Effectiveness of nitrogen abatement trading: a hypothetical market experiment

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BONUS
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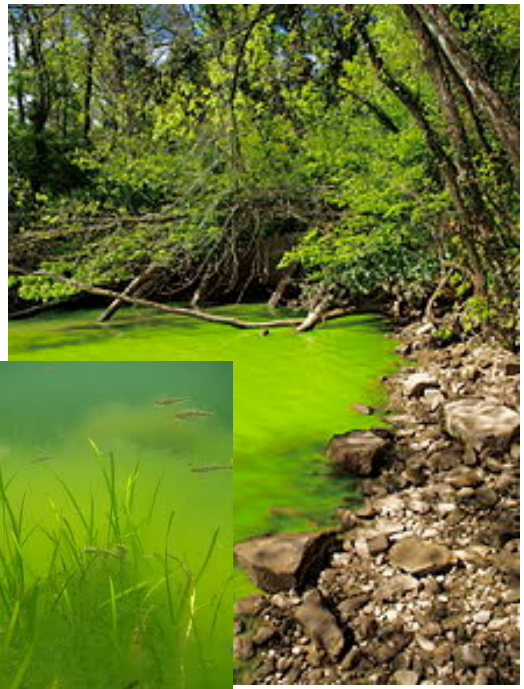
THEMATIC BACKGROUND



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(Acts whose publication is obligatory)

DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 23 October 2000

establishing a framework for Community action in the field of water policy

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

(3) The declaration of the Ministerial S groundwater held at The Hague in 1991 re need for action to avoid long-term deter

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Sustainable N conference
dNmark
June 25.-27. 2017

BACKGROUND

Spatial variability in abatement costs could reduce total costs.

More flexible implementation to enable redistribution of N between farms is needed.

Tradeable nutrient permit scheme.

Few empirical studies on N abatement trading.

Little guidance on how to evaluate farmer participation a priori.

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CONTRIBUTION

We study a hypothetical market in Nitrogen Abatement to understand reallocation of abatement effort and identify who would purchase and who would sell abatement.

We link a choice experiment to catchment and farm scale data to quantify the reallocation of abatement effort between farm types.

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FARM SURVEY

Questionnaire sent out to all registered Danish farmers
by email (approx. 10.000). Focus group, pilot testing. Response rate 13 %.

- Background questions, statements
- Choice experiment on trading nitrogen effect

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SCENARIO

For each water basin within a watershed, an N-target is specified, θ_c (based on the sensitivity of the water basin). This is allocated to farmers according to retention, Ret_c, and cultivated area, A_c, within each watershed.

$$\varphi_C = \theta_C / (1 - Ret_C) / A_C$$

Farmers within each watershed faces the same requirement in kg N/hectare – but not the same costs.

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DEMAND

Price
5, 12, 30, 45, 80 kr./kg N/year

Choice set 1 of 5: imagine that the price is 45 DKK/kg N/year for N effect

	Contract A	Contract B	Contract C
Kg N to buy on the market	15 % of your reduction requirement – eqv. 147 kg N	25 % of your reduction requirement – eqv. to 245 kg N	33 % of your reduction requirement – eqv. to 323 kg N

Nitrogen amount (% of total N requirement)
1, 5, 9, 15, 18, 25, 33, 45, 75, 100

Example
N requirement: 20 kg N/ha
Cultivated area: 49 ha
Total N requirement: 980 kg N

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SUPPLY

Contract length
- Permanent, 10, 1 year
- Permanent set aside, energy crops, catch crops
- Effect, kg N/ha

Price
5, 12, 30, 45, 80 kr./kg N/year

Choice set 1 of 5: imagine that the price is 80 DKK/kg N/year for N effect

	Contract A	Contract B	Contract C
Contract length	Permanent set aside. Effect = approx. 50 kg N/ha/year	1 year contract of catch crops. Effect: with application of manure approx. 35 kg N/ha/year Effect: without manure approx. 22 kg N/ha/year	10 year contract of energy crops. Effect = on clay soils approx. 34 kg N/ha/year Effect: sandy soils approx. 51 kg N/ha/year
Hectare requirement for implementation of measure	1 % of your agricultural area – eqv. to 0.2 ha	4 % of your agricultural area – eqv. to 0.8 ha	25% of your agricultural area – eqv. to 5 ha

