Cost Efficient Regulation of the Danish Agricultural Discharges of Nitrogen to Coastal Waters

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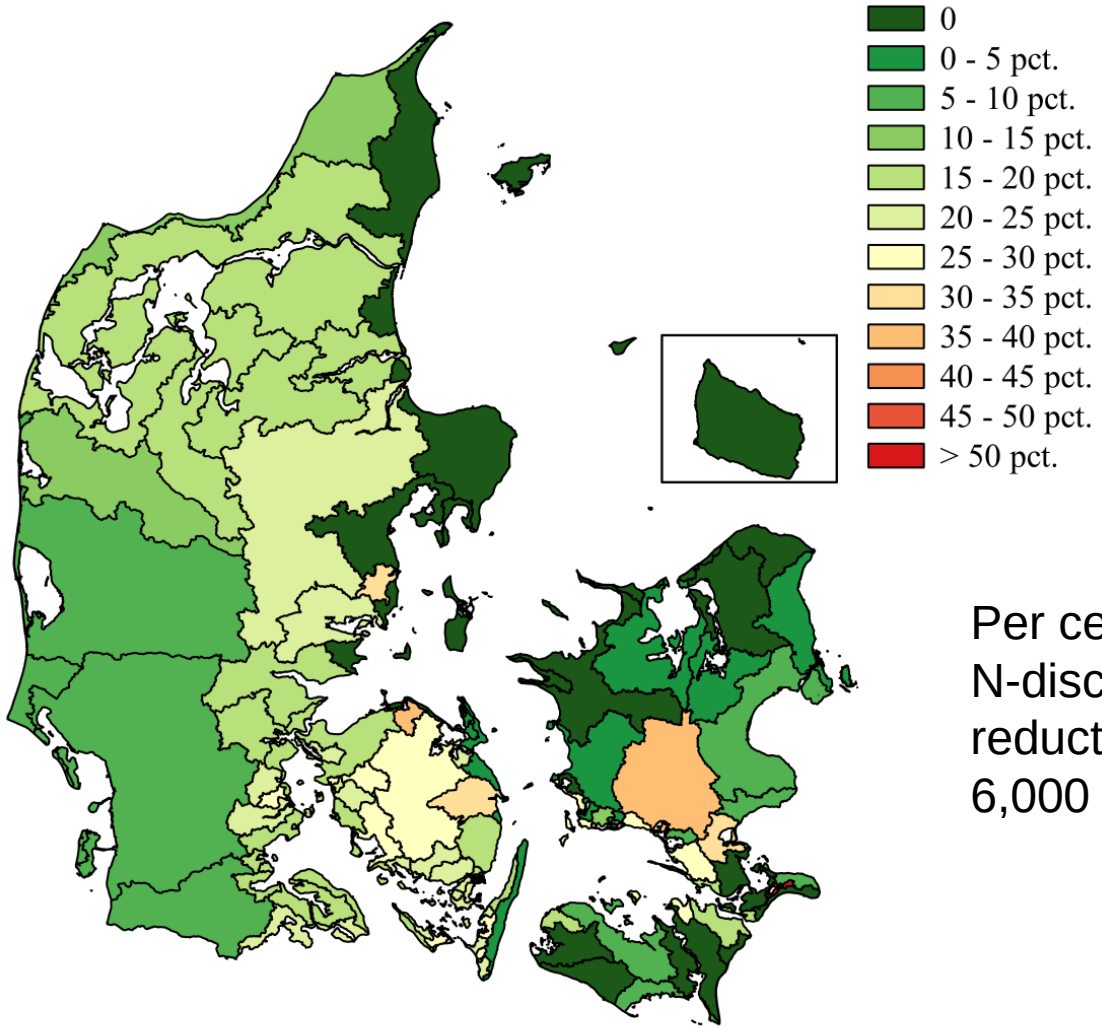
Motivation

- Political agreement:
  - Eased the existing general regulation
  - Outlined a new differentiated regulation, but the details are not decided upon yet

