

Economic impact of the Mid-Term-Review reform on agriculture production, farm income and farm survival: A quantitative analysis for local sub-regions of Schleswig-Holstein in Germany

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Introduction

High uncertainty about impacts of the MTR, because

- ▶ the MTR contains new agricultural policy instruments
→ economic implications were not fully understood
- ▶ the MTR includes a large range of national policy options

Main objectives:

- ▶ reduction and/or redistribution of farm incomes
- ▶ reduction of agricultural production
→ negative effects on employment
→ negative effects on upstream and downstream sectors

⇒ A detailed quantitative analysis of the MTR is needed!

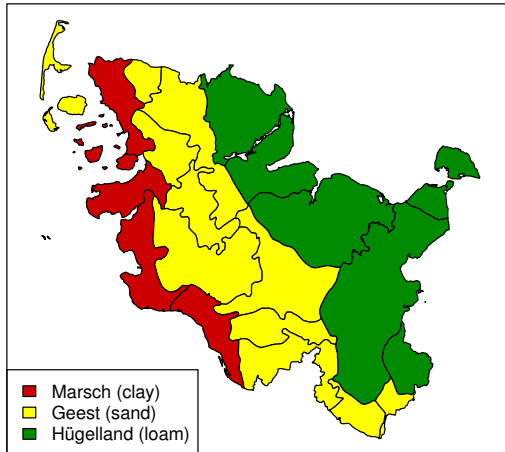
Outline

- ▶ Introduction
- ▶ Agricultural Sector in Schleswig-Holstein
- ▶ Model Description
- ▶ Results
- ▶ Conclusions

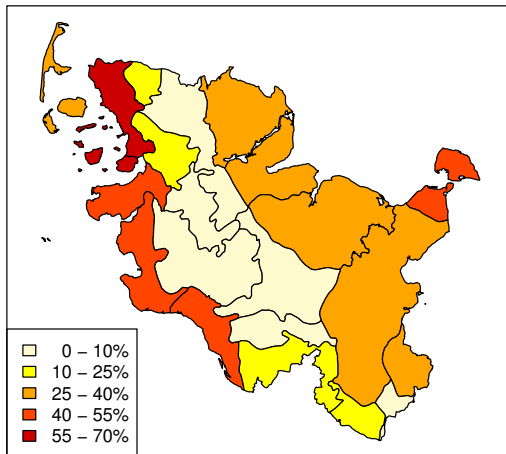
Schleswig-Holstein in Germany



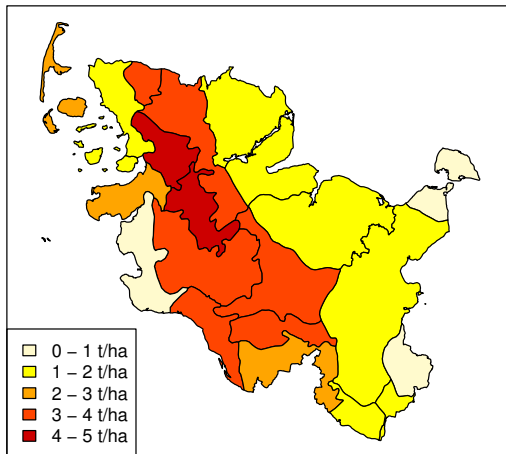
Regions and Soils in Schleswig-Holstein



Wheat Production in Schleswig-Holstein



Milk Production in Schleswig-Holstein



Agricultural Production in Schleswig-Holstein

Marsch

- ▶ arable land: wheat
- ▶ grassland: pastures
- ▶ animals: heterogeneous

Geest

- ▶ arable land: silage maize, rye
- ▶ grassland: grass silage, pastures
- ▶ animals: dairy cows, cattle fattening, suckler cows

Hügelland

- ▶ arable land: wheat, rapeseed and barley
- ▶ grassland: not much
- ▶ animals: pigs

Modeling Approaches

Modeling production adjustment and farm income:

- ▶ farm group model
- ▶ linear programming (LP) model

Modeling structural change:

- ▶ farm succession model
- ▶ based on results of LP model

LP Model: Overview

- ▶ farm group model representing 416 farm groups
- ▶ gross margin is maximized under different scenarios
 - ▶ baserun
 - ▶ political conditions
 - ▶ economic conditions
- ▶ 1100 activities and 550 restrictions to account for
 - ▶ heterogeneous land qualities
 - ▶ different production intensities
 - ▶ crop rotation restrictions
 - ▶ cross compliance requirements

LP Model: Farm groups

Arrangement of farm groups are based on

- ▶ data that farms submit when they apply for direct payments
→ almost complete dataset (15,000 farms)
- ▶ bookkeeping data (supplementary)

Farms are classified into groups according to

- ▶ farm size (4)
- ▶ farm type (8)
- ▶ subregion (22)

LP Model: Farm Level Data

Resource endowments of each farm group

- ▶ agricultural land, divided into
 - ▶ arable land and permanent grassland
 - ▶ 15 soil qualities
- ▶ stable capacities
- ▶ family labor
- ▶ milk quota
- ▶ ...

