WELFARE IMPLICATIONS OF JAPAN'S EGG TARIFF REDUCTIONS FOR THE US CONSUMERS

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I. Abstract

We adopt an Exact Affine Stone Index system to estimate demand for omega-3, organic, cage-free, and conventional eggs in the U.S. Our empirical framework accounts for demand inter-dependencies among these egg types, while allowing for unrestricted Engel curves and unobserved consumer heterogeneity. We further address endogeneity of prices and expenditures and left-censoring induced by disaggregate data. Our results indicate that demand for organic, cage-free, and conventional eggs is price-elastic, while that for omega-3 eggs is price-inelastic. Also, we establish strong substitutability relationship between the eggs considered. Finally, we quantify the adverse consumer welfare consequences of rising egg prices in the U.S. brought by Japan's egg tariff reductions on egg imports.

II. Introduction

The United States and Japan reached a trade agreement in October 2019, which envisioned an improved market access for a number of agricultural and industrial products through a series of tariff reductions. While this creates excellent growth opportunities into one of the country's largest agricultural export destinations for the U.S. egg industry, rising egg prices will be part of the inevitable consequences of this market dynamic soon after trade liberalization goes into effect. Higher egg prices can in turn lead to sizeable unfavorable welfare effects for the U.S. consumers, given that shell egg sales alone amounted to $5.8 billion in 2018 and were projected to grow to $6.5 billion by 2022.

III. Research Objectives

- Identify economic and household demographic factors that influence the demand for different egg types considered;
- Estimate uncompensated and compensated own-price and cross-price elasticity of demand as well as income elasticty;
- Empirically evaluate the welfare implications of Japan's egg tariff reductions for the U.S. consumers, using the Hicksian compensating variation.

IV. Model

Let w_{hit} denote the household h budget share of product i in period t; p_{hit} be price paid by household h for product i in period t; y_{ht} represent household real expenditures on the set of products in question in period t; u_{hit} capture unobserved preference heterogeneity; N, H, and R be the number of products, households, and regions, respectively; L reflect the highest order of polynomial in expenditures to be determined empirically; and α_{ij}, β_{il}, η_{ir}, φ_{it}, and γ_{im} be parameters representing the price, income, region, time fixed effects, and demographic effects, respectively. The EASI specification can then be represented by the following system of demand equations:

$$w_{hit} = \alpha_{i0} + \sum_{r=1}^{R-1} \eta_{ir} \mathrm{K}_r + \sum_{t=1}^{T-1} \varphi_{it} \Upsilon_t + \sum_{m=1}^{M} \gamma_{im} D_{mht} + \sum_{j=1}^{N} \alpha_{ij} \log\left(p_{hjt}\right) + \sum_{l=1}^{L} \beta_{il} y_{ht}^{l} + u_{hit},$$
$$\forall\ h = 1,\ldots,H;\ \ i = 1,\ldots,N; t = 1,\ \ldots,\ T.$$

where D_{mht} represents demographic characteristic m for household h in period t, and K_r and Υ_t capture region and time fixed effects, respectively, incorporated into the EASI budged share equations via the demographic translation procedure.

The EASI demand model is estimated accounting for important econometric issues such as expenditure and price endogeneity and censored data.

We estimate the EASI demand model and the reduced-form expenditure and price equations via the Full Information Maximum Likelihood (FIML) method, using the MODEL procedure in SAS 9.4 statistical software package.

V. Data

We base our empirical analysis on the Nielsen Homescan household-level panel data on omega-3, organic, cage-free, and conventional eggs spanning a period January 2014 - December 2016.

The data contain detailed information on product description and characteristics, quantity purchased, expenditure, and promotion. We supplement the household expenditure survey data with household demographic descriptors.

VI. Estimation Results

Table 3. Uncompensated (Marshallian) Own-Price, Cross-Price, and Income Elasticities of Demand from the EASI System

	with respect to the price of				
Demand for	**Omega-3**	**Organic**	**Cage-free**	**Conventional**	**Income Elasticity**
Omega-3	-0.9629***	0.0073***	-0.0040	0.0476***	0.0463***
	(0.0037)	(0.0023)	(0.0026)	(0.0045)	(0.0022)
Organic	0.0119*	-1.1803***	-0.0248***	0.1703***	0.0519***
	(0.0071)	(0.0045)	(0.0053)	(0.0077)	(0.0025)
Cage-free	-0.0114	-0.0201***	-1.0184***	0.1402***	0.0462***
	(0.0074)	(0.0050)	(0.0050)	(0.0078)	(0.0022)
Conventional	-0.0041***	0.0065***	0.0021***	-1.0169***	0.0514***
	(0.0005)	(0.0003)	(0.0003)	(0.0007)	(0.0025)

Table 4. Compensated (Hicksian) Own-Price and Cross-Price Elasticities of Demand from the EASI System

	with respect to the price of			
Demand for	**Omega 3**	**Organic**	**Cage-free**	**Conventional**
Omega 3	-0.8775***	0.0354***	0.0255***	0.8167***
	(0.0037)	(0.0023)	(0.0026)	(0.0045)
Organic	0.1077***	-1.1488***	0.0083	1.0328***
	(0.0071)	(0.0045)	(0.0053)	(0.0077)
Cage-free	0.0738***	0.0079	-0.9890***	0.9073***
	(0.0074)	(0.0050)	(0.0050)	(0.0078)
Conventional	0.0907***	0.0377***	0.0348***	-0.1632***
	(0.0005)	(0.0003)	(0.0003)	(0.0007)

Compensating Variation by Year

	2020	**2021**	**2022**	**2023**
Compensating variation projected for the entire US, million $	23.9013	17.3010	11.0333	5.3904