International diffusion of gains from biotechnology and the European Union's Common Agricultural Policy

by
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Aim of paper

- Study the impact of adopting or rejecting genetically modified organisms (GMOs) in the EU, taking into account the Common agricultural policy (CAP)

- Main idea:
  - GMO's increase productivity in maize and soybean sectors. A ban excludes EU from these productivity gains.
  - Productivity effects differ accross GMO crops: factor biases
  - International knowledge spillovers are not perfect
  - Policy is important: EU-CAP isolates EU farmers

Productivity impact differs across crops: factor biases

- Herbicide tolerant (HT) soybeans:
  - insert a herbicide tolerant gene into a plant, such that the plant is tolerant to a wide spectrum of herbicides
  - Saves on pesticides and labour
  - 52% of total GM sowing, 0ne third of total sobean area.
  - USA and Argentina have 94% of total GM soybean area

- Bacillus thuringiensis (Bt) corn:
  - Insert genetic material from the Bt into seeds, these crops produce their own insecticides
  - Yield increasing
  - 27% of total GM sowing, 8% of total corn area
  - USA 91% of total GM corn

GM soybean and corn area, 1999

Source: Commission of European Union, 2001

Endogenous international knowledge spillovers

- HYPOTHESES: spillovers not perfect

- H1: Trade linkages: knowledge embodied in traded commodities
  - amount of knowledge

- H2: effectiveness of imported knowledge:
  - absorption capacity (H); more educated
  - structural similarity (D); larger operations
  - **social acceptance (S); consumer resistance**

Spillover equation

Modelling CAP essentials: price insulation

Price insulation for grains

- Imports: insulate domestic economy from world price changes
  - variable import tariff
- **Exports:**
  - variable export subsidies (swap tx with intervention price)
- **Intervention price:**
  - price transmission mechanism between intervention and import price, dependent on net-export position (extra-EU trade position).

Received potential spillovers

in all regions by 5% productivity increase in NAM (social acceptance not taken into account)

% change production and farm income of coarse grains sector in EU

Costs in terms of welfare

Conclusions

- Simulation results (production, income, welfare) are dependent on
  - imperfect international knowledge spillovers
  - factor biased technology change
  - an improved representation of CAP policies
- Inclusion of endogenous spillovermechanism brings adoption close to observed patterns: not all countries gain in same way
- CAP policies shield production from developments in other countries
- With CAP, consumer concerns are of little concern to EU farmers – they are protected from international competition (no negative impact from productivity gains in GMO adopting countries as is in A&N paper)
- Welfare impact of CAP and not adopting GM technologies is negative in EU, Banning GMO's at all has severe negative implications for EU and US.

Experiments

- Spillovers (I)
  - Hicks neutral productivity shock of 5% in cereal grains and oilseed, innovation originating in NAM, with endogenous spillover mechanism (without social acceptance)
- Spillovers and CAP (II)
  - (I) with CAP implementation
- No spillovers and CAP (III)
  - as II, however GMO production is not socially accepted in EU
- Compare results with Nielsen and Anderson (2000) paper: GMO's, trade policy, and welfare in rich and poor countries