Use of economic modelling in agricultural policy

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Types of modelling applications
Types of models used
Institutional solutions to host models
Overview on CAPRI
Examples for applications
Do results matter for policy?
Summary and conclusion
- **Scoping**: What are possible future developments? (e.g. study “SCENAR 2020” or IPCC Climate Change scenarios)

- **Ex-ante impact assessment** of planned policy changes, mandatory for EU Commission if larger budget impact (e.g. recent legal proposal for Common Agricultural Policy - CAP 2014-2020)

- **Ex-post evaluation** of past policies, in the meantime mandatory (e.g. regular tenders by DG-AGRI)
Focus here on Europe and Common Agricultural Policy (CAP)

**CAP changes typically provoke impacts**
(at least potentially)
- on prices => equilibrium models \([\text{supply}=\text{demand}=f(\text{prices})]\)
- on trade => global models
- across EU, but not uniformly => at least detail at country level

⇒ Market entry costs for new models are quite high
(data and parameter requirements due to EU/global coverage, IT infrastructure)

⇒ Relative small set of models available, not much movement in market …
Equilibrium models:

- **Single market models**
  - For prices, quantities, policy in single market (or a few)
  - e.g. Banana model (G Anania), Dairy model (V Requillart) ..

- **Multi-Commodity Models**
  - Equations for many agricultural markets
  - e.g. “AGMEMOD”, “AGLINK”, “CAPRI”, “ESIM”, “GLOBIOM”

- **Computable General Equilibrium (CGE) models**
  - for all markets in whole economy plus budget constraints
  - e.g. “GTAP” variants like “MAGNET”, “MIRAGE”, “GLOBE”, regional CGEs in CAPRI
Equilibrium models possible linked to

- more dis-aggregated supply models (can be in-built as in CAPRI), “Aropaj”, “RAUMIS”, “FARMIS” …
- bio-physical models/components e.g. Dutch model “INTEGRATOR” for nitrogenous emissions, post model link of CAPRI to “DNDC“
- land use models:
  - CLUE-S (P Verbourg)
  - GLOBIOM (P Havlik)
- external studies used for baseline
  - CAPRI uses several sources (AGLINK, GLOBIOM…)
  - Large agencies often combine several inhouse models (IFPRI, FAO, LEI, EU Commission)
Tool may be hosted in
- in administration or government sponsored agency
  - ESIM model used by DG-AGRI (in the past)
  - Models used by ERS (USA), JRC (Europe), INRA (France), TI (Germany)
- in independent institution,
  - long-term contracts or
  - Case by case tenders

Viewpoints:
- Development versus maintenance
- Control over results
- Response time / transaction costs
- Synergies / antagonism if several models
Developed since 1997, operational and maintained since 2000, financed to a larger extent by EU framework programs.

Comparative-static (i.e. no description of path of adjustment), deterministic.

Consistent combination of different sub-models/components:
- Global trade model
- European supply models
- Regional CGEs
- Post-model processing (environmental indicators, welfare analysis, CAP budget, energy use indicator)
- Spatial down-scaling to 1x1 km grid cells and link to bio-physical models.
• Global: 40 trade blocks and ca. 80 countries
• Spatial: “Armington” assumption
  (=> goods differ by origin)
• Detailed trade policy

• Non-linear programming models for 280 regions or 1,900 farm types
• Profit maximization under constraints
• => detailed policy representation
  (premiums, quotas…)
• … and links to environment

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Data from Eurostat, FAOstat, EU Commission (FADN) …

Technical solution:
- Data transformations and simulation in GAMS
- User interface in Java (steering, tables/graphs/maps)
- Server based software versioning system (SVN) for exchange of data and computer code in network

Institutional model
- Open source/access, …
- Network of users/developers across Europe, including EU Commission services
Examples of CAPRI applications

- **Research project applications:**
  - Selection mainly to give a good illustration of model development
  - Relevant example may raise awareness of potential users
  - But no influence on scenario design: leave or take option for policy

- **Tendered applications:**
  - First one for CAPRI 6 years after development started and 3 years after first operational version
  - CAP Mid Term Review, sugar market reform, some contributions to ex post evaluations
  - Recent years:
    - Ongoing CAP reforms (premium, market organizations)
    - Free-trade agreements
    - Agri-Environmental interactions
    - Study on ban of GMOs (genetically modified organisms) by LEI
    - Climate related studies

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Example: SCENAR 2020 scoping study

- Scenario study => no immediate policy under investigation, only broad options for EU policy:
  - “Baseline”, “Regionalisation”, “Liberalisation”
  - Research environment better than administration for scenario approach

