“Eco-labelling and the gains from agricultural and food trade: A Ricardian approach”

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*** “The analysis and views expressed are the authors' and do not represent the views of the Economic Research Service or USDA.”**

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Motivation

- Analysis of agricultural system should recognize extent of vertical product differentiation, e.g., environmental claims (Sexton, 2013)
- Eco-labelling key to resolving information asymmetry associated with environmental *credence* goods
- Rapid growth of eco-labelling relating to food and agricultural products since 1970s (Gruére, 2013)
- Trade often expected to generate negative externalities (Copeland and Taylor, 2004)
- However, if production generates environmental benefits, eco-labelling beneficial (Swinnen, 2015)

Model: Technology

- ***I*** **countries trade continua, of two product types** ***j*** **=** ***LC*****,** ***EF*****, distinguished by technology:**

$$q_i^{LC}(j) = z_i(j)L_i$$

$$q_i^{EF}(j) = z_i(j)L_i^{\alpha}\boldsymbol{H_i^{1-\alpha}}$$

  - **Low cost technology (*LC*) requires land, *L***
  - **Environmentally friendly (*EF*) also requires environmental services, *H***

- **Product-specific technology, $z_i(j)$ distributed independently as Frechet:**

$$F_i(z) = exp\{-T_i z^{-\theta}\}$$

Model: Ricardian Trade

- **Prices offered by exporter *i* in *n*:**

$$p_{ni}^{LC}(j) = \frac{r_i \tau_{ni}}{z_i(j)} \qquad p_{ni}^{EF}(j) = \frac{(r_i^{\alpha} w_i^{1-\alpha}) \tau_{ni} \zeta_{ni} \kappa}{z_i(j)}$$

-Consumers buy *LC* and *EF* products from source country with lowest price

-Average productivity, input costs, trade and labelling costs affect prices of each type of good in each market

Model: Demand Innovation

- Consumers have homothetic preferences over products, choosing *EF* and *LC* to maximize:

$$\frac{\sigma}{\sigma-1}\left(\int_0^1 q_i^{LC}(j)^{\frac{\sigma-1}{\sigma}}\,dj + \omega_i^{\frac{1}{\sigma}}\int_0^1 q^{EF}(j)^{\frac{\sigma-1}{\sigma}}\,dj\right)$$

  - Consumers only recognize *EF* if labelled

- Total expenditure on *EF* relative to *LC*:

$$\frac{x_i^{EF}}{x_i^{LC}} = \omega_i\left(\frac{P_i^{EF}}{P_i^{LC}}\right)^{1-\sigma}$$

  - P_i^k is CES price index

Comparative Statics

- **Consumer gains from eco-labelling**

  (i) Labelling increases share of *EF* expenditure on imports

  (ii) Labelling increases share of total expenditure allocated to *EF* products

  (iii) Consumer gains depend on weight attached to *EF*

- **Environmental/trade gains from eco-labelling**

  (i) Labelling increases share of land allocated to *EF* production

  (ii) Trade gains depend on labelling regime

Model: Parameterization Strategy

- **Average productivity and trade cost parameters from gravity-like structural relationship in *LC*:**

$$ln\left(\frac{\pi_{ni}^{LC}}{\pi_{nn}^{LC}}\right) = S_i - \theta\left(b_{ni} + l_{ni} + RTA_{ni} + \sum_r d_{r_{ni}} + ex_i\right) - S_n$$

- ***EF* parameters from supplemental data (organics) and other structural relationships**
- **Equilibrium solution and other parameters based on following Eaton and Kortum (2003) approach**

Next Steps

- **Use parameterized model to explore impact of alternative eco-labelling policies:**
  - **Mutual recognition**
  - **Regulatory harmonization**
- **Allow for non-homothetic preferences to explore impact of income differences across *i* (Fieler, 2011)**
- **Construct index of environmentally-friendly production by country**