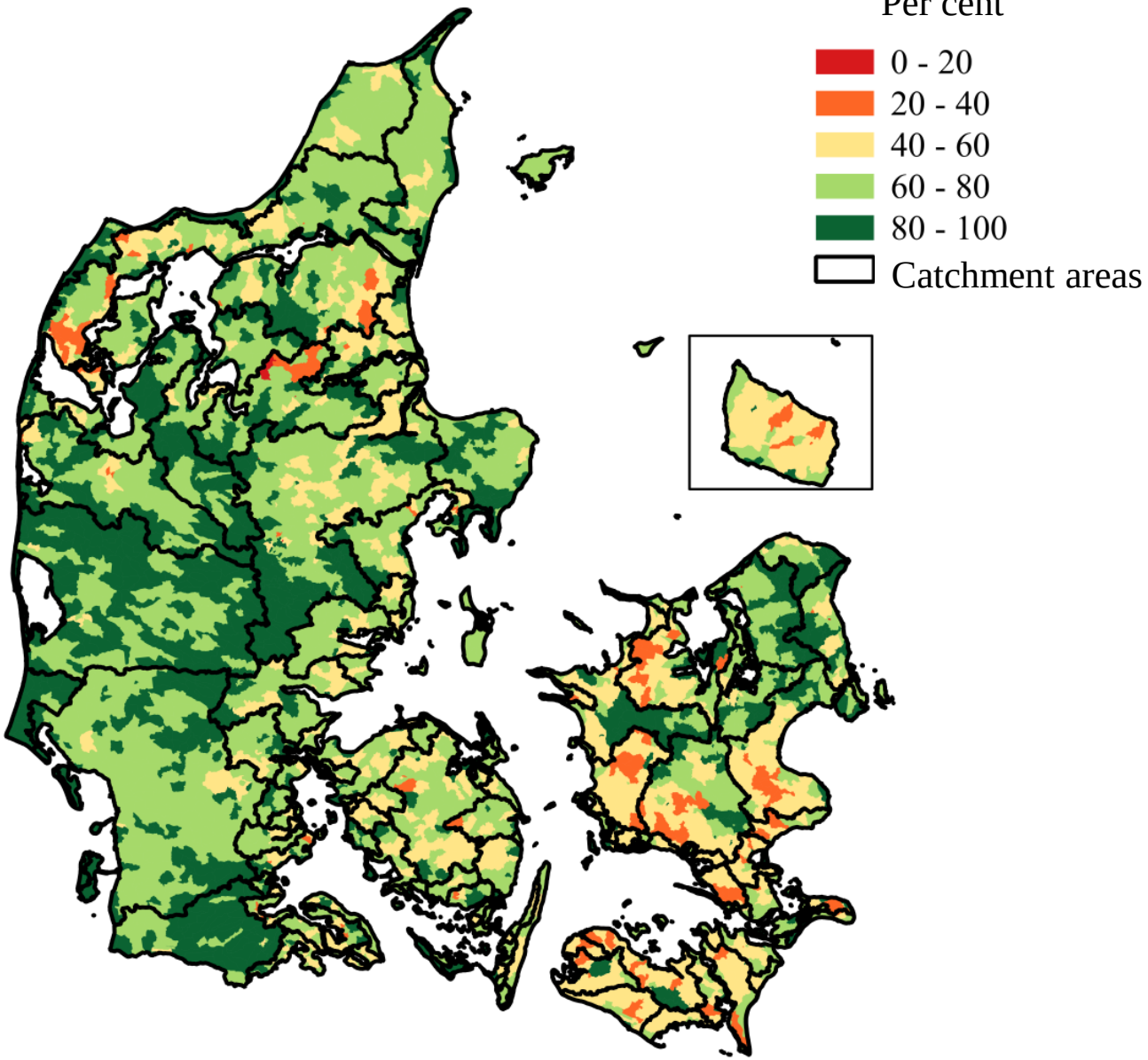
- Differentiating the regulation is important
  - Reduction targets varies across 90 different catchments
  - It differs geographically how much of the nitrogen leached from the root zone that actually ends up in the coastal waters (retention)
  - Private reduction costs varies between farms

Reduction targets 2015-21



Per cent reduction of N-discharges with a reduction target of 6,000 tonne N

Retention



The analysed regulations

1. Allowance-based leaching rights
   - Somewhat similar to the general regulation that has just been eased but differentiated across catchment areas
   - All farms in a catchment area must reduce the supplied amount of nitrogen fertilizer by the same share of the profit-maximizing amount
   - Differentiated with the reduction targets but only a little with retention
   - No incentive to choose crops that leach less
   - Economic incentive to illegal trade with N
2. Targeted crop taxes
   - Tax per hectare differentiated with the reductions targets, retention and the choice of crop – assume profit-maximizing amount of N
   - Same cost per discharged kg N within the same catchment area
   - Different tax per ha across farmers within the same catchment area
   - Tax on livestock production as well
   - Incentives for long term structural changes