- Modelling suite
  - LEITAP-IMAGE (global CGE), ESIM (ag baseline, biofuels), CAPRI (CAP, NUTS2), CLUE-S (complete land use model)

- Plus statistical analysis, cluster analysis, SWOT analysis for regions

- Results from modelling chain at national level but rural problems (beyond agriculture) need further analysis
  - Picked up in project CAPRI-RD with regional CGEs
  - Other methodology also picked up in CAPRI trunk
    - Land supply curve
    - Implementation of Rural Development policies

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CAPRI selected as it offered
• rich detail in describing the CAP pillar I instruments (premiums and market price support)
• full EU coverage
• farm type and regional dis-aggregation (not available with OECD in-house tools)

What has been the effect of decoupling?
• Overall limited effects on allocation
• But transfer efficiency increased
Example: DEFRA study on drastic reform

- **Background:**
  - UK Department for Environment, Food and Rural Affairs (DEFRA) in favor of drastic reform for CAP 2013-2020
  - But what about land abandonment in marginal areas?

Combination of CAPRI and Land Use Cover Change Model (CLUE-S) used, CAPRI expanded to simulate shrinking and expansion of agricultural area

- **Main findings:**
  - At country level reduction in land use between 6 (UK) and 15% (Greece), larger effects for marginal areas
  - Price increases for outputs partially offset loss of subsidies
  - Environmental impacts overall reduced, but higher intensity on remaining agricultural land
Recent study by EU Joint Research Centre on Free Trade Agreement with Mercosur

- Combined CGE (GLOBE) and multi-commodity model (CAPRI) application
- Explicit representation of trade policies in CAPRI permits realistic analysis
- Quite detailed scenario definition (tariffs and tariff rate quotas, sensitive products…)
- Equally interest in regional effects, e.g. will freer trade in beef with South-America lead to heavy income losses in mountainous regions specialized in suckler cows?
Background and motivation:
- Searchinger et al 2008, Science: Pay back period of ethanol from US maize is 167 years, because indirect land use change (ILUC) effects release huge quantities of carbon
- Stimulated criticism and numerous studies
- But also marks turning point in biofuel enthusiasm

- ILUC effects had to be investigated according to RED
- With several delays finally presented Nov 2011
- State of the art CGE model MIRAGE:
  - Endogenous yields, by-products, disaggregated oilseeds, substitution of cropland, pasture, forest, income elasticities updated on baseline, Monte Carlo for parameters...
- => ILUC factors for policy package and by crop (gCO2/MJ)
Do results matter? (1)

- Weak empirical evidence (no systematic with and without observations, interviews likely to provoke strategic answers ...)

- Need to look at historical examples, #1: CAP reform process (from price to coupled to decoupled support) as of 1992
  - Standard welfare analysis did back up Commission position
    - But this argument was already made for decades by Josling 1973, Koester/Tangermann 1977
  - Perhaps more relevant: stabiliser policy unable to meet income goals
  - Inviting to use economic model results as a justification for reform proposals
  - But sometimes apparently studies are effective: Choice of Ireland for complete decoupling in view of farm income benefits
Example #2 Sugar market reform 2006

- Several preceding studies have demonstrated the inefficiency of the Sugar Common Market Organisation and the need for reform
- Why 2006 after decades of stability?
  - Everything But Arms agreement
  - WTO panel decision 2005 (no C-sugar exports),
- But unclear whether Commission has defended its sugar policy as good as possible in panel
  - perhaps already convinced by need for reform?
- But choice of reduced intervention price clearly informed by earlier studies
- Could be a general phenomenon: quantitative analysis for choice of details in implementation
Example #3: Increasing weight for environmental issues in CAP:
- Several criticisms of the CAP from academia and non-governmental organisations
- Therefore cross-compliance and decoupling?
- Could also be political vehicle to rescue CAP support
- Some econ arguments are being picked up
  - Details of crop diversity requirements

Example #4: Any effect of ILUC studies on policy?
- Yes for Searchinger et al 2007!
- Unclear for MIRAGE study in view of Commission Impact Assessment (Oct 2012):
  - Option D (ILUC Factors) discarded because
    - Devalution of existing investments in biofuel industry
    - RED target of 10% in danger (and a past EU decision cannot be wrong)
  - Preferred option E: Cap for conventional biofuels in meeting RED target at 50% => safeguard for past investments (and past policies)
Conclusions (1)

- Overall: direct influence of economic modelling is open or unclear
  - Probably highest for fine-tuning of policies
- But indirect effect through training of economic thinking for staff concerned with policy design
- Modelling may serve to structure the debate on policy issues
  - Example: Impacts of rural development support
  - To quantify regional CGE layer of CAPRI (for example)
  - Forces to interpret each measure in terms of the rigorous model framework


