Farm Level Effects of EU Policy Liberalization: Simulations Based on an EU-Wide Agricultural Sector Model and a Supply Model of the German Agricultural Sector

Andre Deppermann, Harald Grethe  
(Universität Hohenheim)  
Frank Offermann  
(von Thünen-Institute)  

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Outline of Presentation

1) Approaches for Linking Simulation Models
2) Our Approach
3) Models and Model Linkage
4) Model Harmonization
5) Scenarios
6) Results
7) Conclusion and Outlook
Approaches for Linking Simulation Models

• Policy scenarios have effects on different levels of aggregation

• The use of single models may not be sufficient for various analyses (e.g. EU policy liberalization)

• Linking approaches:
  • Mapping results from models of a higher aggregation stage to a lower aggregation stage (e.g. Banse and Grethe, 2008; Nowicki et al. 2009)
  • Aiming at full consistency via iteratively running models at different aggregation stages (e.g. Kuhlmann et al., 2006; Britz, 2008)
Our Approach

Fully integrated interface between the European Simulation Model (ESIM) and the Farm Modelling Information System (FARMIS)

- ESIM: quantification of effects of agricultural policies at the European level
- FARMIS: Measurement of impacts on intra-sectoral income distribution among German farmers
Models and Model Linkage
- ESIM

- Comparative static partial equilibrium multi-country model for the agricultural sector
- Isoelastic supply functions (separate for yield and area) and demand functions
- 31 regions (EU Member States; USA, Croatia, Turkey, Western Balkans, RoW)
- Product coverage:
  - 15 crops
  - 6 animal products
  - 21 processed products
Models and Model Linkage
- FARMIS

• Comparative-static process-analytical programming model for farm groups
• Representing the German agricultural sector
• Main database: German Farm Accountancy Data Network (FADN)
• Product coverage:
  – 27 main activities of crop production
  – 15 activities of livestock production
• Detailed representation of production technology and regions as well as specific farm types
Models and Model Linkage
- ESIM-FARMIS Interface

Iterative process

Vector of **price** and **yield** changes

ESIM → FARMIS

Vector of **area** and **quantity** changes

→ until convergence is reached
Models and Model Linkage
- ESIM-FARMIS Interface

**Preliminary work**

- Agreement on modelling of policy parameters in the base period
- Agreement on policy assumptions and parameters exogenous to both models for the baseline
- Definition of consistent product interfaces
- Detailed comparison and analysis of the reactions of both models to the same vector of price changes
Model Harmonization

• Intention:
  – Achieve a high degree of analogous model behaviour
  – Understand differences among the models

• Examples:
  – Treatment of the impacts of obligatory set-aside
  – Biophysical constraints in beef production
Model Harmonization
- Obligatory Set-Aside

• Treatment of the impacts of obligatory set-aside is different in the two models
• FARMIS: all formerly set-aside land can be used for production
• ESIM: only 50% of set-aside land can become productive again → because marginal land is more likely to be set-aside
• To match this effect on total production for the model linkage, the yield changes generated by ESIM were downwardly adjusted
Model Harmonization
- Biophysical Constraints in Beef Production

• Divergence in reaction of beef production due to biophysical constraints implemented in FARMIS
• FARMIS: calf stocks are reduced because of an increase of milk output per animal and a binding milk quota → drop in beef production
• ESIM: positive cross price elasticities between milk and beef; technical link between milk output change per animal and beef production was missing
• To improve the depiction of beef supply in ESIM, such a link was implemented
Scenarios
- Baseline

- Projection year: 2015
- World market prices calibrated to FAPRI projections
- Full implementation of the 2003 Reform and the Health Check except for the abolishment of milk quotas
- Constant levels of tariffs, export subsidies, tariff rate quotas (except for sugar) compared to the base year and the current system of intervention prices
- Biofuel share of almost 6% in total EU transport fuel consumption is assumed by 2015
Full market liberalization of EU agricultural policies:

- Abolishment of all price policies
- Cut in direct payments by 50%
## Results
- Baseline

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<tr>
<th>Products</th>
<th>Before iteration</th>
<th></th>
<th></th>
<th>After iteration</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Change in price</td>
<td>Change in area/supply in ESIM</td>
<td>Change in area/supply in FARMIS</td>
<td>Change in price</td>
<td>Change in area/supply in ESIM</td>
<td>Change in area/supply in FARMIS</td>
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<td>% comp. to 2005 (2)</td>
<td>% comp. to 2005</td>
<td>% comp. to 2005 (1)</td>
<td>% points difference with (2)</td>
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14
# Results
- Full Liberalization

<table>
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<th>Products</th>
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% - changes compared to Baseline
Results
- Farm Net Value Added per Agricultural Work Unit

![Bar chart showing farm net value added per agricultural work unit for different farm types and sizes.]

- Baseline
- Full Lib.
- Baseyear

- All farms
- Arable
- Grazing livestock
- Pig+poultry
- Small
- Medium
- Large
- Arable farms
- Dairy farms
Results
- Farm Net Value Added per Agricultural Work Unit cont’d

• Liberalization of agricultural market leads to a strong reduction of farm incomes

• Average income in the baseline is substantially higher than in the base year

• The impact on family farm income is often much smaller as the reduction of direct payments reduces land rental prices

• Projections should be interpreted against the background of low-income levels that indicate that significant structural change can be expected

→ Not depicted in the current model specifications!
Conclusion and Outlook

• Analysis of model reactions was most important step in the linking process
• Iterative process mostly is relevant for non-tradable goods and such goods for which the country is large
• Detailed analysis of scenarios with respect to income distribution among different farm groups can be carried out
• An extension of the FARMIS model to explicitly and endogenously account for farm exits is envisaged
Thank you for your attention!
References


