Agricultural Trade Liberalization and The Environment in North America: Analyzing the "Production Effect"

Objective of the Paper

To estimate the impacts of the NAFTA and the Uruguay Round Agricultural Agreement (URAA) on environment stresses in three key North American agricultural sub-sectors: beef, maize and vegetables.

The "Production Effect" Thesis

When producer prices increase relative to production inputs as a result of trade liberalization in a given sector, production will increase

Calculating Trade Liberalization's Production Effect

- Need to distinguish it from other factors affecting trade patterns: exchange rates, economic growth, consumer tastes, weather
- Problem of estimating effect of eliminating quantitative restrictions may be more complex than it appears
- Effect of tariff reductions requires modeling of "with" and "without" scenarios

Two Intervening Variables that affect the Production Effect in Agriculture

- Price Inelasticity
- Technological change

Price Inelasticity in Agriculture

- Price responses to trade changes are dramatically less than in manufacturing
- Maize: weather, government payments and input prices are more important than output prices in planting decisions.
- Beef sector: Because of "cattle cycles" price elasticity can be zero or negative in a given year

Environmental Effects of Technological Changes in Agriculture

- Yield enhancing technologies mean less crop acreage required per unit of production, hence less agro-chemical use.
- Production technology may involve less intensive use of agro-chemicals.

Winners: Canadian Beef

- 5.6% increase in Canadian beef exports attributable to NAFTA
- But no increase in size of cattle herd, because of "cattle cycles" and lack of response to price signals

Winners: U.S. Maize Production

- U.S. Maize exports to Mexico increased 5.7 to 7 % because of NAFTA.
- Price elasticity of U.S. corn acreage was so low that production effect = .1 percent of production
- 14% increase in yields per acre overwhelmed NAFTA-induced exports.

Losers: Mexican Maize Production

- Yields fell by 2 % average between pre-NAFTA and post-NAFTA periods
- Irrigated sub-sector: 31 % decline in production, 40 % decline in area
- Rain-fed sub-sector: 18 % increase in production
- Irrigated sub-sector uses most of the pesticides, so decline in pesticide use was significant.

Winners: Mexican Tomato Cultivation

- Increased exports to U.S. attributable to NAFTA = 6-10 percent of production
- Technology effect (drip irrigation and plastic mulch): doubling of yields in Sinaloa and less agro-chemical intensity
- Acreage remained stable, then contracted 25 percent in 1998.

Losers: Florida Tomato Cultivation

- Florida's production competes directly with Mexican imports
- Tomato production fell by 20% and acreage by 22% in the 3-year period following NAFTA
- 8-15 % NAFTA-induced increase in Mexican exports implies a 2-3 percent reduction in Florida's agro-chemical use.

Tomato Cultivation: Comparative Environmental Performance

- Florida pesticide use: no clear trend line?
- No data on Mexican pesticide use
- Florida uses one-third less fertilizer than Sinaloa per unit of production
- Conclusion: probably net increase in chemical use because of NAFTA

NAFTA's Agricultural "Production Effect" and the Environment

- No effect on U.S. and Canadian beef inventories
- No discernible effect on U.S. maize production, but significant reduction in Mexican irrigated maize production=significantly less chemical use.
- Probably somewhat greater net chemical use in tomato cultivation because of production shift to Mexico.

Weaknesses of the Uruguay Round Agricultural Agreement

- Tarrification weakened by generous base period and lack of rules for setting bound tariffs
- Domestic support disciplines: Average AMS at time of URAA only 60 percent of base period, while reduction commitment was 20%
- Export subsidy disciplines: only 40 percent of subsidy outlays permitted by base period were used in 1995-1998 period.

URAA Impact on Beef

- U.S. and Canadian Beef: TRQs replacing quantitative restrictions make markets *more* restrictive

- Further opening of Japanese and Korean beef markets had no impact on U.S. cattle inventories

URAA Impact on Maize and Tomatoes

- Overall effect on US maize exports was negligible, because maize remains well protected
- 2% URAA-induced increase in Mexican tomato exports to US, because tariffs on vegetables were already low

Conclusions

- Price inelasticity or technological change can minimize the production effect of trade liberalization in agriculture
- Production *location* effect may be more important in cases of significant differences in environmental performance between winners and losers.