The 'Learning Effect' and the Impact of High Maximum Residue Limit Standards on U.S. Vegetable Exports

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Introduction

- Food safety standards have been on the rise as world income has increased for the last few decades, partly due to the fact that high income consumers are more sensitive to health and safety concerns.

- Most governments set Sanitary and Phytosanitary (SPS) standards such as Maximum Residue Limits (MRLs) in order to protect consumers. As governments have implemented more and stricter food safety regulations, trade disputes have increased among the countries involved.

- Some studies have argued that non-tariff barriers (like SPS regulations) have increased because governments want to protect their producers (Götz et al., 2010). Even when a government's purpose for an SPS standard is for food safety concerns and consumer protection, political economists have raised concerns about the protectionist impacts of SPS and other technical barriers (Götz et al., 2010)

- There are different views concerning the effects of SPS standards on competitiveness. Henson and Jaffee (2008) have shown that tighter standards can be a source of competitive advantage for certain countries. One possible explanation for this is the learning effect (Lawless, 2009).

- Domestic SPS standards might have a positive impact on exports due to the learning effect, and therefore, increase competitiveness of the firms facing tough foreign food safety regulations.

Objectives

- This research investigates whether high MRL standards in the home country (U.S.) expedites its vegetable exports.

  ✓ Investigating the learning effect from high food safety standards on the home country
  ✓ Among SPSs, this paper chooses MRL due to detailed and rich dataset.
  ✓ Among countries, this study chooses U.S. since U.S. is one of vegetable exporting countries and MRL dataset focuses on U.S.

- This paper avoids the problems in the measurement of non-tariff barriers about food safety.

  ✓ Use the MRL protectionism index that is developed by Li and Beghin (2014) that solves the problems of sample section bias and aggregation problems.

Data and MRL Protectionism Index

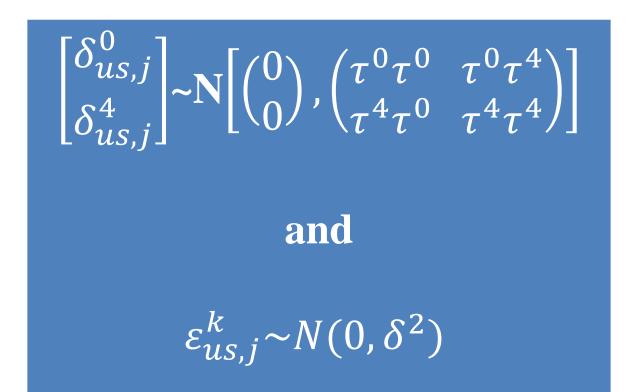| Data (2015)	Source
MRL level data	Global MRL Database
Exports	UN Comtrade
GDP	World Bank
Distance	Mayer and Zignago (2011)
Tariff rate	World Trade Organization (WTO)

$$MRL\ protectionism\ index = \frac{1}{T_{(k)}}\left(\sum_{t_{(k)}}^{T_{(k)}} \exp\left(\frac{M_{intl,kt_{(k)}} - M_{jkt_{(k)}}}{M_{intl,kt_{(k)}}}\right)\right)$$

$M_{jkt_{(k)}}$	the maximum residue level of importer j, for good k, and unsafe material $t_{(k)}$
$M_{intl,kt_{(k)}}$	the international maximum residue level for the identical good and unsafe material.

Gravity Model (Estimated by Multilevel Model)

$$ln(Export_{ij}^k) = \pi_{us,j}^0 + \beta_{10}\ln(GDP_{us}) + \beta_{20}\ln(GDP_j) + \beta_{30}\ln(MRL_{us}^k) + \pi_{us,j}^4\ln(CMRL_j^k) + \beta_{50}\ln(Dis_{us,j}) + \beta_{60}Com_{us,j} + \beta_{70}Col_{us,j} + \beta_{80}Con_{us,j} + \varepsilon_{us,j}^k$$

k is the level 1 (products)
j is the level 2 (importing countries)
$CMRL_j^k = MRL_j^k - \overline{MRL^k}$
ε_{ij} is the error term
$\pi_{us,j}^0 = \beta_{us,0}^0 + \delta_{us,j}^0$
$\pi_{us,j}^4 = \beta_{us,0}^4 + \delta_{us,j}^4$

$$\begin{bmatrix}\delta_{us,j}^0 \\ \delta_{us,j}^4\end{bmatrix} \sim N\left[\begin{pmatrix}0\\0\end{pmatrix}, \begin{pmatrix}\tau^0\tau^0 & \tau^0\tau^4 \\ \tau^4\tau^0 & \tau^4\tau^4\end{pmatrix}\right]$$

and

$$\varepsilon_{us,j}^k \sim N(0, \delta^2)$$

Variables	Explanation
us	Exporting country (the United States)
j	Importing country
k	Product
Export	Export value
GDP	Gross domestic product per capita
Dis	Bilateral distance between the importer and the U.S
Com	Common official primary language (dummy)
Col	Colonial experience (dummy)
Con	Contiguous with the U.S (dummy)
MRL	Protectionism index calculated by the Maximum Residual Limits

Results

	Multilevel Model Without Centering	PPML	Multilevel Model With Centering
Ln (Importing Country's GDP)	0.126 (0.0949)	0.029 (0.1118)	0.083 (0.0938)
Ln (Importing Country's MRL index)	-1.094*** (0.2478)	-0.870*** (0.2495)	-
Ln (Importing Country's MRL Index)_Centered	-	-	-1.287*** (0.2727)
Ln (U.S. MRL index)	1.619*** (0.2131)	2.676*** (0.7166)	1.580*** (0.2126)
Log Likelihood	-6488.435	-165,100,000	-6487.365
Observations	2,768	3,115	2,768

- The coefficient for the importing country's MRL protectionism index has a negative effect on U.S. vegetable exports. This result is consistent with the impeding role of NTMs on exports.
- All three models show that the U.S. MRL protectionism index has a positive effect on U.S. vegetable exports. This result is consistent with the hypothesis presented earlier; that the learning effect of the home country's strict food safety regulation may lead to increased exports.

Conclusion and Implications

- **Firm Level**
  ✓ The home country's strict regulation can be considered as an opportunity when firms sell their products in foreign markets that have high food safety regulations.
  ✓ Firm can recoup some of their investment costs by exporting to other countries that value safer foods.
- **Government Level**
  ✓ Stricter regulations can have a role in enhancing producers' competitiveness by providing them the learning effect advantages as food regulations increase throughout the world.

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Further Information
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