

# Allocation methods in emission trading

## The impacts of the choice of benchmark value in Finnish pulp and paper industry

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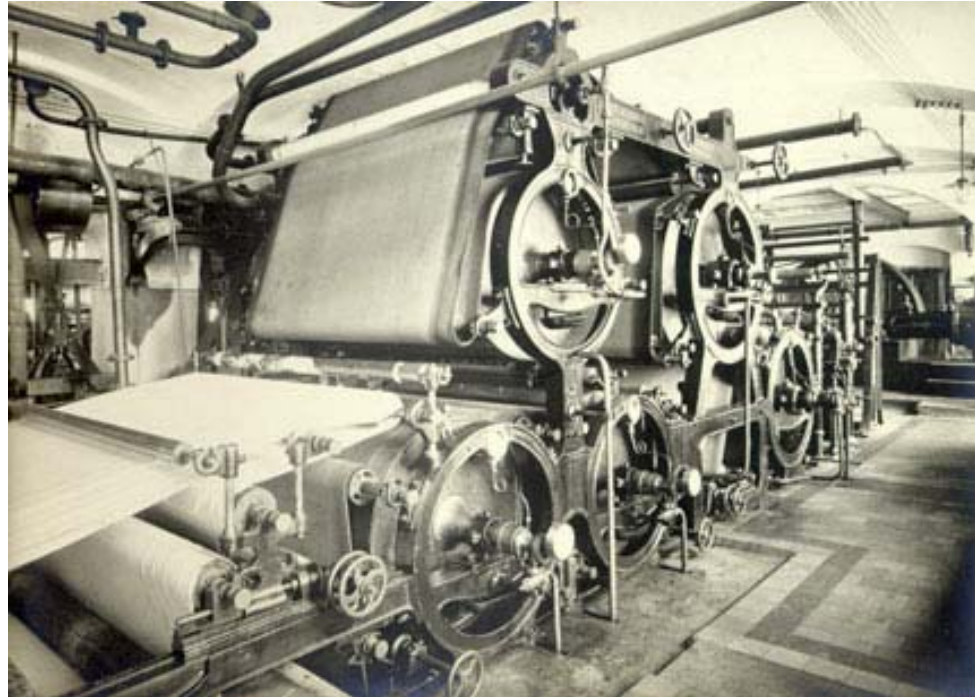
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# OUTLINE OF THE PRESENTATION

- I. Background and motivation
- II. Theoretical approach
- III. Numerical application
- IV. Future work



# MOTIVATION

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- Different regional climate policies
    - Tighter climate policy may shift production to regions with less tight climate policy
    - The areas that have less tight climate policy, have also often higher emission intensity in production
- Carbon leakage
- In emission trading, the problem of carbon leakage might be mitigated by **benchmarking** the emission intensity of production
    - The benchmark and the production of the main output define the amount of the emissions that are allocated freely (auctioning of credits)

# BACKGROUND

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- Two approaches:
  1. Theoretical approach (Kangas, Uusivuori)
    - The economical justification of benchmarking?
    - The optimal benchmark level?
    - The other effects of benchmarking (production, emission credit price etc.)
  2. Numerical application (Kangas, Alexeeva-Talebi, Löschel, Pohjola, Uusivuori)
    - Effects of benchmarking on representative markets (i.e. Finnish pulp and paper markets)
    - Softlinking of bottom-up pulp and paper market model and CGE model
    - What are the effects of benchmarking on Finnish pulp and paper sector?

# THEORETICAL APPROACH

- Literature:
  - Groenenberg and Blok (2002)
    - First proposal of benchmarking in emission trading
  - Böhringer and Lange (2005)
    - If the allocation is based on production rather than emissions, the production is higher
  - Mackenzie, Hanley and Kornienko (2008)
    - Extension to the work by Böhringer and Lange (2005)
- None of the previous studies examine the optimal benchmark value and the economic implications of benchmarking

# THE SETTING (1)

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- Climate change causes **damage**
  - Separate areas might value damage differently, why?
    - Different time preference?
    - Different points on the environmental Kuznets curve?
    - Cultural differences?
    - Geographical differences?
- Damage is represented by **damage function**
  - Defines the current value that is given to the flow of damages of emissions

# THE SETTING (2)

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- Two representative areas:
  - Area 1 (e.g. European Union)
    - High level of damage function from global warming and thus tight climate policy
    - Emission trading with auctioning of credits
    - Benchmarking of emission intensity
  - Area 2 (e.g. The rest of the world)
    - Low level of damage function from global warming and therefore the climate policy is less tight
    - Emission trading with auctioning of credits

# NUMERICAL APPLICATION

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- Literature:
  - Böhringer and Rutherford (2009)
    - Propose a new way of decomposing top-down and bottom-up models for energy policy analyses (partly also our methodology for soft-linking)
  - Ecofys (2009)
    - Methodology for benchmarking in EU ETS, sector report of pulp and paper industry (paper grade division, basis for the benchmarking)
- None of the previous studies examine the effect of benchmark value choice on production, output prices, emission credit prices etc.

# BENCHMARKING IN EU ETS

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- 2005-2012: free allocation of credits
- From 2013 → auctioning of credits
  - Energy sector: full auctioning
  - Energy intensive sectors: benchmarking of emission factor of production and free allocation of the emissions under the benchmark level
- Benchmark value will be based on the average performance of the 10% most efficient installations
- Pulp and paper industry proposed benchmarks (Ecofys 2009) (t CO<sub>2</sub>/ton of output)
  - Newsprint 0.318
  - Uncoated fine paper 0.405
  - Coated fine paper 0.463
  - Tissue 0.343
  - Containerboard 0.368
  - Carton board 0.418
  - Pulp 0

# SOFT-LINKING OF THE MODELS

- Finnish pulp and paper model
  - Represents all Finnish pulp and paper producers with technical accuracy
  - Pulp, paper, electricity and heat production
- PACE model
  - Global CGE model, focus in EU27 and emission trading sectors
- Linking points:
  - Pulp and paper price
  - Pulp and paper production (Finland)
  - Emission credit price
  - Fuel prices
  - Electricity price
- Recursive solution (as long as the pulp and paper prices and production match)

# REALITY vs. THEORY

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- Pulp and paper sector
  - Separate energy and pulp and paper productions
  - Energy productions → CO<sub>2</sub> emissions
  - Paper production → free allocation of emissions based on benchmarking
- Abatement costs of CO<sub>2</sub> emissions
  - CCS technology?
- Reality: more than one producer, more than one product
  - Energy producers have full auction, no benchmarking

# FUTURE WORK

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- Theoretical approach
  - Improve the theoretical considerations
  - Include other sector with no benchmarking (i.e. the energy sector)
  - Include the separation of energy and output production?
  - Is there economic justification for benchmarking or might there be a more efficient policy?
- Numerical application
  - Data modification
  - Policy calculations

Thank you!

Tack så mycket!

Kiitos!

happy birthday! me'n the  
kids all chipped in and bought  
you some carbon credits