Number of hectares (% of agricultural area)
1, 4, 10, 25, 40

Example: Farmer cultivating 20 hectares

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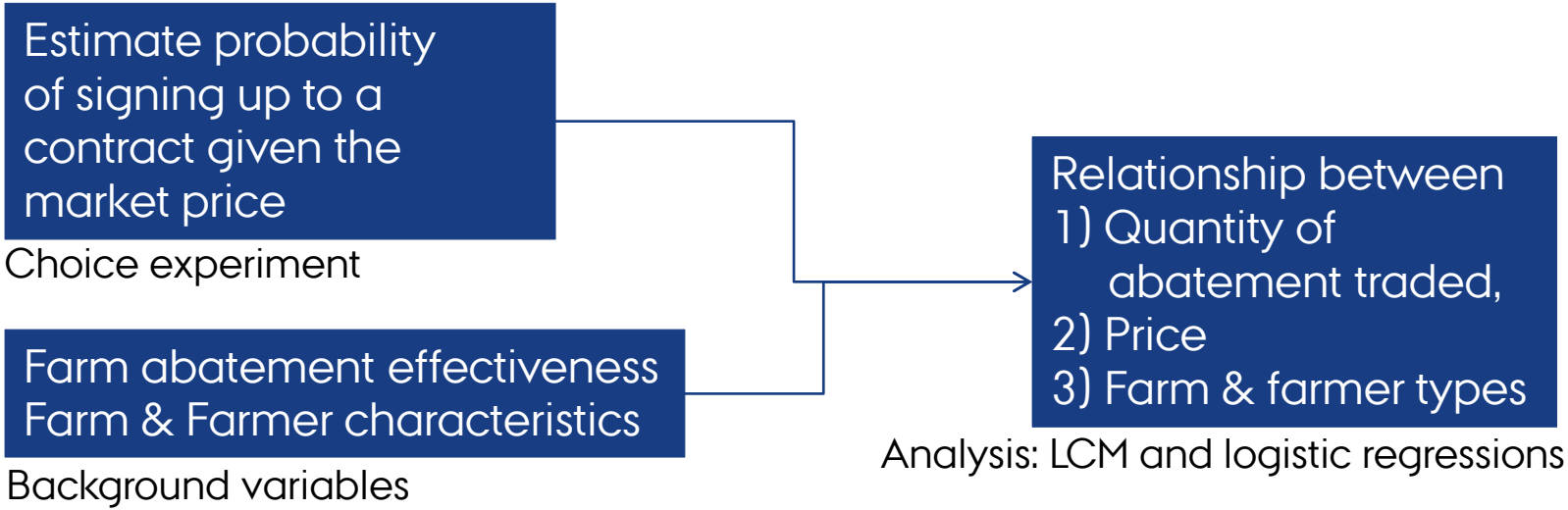
ESTIMATING DEMAND AND SUPPLY CURVES



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MARKET DEMAND VERSUS MARKET SUPPLY

	DEMAND	SUPPLY
Respondents	470	453
Total N requirement	1,038	558
Cultivate areas	Large farms	Small farms
Organic	-	X
Full time farmers	-	X
Forested areas	-	X

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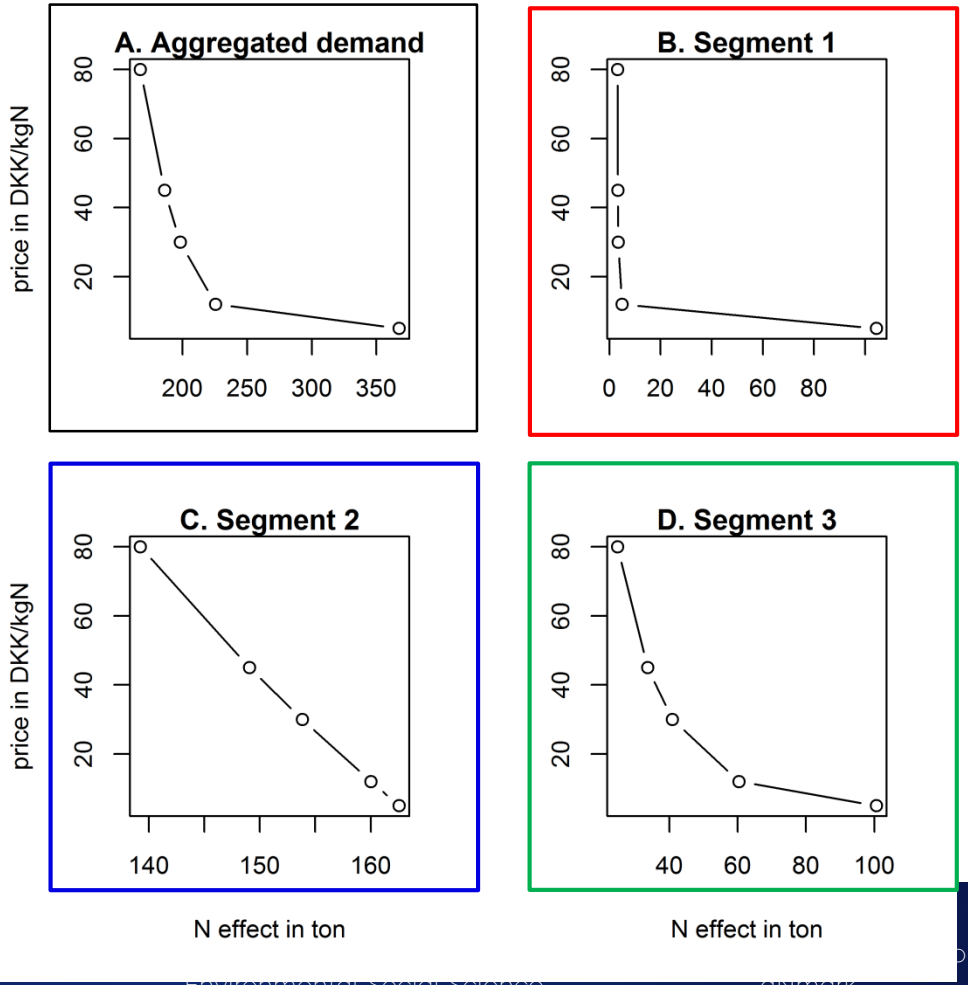
MARKET DEMAND