LP Model: Production Activities

Land cultivation activities:

- ▶ cash crops
- ▶ set-aside
- ▶ forage production

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Land cultivation activities:

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- ▶ forage production

Animal farming activities:

- ▶ dairy production
- ▶ suckler cows
- ▶ cattle fattening
- ▶ sheep farming
- ▶ pig farming

LP Model: Non-production Activities and Data Sources

Non-production activities

- ▶ hiring of labor
- ▶ selling of family labor
- ▶ selling and purchasing calves
- ▶ receiving premium payments

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Data sources

- ▶ bookkeeping data
- ▶ data collections for planning purposes
- ▶ assessments of experts

Calculation of Profits

Profit = gross margin – general expenses – tenure payments

Tenure price of land

- ▶ unified regional payments: entitlements > land
→ tenure price = shadow price + area payments
- ▶ single farm payments: land > entitlements
→ tenure price = shadow price

Farm Succession model

Structural change ← survival of farms ← succession of farms

Farm structure mainly depends on

- ▶ number of farmers reaching retirement age
- ▶ probability of succession

Probability of succession depends on

- ▶ farm size
- ▶ farm type
- ▶ profit of the farm
- ▶ ...

Implementation of the Model

Programming of the model and analysis of the results:

- ▶ statistical environment “**R**” (<http://www.r-project.org>)

Solving of LP models

- ▶ **R**-package “lpSolve” (Berkelaar and Buttrey, 2004)
- ▶ “lp_solve” (Berkelaar et al., 2003)

Maps are drawn with **R** using the packages

- ▶ “shapefiles” (Stabler, 2003)
- ▶ “mapproj” (Lewin-Koh and Bivand, 2004)

Realistic Scenario

What is realistic?

- ▶ full decoupling
- ▶ uniform regional premiums (359 €/ha)
- ▶ prices of meat and grain (except rye) remain unchanged
- ▶ milk price is reduced from 0.29 €/kg to 0.22 €/kg

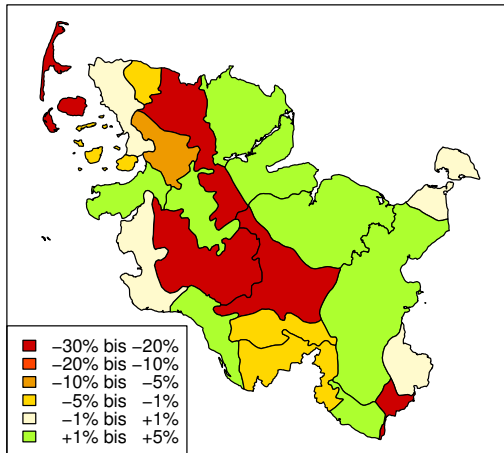
Aggregate Results

	relative change	change of ag. land
cash crops	-2.3%	-1.1%
forage growing	-0.6%	-0.3%
fallow land	+36%	+1.4%
cattle	-14%	
milk production	+1.5%	
labor	-6.6%	

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labor	-6.6%	
rye	-56%	-1.8%
suckler cows	-97%	

Regional Results: Cash Crops



Farm Incomes

Farm income on average reduced by 20%

Income changes significantly vary:

- ▶ dairy farms: -31%
- ▶ cash crop and pig farms: $\pm 0\%$
- ▶ beef production farms: $+17\%$

Results of Alternative Scenarios

Distribution of decoupled payments

- ▶ does not affect production decisions, but
- ▶ strongly influences the income of individual farms and the prices of land and milk quota

Single farm payments do not reduce the average farm profit (compared to -20% in the realistic scenario)

Structural Change

	without MTR	with MTR
Cash crop farms		
≤ 50 ha	-4.5%	-4.6%
> 50 ha	-1.1%	-1.2%
Forage-growing farms		
≤ 50 ha	-4.1%	-4.3%
> 50 ha	±0.0%	-0.2%
All farms		
≤ 50 ha	-4.2%	-4.4%
> 50 ha	-0.3%	-0.5%

Conclusions

- ▶ Aggregated results may strongly differ from disaggregated results
- ▶ Resource endowments have a major effect on production adjustments and farm incomes
- ▶ New policy instruments can be exactly and easily implemented in farm level models

⇒ Farm level models are an important tool for policy analysis!