



# An Empirical Analysis of the U.S. Import Demand for Nuts

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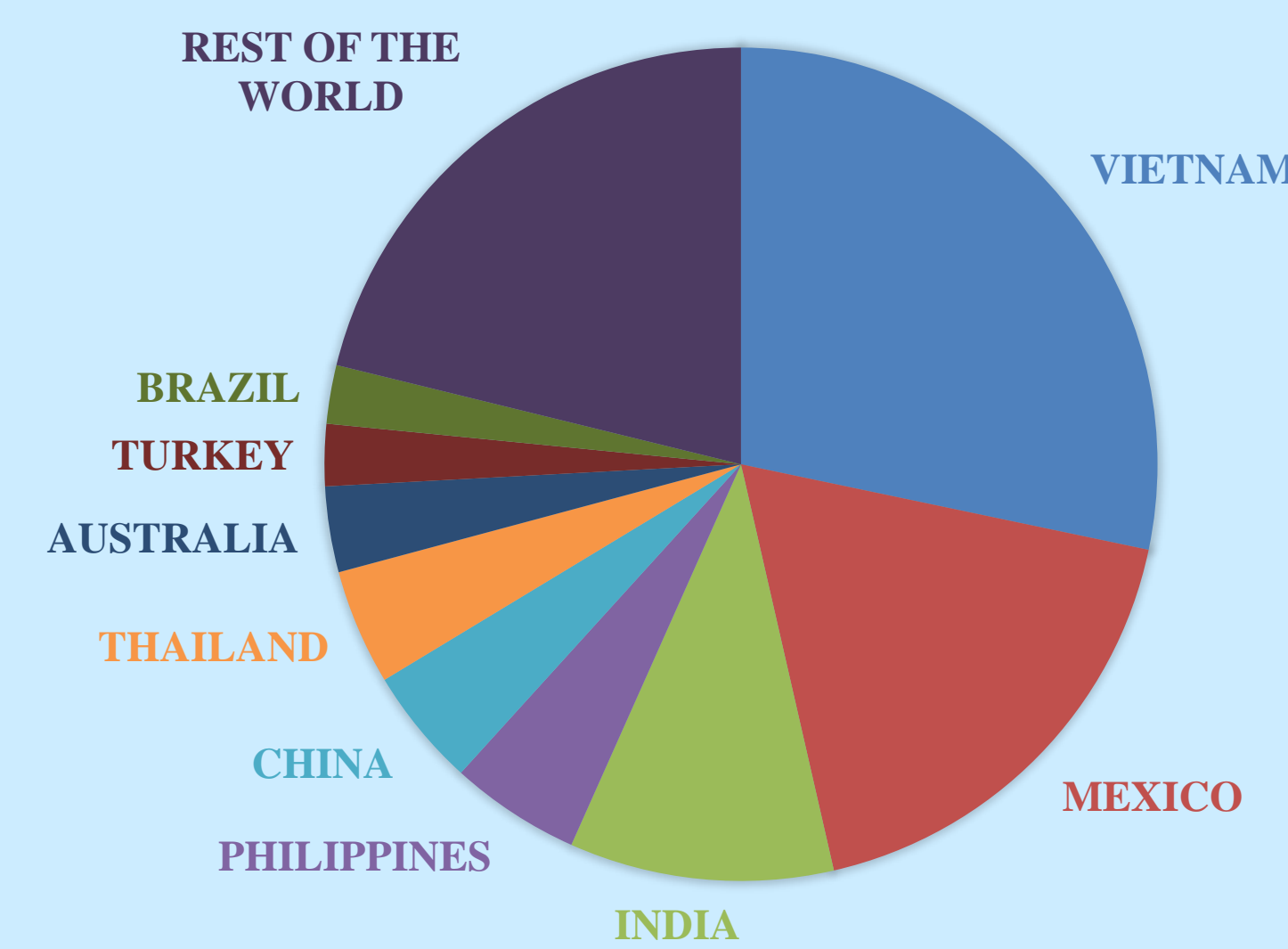
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## I. Introduction

- The U.S. is one of the world's major producers and importers of nuts, with a 9% average increase in imports for the 1996-2016 period.
- With nuts on average accounting for 18% of the total fruit imports, it is important to analyze recent trends in the U.S. demand for nuts.
- Estimation of import demand elasticities is an effective approach for building economic models and predicting possible development scenarios for the international trade.