Total N requirement of 1,038 ton,

Segment 1: Preferences for "Not trading".

Segment 2: Preferences for trading.

Segment 3: Preferences for "NOT trading".



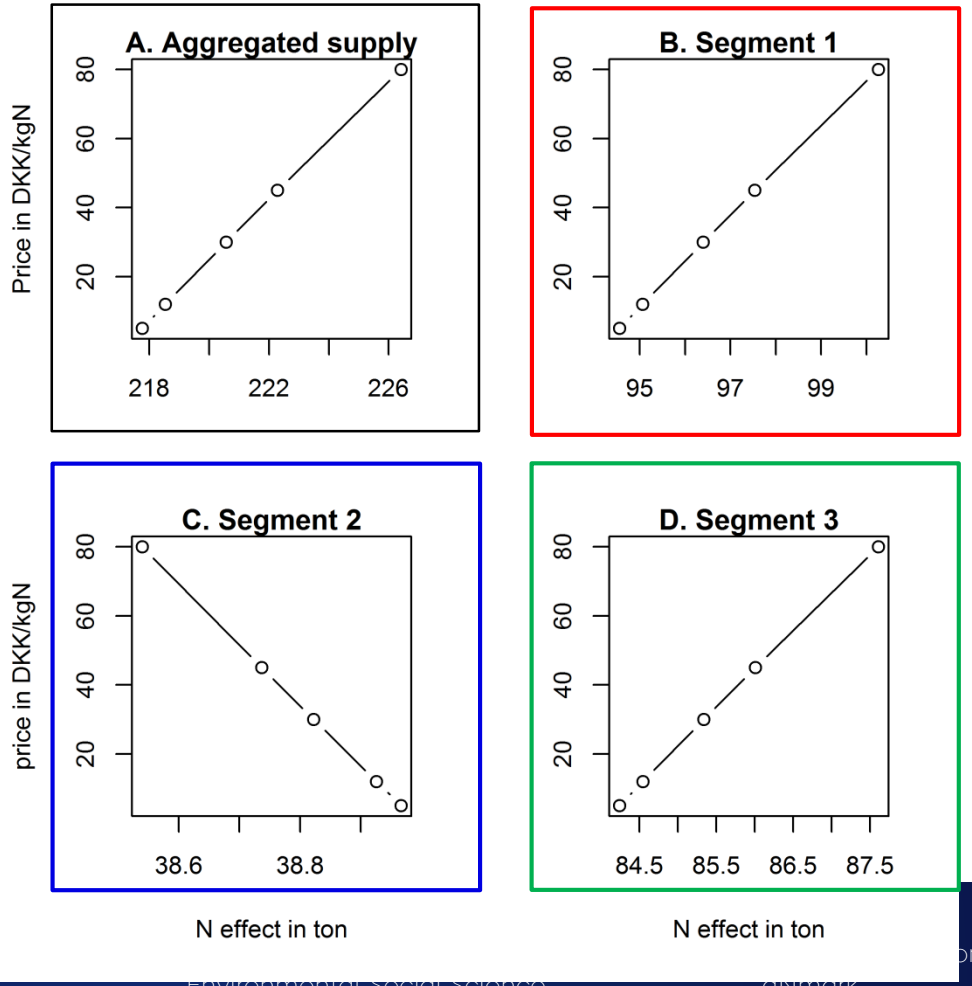
SUPPLY

Total N requirement of 558 ton.

Segment 1: Preferences for "NOT trading".

Segment 2: Preferences for trading.

Segment 3: Preferences for "NOT trading".



CONCLUSION

Farmers are willing to trade and trade can help meet some of the N cap given in the current regulation and eventually improve cost efficiency.

Heterogeneity among farmers is crucial to secure the presence of both purchasers and suppliers of N abatement within an area

Farmers can be classified into different segments – each with different supply or demand patterns. However, the link to farm and farmers characteristics is not strong.

The results could be used to support the decision on whether a market for trading N abatement can help efficient reallocation of N abatement effort within a catchment.

The results can be used to support the design of policy incentives used to address nutrient reductions.

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