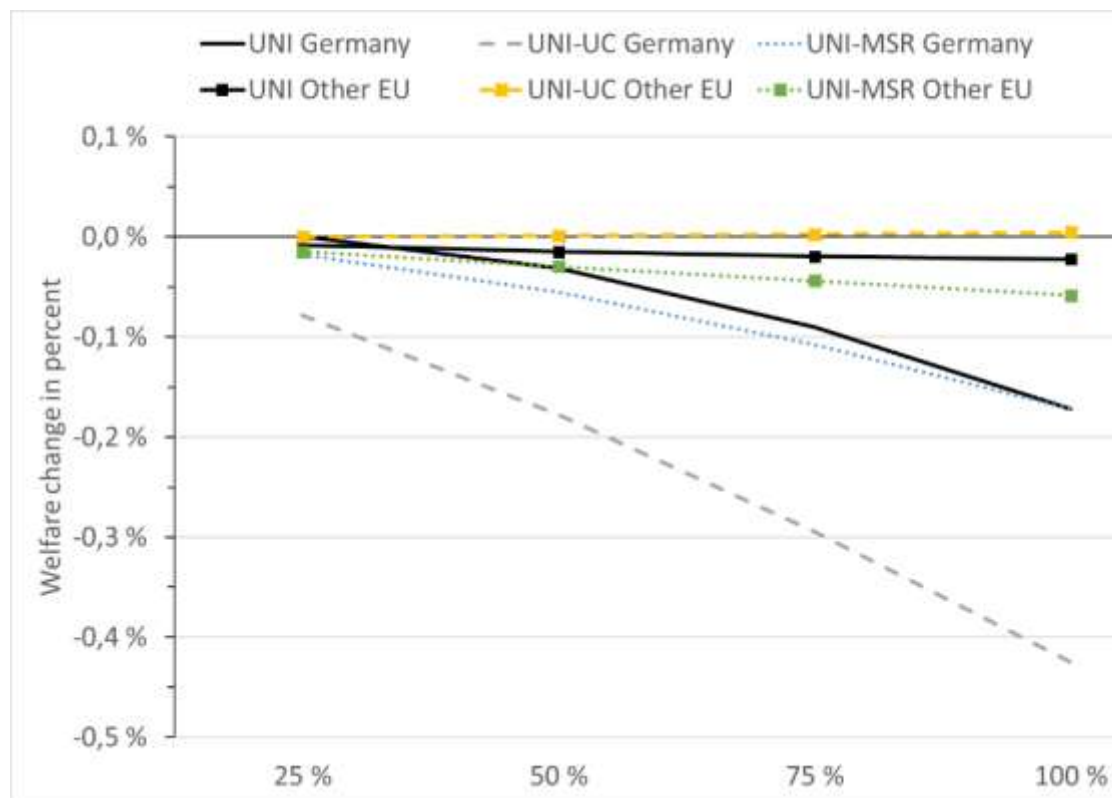
- Unilateral coal phaseout in Germany
  - Without cancellation of emission allowances:
    - ETS price drops from 47 to 31 Euro per ton
    - Relocation of emissions to other countries (espec. Poland), other sectors and within the electricity sector
    - Coal power in Germany is replaced by mostly renewables and gas power
  - With 100% cancellation of emission allowances:
    - ETS price increases from 47 to 49 Euro per ton
    - Little relocation of emissions

# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- Unilateral coal phaseout in Germany – welfare impacts

- Excl. climate benefits
- Small phaseout has negative costs
  - Net importer of allowances
- Full phaseout costs 4 billion Euro in 2030
- Most other countries lose
- Costs are doubled if



