A Forest Sector Model for the Region Baden-Wuerttemberg in Germany

BW-GLOBAL-FOR

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Clusterinitiative
Forst & Holz Baden Wuerttemberg

• Common initiative of stakeholders and public administrative:
  – Reflects importance of forestry and wood processing industry in Baden-Wuerttemberg, Germany, economically, but also from a land use, environmental and rural development perspective
  – Foster networking of enterprises and collaboration between enterprises and research institutions...
  – ...to benefit from opportunities of emerging bio-economy, e.g. increased use of wood chips for heating...
  – ...and to increase competitiveness
• Analyses effects of market and policy changes on forestry and related industries in Baden Wuerttemberg...

• ... but reflects link to national and global markets for wood and wood based products

• Bio-economic, partial equilibrium model
  • Recursive-dynamic, yearly steps
  • Perfect competition, imperfect foresight
  • Production, Consumption, Bi-lateral trade, Prices
  • Calibrated against medium-term baseline (2030)
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Spatial resolution
1990 – 2010

• Germany/ BW: German federal forest Inventory
• EUROPE: UNECE/FAO Forest & Timber statistics
• World: Global FAO Forest statistics

• Production
• Demand
• Export, import (bi-laterally)
• Harvest quantity
• Forest ownership
• Assortments
• Forest area
• Growth rates
• Production shares
• Import and export unit values as price source
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General structure
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Harvest intensity

- Harvested quantity
- Desired long-time harvest rate

Realized price = Expected price

Realized price < Expected price
Realized price > Expected price
• Simulation based on Armington approach
  – Relaxing assumption of trading homogenous goods
    • Aggregated commodities as imperfect substitutes (tropical woods compared to temperate zone ones, different processing qualities ....) => law of one price does not hold
    • Allows for bi-lateral gross-trade, smooth reaction of import shares to price changes

• Spatial equilibrium concept applied inside Germany:
  – Homogenous goods
  – Price differences driven by transport cost
  – Can alternatively also be used globally
Functional forms and Parameterization

• **Supply**: double log, plus CET (distribution to different wood parts), plus harvest intensity equations (only Europe)

• **Demand**: double log plus CES (share of different wood parts)

• Magnitude of parameters taken from similar models / studies, further literature work ongoing, not yet own econometric work
• Simple polynomial long-term trends of prices (supply, demand, trade flows, prices ...) as a priori

• Model structure as “data information“ (closed market balances reflecting bi-lateral trade, dynamics in supply, optionally: spatial arbitrage condition for prices)

• Introduction of shock in order to analyze the models reaction due to its mechanisms regarding structure and parameterization
Model plausibility and stability

- Preliminary counterfactual run: 5% yearly increment of standing forest
- Resulting model response to shock:

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<th>Prices:</th>
<th>Import:</th>
<th>Domestic sales:</th>
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• Data transformations, reference run, calibration, simulation implemented in GAMS (General Algebraic Modelling System)

• Simulation model as Mixed Complementarity Problem (MCP) solved with PATH

• Design of Experiments for sensitivity experiments in R combined with parallel execution of model runs

• Java based Graphical User Interface for model steering and result exploitation (tables, graphs)
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Summary and Outlook

• BW-GLOBAL-FOR:
  – Complements the few existing (global) forest models with different methodologies (e.g. Armington, CES/CET, MCP, large-scale sensitivity analysis)
  – Prototype version operational

• Next steps:
  – Incorporate regional data for Baden-Württemberg
  – Improve reference run and parameterization
  – Implementation of specific policy instruments
  – Apply BW-GLOBAL-FOR for scenario analysis
    • i.e. FSC certification of public forests in BW
Thank you for your attention!