Method

- Model calculations from IFRO, UCPH
  - ESMERALDA: partial equilibrium model
  - 15 types of farms and their crop choices, choice of livestock production and production input (e.g. nitrogen in fertilizer and feed)
    - Maximising the land rent
  - Modelling different levels of regulation and the resulting changes in:
    - Land rent
    - Leached amount of nitrate

Method

- Geographical data from AGRO, AU
  - Distribution of farm types on catchments and levels of retention (10 levels)
- Calculate which levels of regulation that will reach the reduction targets in each catchment area and when it will be cheaper to use e.g. constructed wetlands or catch crops

Results

	DKK bn.
Allowance-based leaching rights	1.03
Targeted crop taxes	0.58

Consequences of illegal trade:
Costs of the allowance-based leaching rights can rise to **DKK 4.52 billion**

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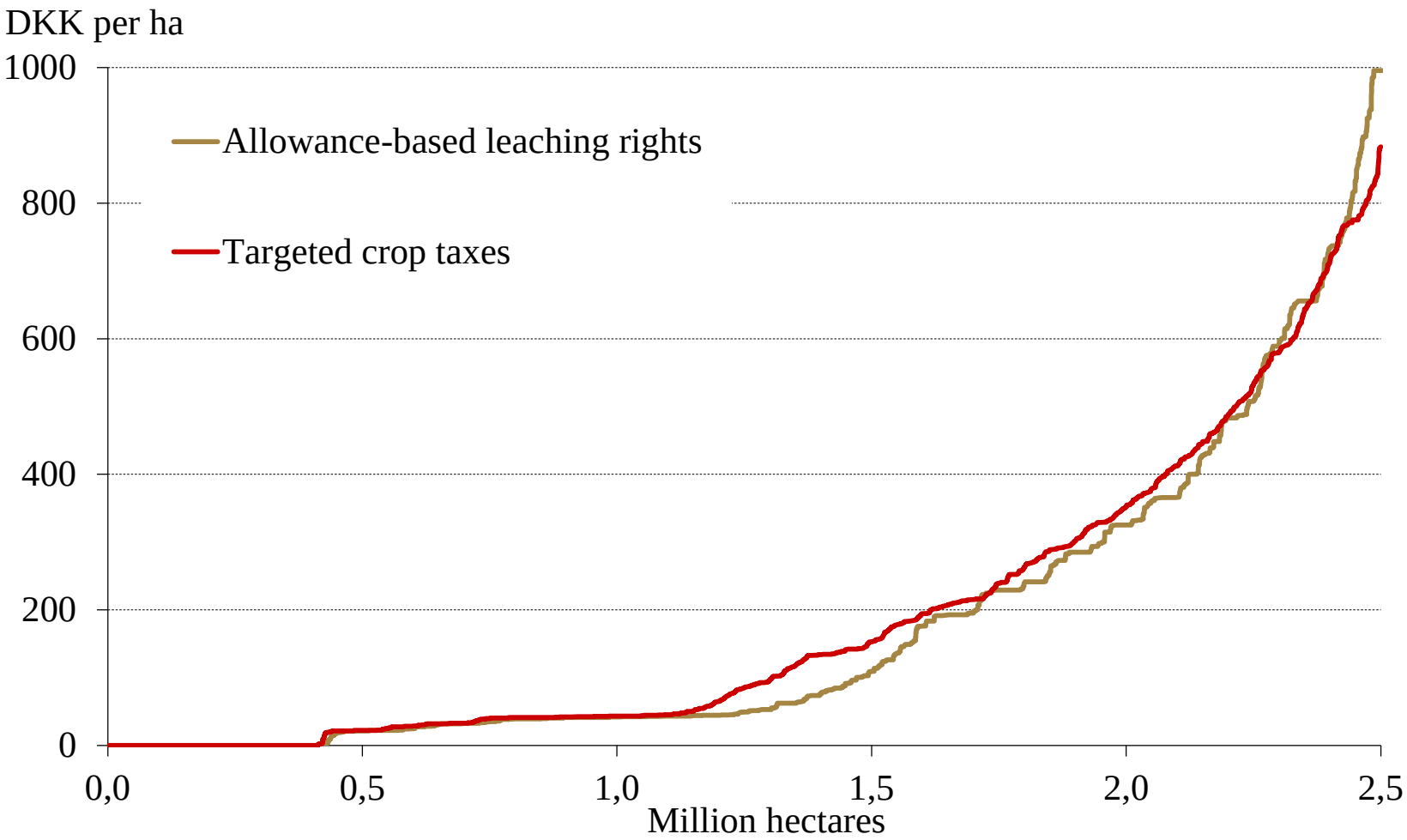
Other reduction targets (groundwater)