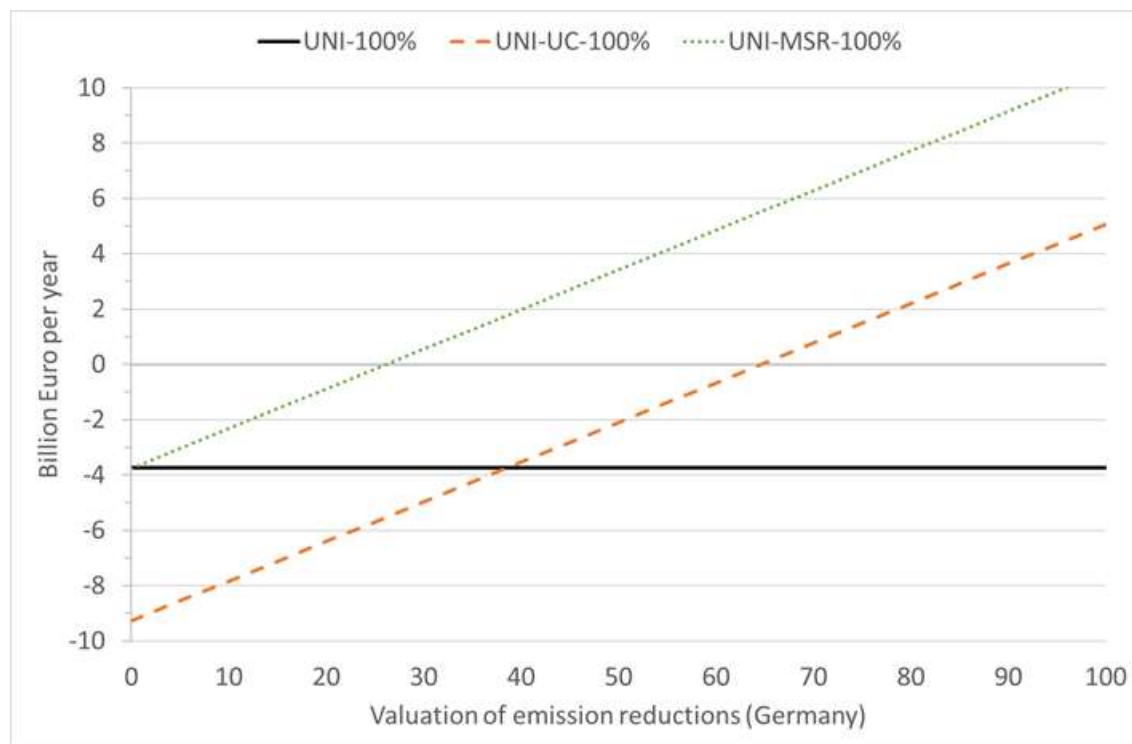
canceling allowances alone (but unchanged if via the MSR)

# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- Unilateral coal phaseout in Germany – cancel allowances?

- Depends on Germany’s “price tag” on emissions
- If price tag exceeds 40 Euro per ton, then cancellation is better
- If price tag exceeds 65 Euro per ton, then coal phaseout with cancellation is better than no phaseout



# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- Unilateral coal phaseout in different EU regions

- Higher share of coal power → Higher costs
- Required price tag on emissions highest for countries with high share of coal power
- Required price tag on emissions much higher with unilateral cancellation than via the MSR (But: How much will the MSR cancel?)



# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

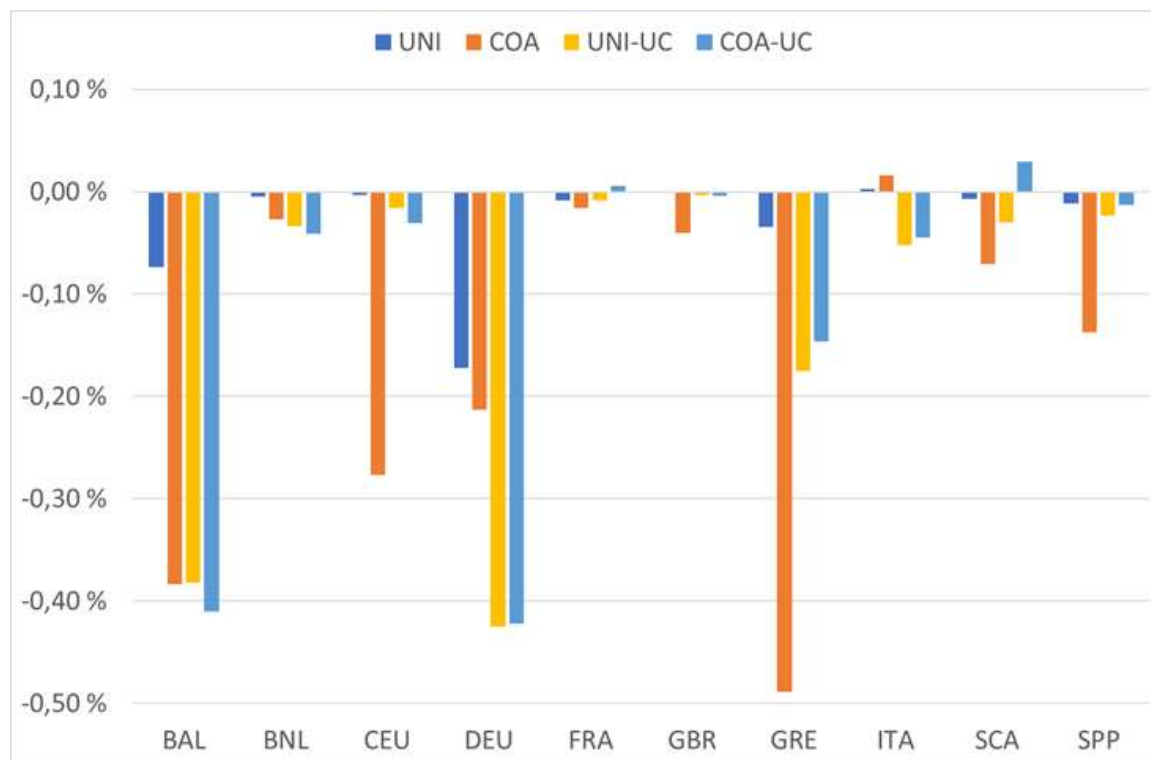
- Multilateral coal phaseout by coalition of EU regions
  - Coalition: All EU members except Poland, Romania, Bulgaria
  - Without cancellation of emission allowances:
    - ETS price drops from 47 to 16 Euro per ton
    - Relocation of emissions mostly within the coalition (more gas power)
    - Several coal phaseout countries increase their total emissions
  - With 100% cancellation of emission allowances:
    - ETS price increases from 47 to 50 Euro per ton
    - Little relocation of emissions

# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- Multilateral coal phaseout by coalition of EU regions

- Most countries lose when other countries also phase out coal
- Main reason: Lower export revenues from export of emission allowances as the ETS price drops
  - Exception: Italy



- Scandinavia benefits from higher electricity export to Germany

# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

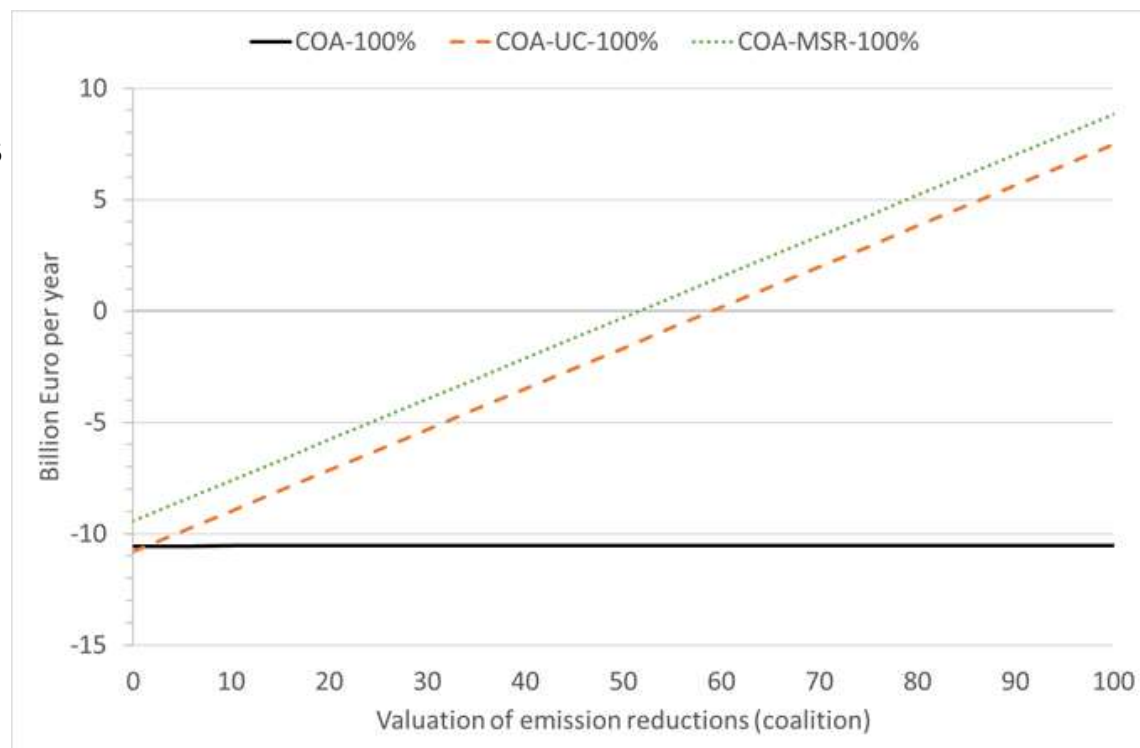
- Multilateral coal phaseout by coalition – cancel allowances?

- Depends on coalition's "price tag" on emissions

- If price tag exceeds 2 Euro per ton, then cancellation is better

- If price tag exceeds 60 Euro per ton, then coal phaseout with cancellation is better than no phaseout

- MSR less beneficial for coalition than with unilateral phaseout



# Paper #2: Europe Beyond Coal

## – An Economic and Climate Impact Assessment

- What remains
  - Some sensitivity analysis
    - Especially wrt. price responsiveness of electricity supply
- Some conclusions
  - Welfare impacts of coal phaseout depend on
    - Whether and how emissions allowances are canceled
    - What other regions do
  - With cancellation, welfare impacts further depend on
    - Price tag on emissions
    - Who pays for the cancellation





THANKS FOR THE ATTENTION!

