A Case Study of Fresh-Fruits Trade among NAFTA, CAFTA, and MERCOSUR

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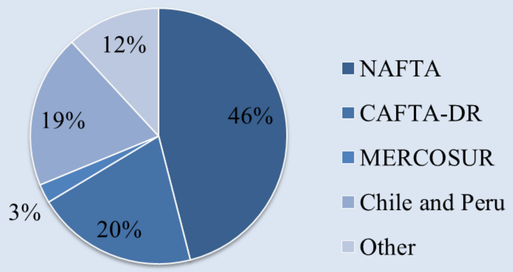
I. Introduction

- U.S. is one of the world's major importers of fresh fruits with a constantly increasing import trend and a 50% average share of import in domestic consumption from 2014 to 2015 (USDA-ERS, 2016).
- Given the increasing dependence on fresh-fruit imports, it is important that the U.S. monitors trends, develops future trade scenarios, and establishes corresponding action plans.
- Estimation of import demand elasticities is an effective approach for building economic models and analyzing likely trade scenarios.

Figure 1.
The Main Sources of U.S. Fresh-Fruits Imports in 2015



II. Research Objectives

The main objective of this study is to analyze the U.S. demand for the fresh fruits differentiated by their sources of origin. The specific objectives are:

- Estimate and interpret the own-price, cross-price, and expenditure elasticities of demand;
- Discuss the policy implications of the study results.

III. Model

The following Source-Differentiated Almost Ideal Demand System was estimated:

$$w_{i_t} = \alpha_i + \sum_j \gamma_{ij}\, log(p_{j_t}) + \beta_i log\left(\frac{x}{P}\right)_t + s_i sin_t + c_i cos_t + z_i t_t + \rho\left(w_{i_t} - \left(\alpha_i + \sum_j \gamma_{ij}\, log(p_{i_{t-1}}) + \beta_i log\left(\frac{x}{P}\right)_{t-1} + s_i sin_{t-1} + c_i cos_{t-1} + z_i t_{t-1}\right)\right) + \varepsilon_i;$$

where i and j represent fruit-source combination indices; w_i is the import expenditure share for each fruit-source combination; p_j is the import price of j^{th} fruit-source combination; x is the expenditure on all fresh fruits included in the model; t represents a trend variable; $\alpha_i, \gamma_{ij}, \beta_i, c_i$ s_i and z_i are the population parameters that will be estimated; P is the nonlinear price index; $Sin_i=f(t_i,SL)$ *and* $cos_i=g(t_i,SL)$ are trigonometric functions capturing seasonality; ρ (or rho) is the first-order autoregressive coefficient; and ε_i is the error term.

IV. Data

- This study analyzes data on monthly import values ($) and quantities (kg) from 2005 to 2016 (a total of 132 observations) reported by the United States International Trade Commission.
- Unit values (import values divided by import quantities) were adjusted for inflation, using the CPI reported by the U.S. Bureau of Labor Statistics.
- Gross Domestic Product data reported by the U.S. Department of Commerce was used to address potential endogeneity between w_i and x.

V. Estimation Results

Table 1. The uncompensated own-price and expenditure elasticities, and compensated cross-price elasticities of demand

i	1	2	3	4	5	6	7	8	9	10	Exp.
1	-0.945**	-0.134*	0.168**	0.393**	0.126	0.111	0.083	0.002	0.024	0.023**	2.482**
2	-0.354*	-1.088**	0.113	0.342	-0.047	1.214**	-0.276	-0.002	0.059	0.035	0.079
3	0.447**	0.114	-1.147**	0.699**	0.199	-0.846**	0.435*	0.013*	-0.014	0.060**	1.767**
4	0.064**	0.021	0.043**	-0.677**	0.008	-0.006	0.084*	-0.001	0.029	0.008	1.168**
5	-0.823**	-0.005	0.020	0.013	-0.155	0.015	-0.020	0.005	-0.032	0.009	0.523**
6	0.029	0.118**	-0.082**	-0.009	0.014	-0.223	0.012	-0.005	-0.009	-0.001	0.663**
7	0.113	-0.142	0.223*	0.697*	-0.100	0.064	-0.958**	-0.002	-0.014	0.028	2.075**
8	0.060	-0.029	0.176*	-0.203	0.611	-0.630	-0.062	-0.241	0.290	0.024	2.449**
9	0.060	0.056	-0.013	0.433	-0.289	-0.084	-0.025	0.021	-0.246*	0.083	0.221
10	0.195**	0.113	0.189**	0.407	0.265	-0.041	0.170	0.006	0.281	-1.598**	1.915**

Note: i = 1, 2, …, 10, where 1 = mangos imported from NAFTA, 2 = mangos from MERCOSUR, 3 = mangos from ROW, 4 = bananas from CAFTA-DR, 5 = bananas from ROW, 6 = avocados from NAFTA, 7 = avocados from ROW, 8 = papayas from CAFTA-D, 9 = papayas from NAFTA, and 10 = papayas from ROW. Asterisk (*) and double asterisks (**) indicate statistical significance at 5% and 1%, respectively.

- The own-price elasticities (highlighted by the darker blue color) suggest that demand was price- elastic for mangos from MERCOSUR and ROW, and for papayas from ROW; while for the other fruits, demand was price-inelastic.
- Cross-price elasticities highlighted by a softer blue color had positive sign indicating that these fruits were substitutes.
- Cross-price elasticities highlighted by a white color had negative sign indicating that the corresponding fruits had complementary relationships.
- The expenditure elasticities suggested that mangos imported from NAFTA and ROW, bananas imported from CAFTA-DR, avocados imported from ROW, and papayas imported from CAFTA-DR and ROW were considered as luxury goods .

VI. Policy Implications and Conclusions

The estimated elasticities of demand can be used for conducting the following economic analyses.

- Evaluating the impact of various economic factors that can influence the price of fresh-fruits imported to the U.S. For example:
  - 20% tariff on imports from Mexico, if imposed, would reduce the average monthly imports of fresh fruits by nearly $1 million (measured in 2015 dollars).
  - On the other hand, a 5% tariff on imports from Mexico, if imposed, would reduce the average monthly imports of fresh fruits by nearly $0.3 million.
- Measuring the degree of the responsiveness of the U.S. to the changes in prices of the imported fresh fruits.
  - For example, the fresh fruits that were found to be price inelastic are expected to be less impacted by the price changes than those with higher own-price elasticity of demand. This information can be useful in policy making.
- Developing possible scenarios of U.S. fresh-fruit imports.