- Reductions not only necessary for the coastal water
- Example: Local targets related to groundwater
- Targeted crop taxes can handle more targets in a relatively simple way
  - The taxes can be differentiated according to more local targets
  - The different targets (coastal water and groundwater) can be combined to one set of crop taxes for each farmer
  - Administrative burden for the farmer is unchanged

Distribution of cost



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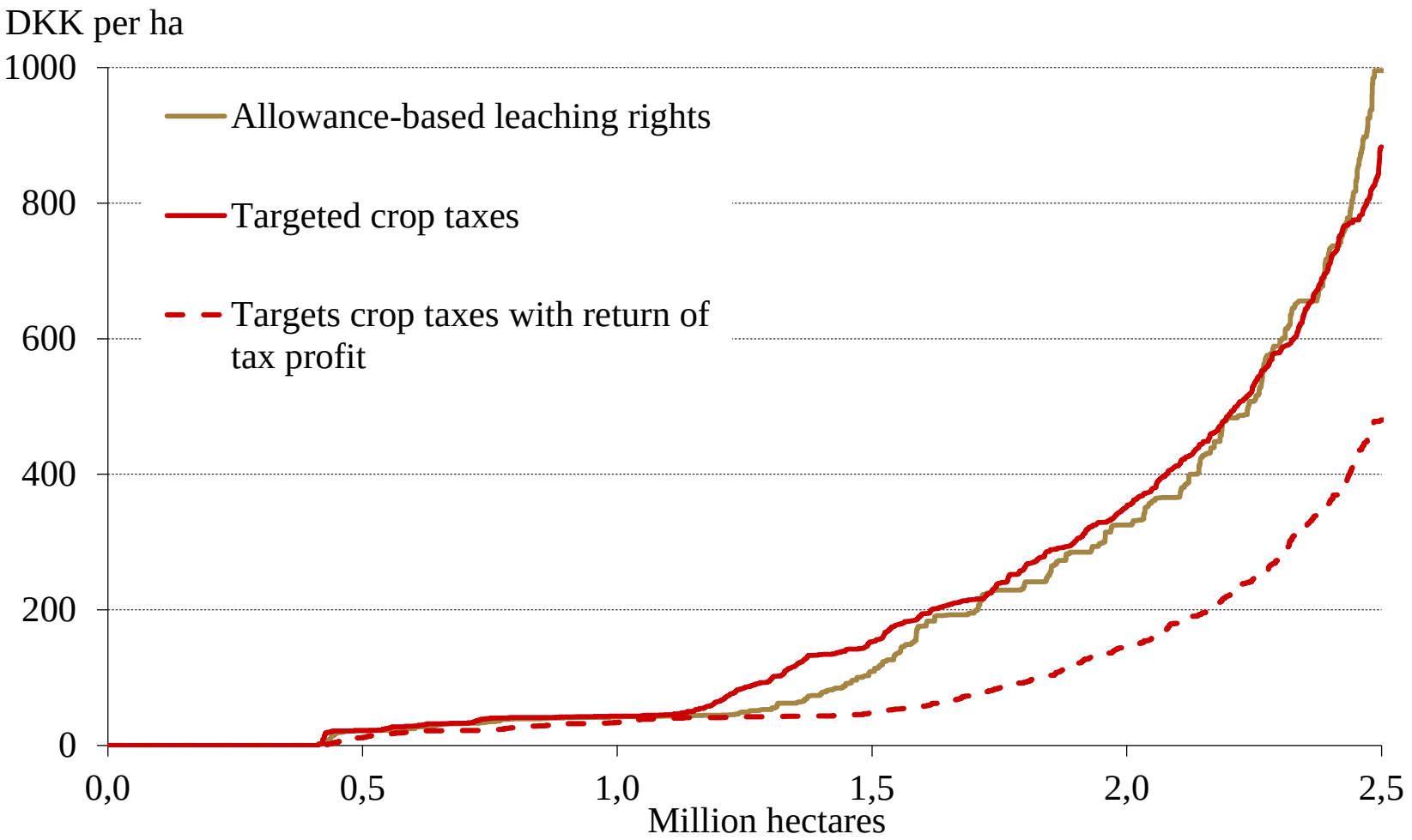
Distribution of cost



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