Figure 1.  
U.S. imports of tree nuts by country in 2016



## II. Research Objectives

The main objective of this study is to analyze the U.S. import demand for nuts. The specific objectives are:

- To estimate and interpret the own-price, cross-price, and expenditure elasticities of demand; and
- To discuss the policy implications from this study's findings.

## III. Model

The Almost Ideal Demand System was estimated as:

$$w_{it} = \alpha_i + \sum_j \gamma_{ij} \log(p_{jt}) + \beta_i \log\left(\frac{X}{P}\right)_t + s_i \sin t + c_i \cos t + z_i t + \rho(w_{it} - (\alpha_i + \sum_j \gamma_{ij} \log(p_{jt-1}) + \beta_i \log\left(\frac{X}{P}\right)_{t-1} + s_i \sin_{t-1} + c_i \cos_{t-1} + z_i t_{t-1})) + \varepsilon_i$$

where  $i$  and  $j$  represent indices of nut types;  $w_i$  is the import expenditure share for  $i^{\text{th}}$  nut type;  $p_j$  is the import price of  $j^{\text{th}}$  nut type;  $X$  is total import expenditures on all goods 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 by the model;  $P$  is a nonlinear price index;  $\sin_t = f(t, SL)$  and  $\cos_t = g(t, SL)$  are trigonometric functions capturing seasonality;  $\rho$  is the first-order autoregressive coefficient; and  $\varepsilon_i$  is an error term.

## IV. Data

- This study analyzes data on quarterly imports (\$) and quantities (kg) for 10 years from 2006 to 2016 reported by the United States International Trade Commission.
- Prices 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 the problem of endogeneity. All data are publicly available.

## V. Results

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

	Coconuts	Brazil nuts	Cashew nuts	Almonds	Hazelnuts	Walnuts	Chestnuts	Pistachios	Other	Exp
Coconuts	-0.06	0.15*	0.05	-0.01	-0.03	0.00	-0.03	0.00	-0.07	-0.03
Brazil nuts	0.28*	-1.34*	0.34	0.14*	0.08	-0.02	-0.04	-0.02	0.52*	1.50*
Cashew nuts	0.01	0.02	-1.07*	-0.01	0.04*	0.01	0.06*	0.00	0.38*	0.93*
Almonds	-0.08	0.40*	-0.13	-1.17*	-0.09	0.02	0.15	0.05	0.82	2.46*
Hazelnuts	-0.09	0.14	0.95*	-0.05	-1.00*	0.07	-0.09	0.01	0.01	2.42*
Walnuts	0.01	-0.20	2.20	0.06	0.45	-1.41*	0.54	0.06	-1.69	-2.99*
Chestnuts	-0.18	-0.12	3.20*	0.18	-0.18	0.18	-0.14	-0.06	-2.89*	1.51
Pistachios	0.01	-0.35	0.06	0.24	0.13	0.08	-0.28	-1.07*	1.16*	0.41
Other	-0.02	0.08*	0.88*	0.04	0.00	-0.03	-0.13*	0.01*	-1.14*	1.20*

Note: An asterisk (\*) indicates statistical significance at the 5% level.

- The own-price elasticities, highlighted by darker blue color, suggest that demand was price elastic for brazil nuts, cashew nuts, almonds, hazelnuts, walnuts, pistachios and other nuts. For coconuts and chestnuts, demand was price inelastic.
- Cross-price elasticities, highlighted by softer blue color, had positive signs indicating that these nuts were substitutes.
- Cross-price elasticities, highlighted by white color, had negative signs indicating that the corresponding nuts had complementary relationships.
- The expenditure elasticities suggested that brazil nuts, almonds, hazelnuts, were luxury goods.

## VI. Policy Implications and Conclusions

The estimated elasticities of demand can be used for:

- Evaluating the impact of various economic factors that influence the U.S. import price of nuts.
- Measuring the degree of U.S. responsiveness to changes in prices of imported fresh fruits.
  - For example, the nuts that were found to be price inelastic are expected to be impacted the least by price changes compare to those with higher own-price elasticities of demand. This information can be useful in policy-making.
- Developing possible scenarios of U.S. nuts imports.

## VII. References

Deaton, A. M. (1980). An Almost Ideal Demand System. *American Economic Review*, pp. 312-326.