The Value of Country-of-Origin and Wild-Caught Labels: A Hedonic Analysis of Shrimp Retail Prices in the United States

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Abstract

The retail market for shrimp is dynamic with substantial competition between imports and domestic products. Country of origin and method of production (wild and/or farm-raised) labels are required for all seafood since April 4, 2005. But little is known about how these and other credence attributes are valued in the retail market. To estimate the value of these attributes, we use weekly store scanner data of unbreaded frozen shrimp products in 2013. An estimated hedonic model shows a premium for both home (product of USA), and price premium for fishing method (wild-caught), and a premium for the organic claim. The results contribute new insights regarding opportunities for differentiation by credence attributes which may lead to more sustainable and effective resource use along the value chain for shrimp.

Key Words: country-of-origin labeling; revealed preference; hedonic price; shrimp; scanner data

JEL classifications: C23, D12, Q22

Introduction

Shrimp is the most consumed seafood in the U.S., with annual consumption 3.5 pound per capita. and 1.1 billion pounds consumed in 2013. But more than 90 percent of it is imported, mostly from farms in Southeast Asia, India, China and Ecuador. Facing the fierce competition from the influx of imported shrimp, the domestic shrimp industry has been trying to urge the government to take several actions against the unfair trade and contaminated shrimp imports. For instance, imported shrimp has frequently been the subject of antidumping investigations (imports sold at less than fair

value, LTFV) and countervailing duty investigations (subsidized imports) in the United States. In January 2005, after one-year investigations, the U.S. International Trade Commission (USITC, Commission) determined that an industry in the United States was materially injured by reason of frozen warm water shrimp imports from Brazil, China, Ecuador, India, Thailand, and Vietnam. The Department of Commerce found these imports to be sold in the United States at LTFV (USITC, 2005). On December 28, 2012, the Coalition of Gulf Shrimp Industries, Biloxi, MS, the same petitioner in the prior antidumping investigations, launched a petition, which alleged that material injury by subsidized imports from China, Ecuador, India, Indonesia, Malaysia, Thailand, and Vietnam. The petition requested the Commission and the U.S. Department of Commerce (USDOC, Commerce) to impose duties on imports from these countries. However, the final determination by USITC was negative in October 2013 (USITC, 2013).

Besides, while the U.S. shrimp industry hold high quality and safety standards, shrimp producers outside of the U.S. are currently not subject to some of the same regulations as domestic growers. According to the U.S. Department of Commerce, over 80% of the total imported edible seafood in 2009 came from less developed countries. Even though all seafood imports are subject to Food and Drug Administration (FDA)'s Hazard Analysis and Critical Control Point (HACCP) program, enforcement may be weaker and a small fraction of imported product is inspected by the FDA. In 2014, the U.S. Food and Drug Administration (FDA) only inspected 3.7 percent of shrimp imports and tested 0.7 percent. Countries also vary in their use of vaccines, feed additives, and antibiotics for farm-raised fish and shellfish (Allshouse et al., 2004). The U.S. Center for Disease Control (CDC) and Prevention reported in 2012 that foodborne illness outbreaks due to imported food products had risen between 2009 and 2010, with fish as the most common culprit and Asia as the most common source (CDC, 2012). U.S. shrimp and seafood industries have been constantly

seeking to tighten restrictions and increased inspection standards on foreign imported seafood. An Imported Seafood Safety Standards Act was introduced to the Congress in 2015, which requires the FDA to inspect and test not less than 20% of all imported seafood each year.

Undoubtedly, the passing of Mandatory Country of Origin Labeling (COOL) is a good news for the domestic shrimp industry as it would help differentiate domestic and imported shrimp. Fish and shellfish was the first category among all covered commodities for which COOL was enacted on April 4, 2005[1]. This implementation requires retailers, such as full-line grocery stores, supermarkets and club warehouse stores, to provide country-of-origin labeling as well as method of production information (farm-raised or wild-caught) to be noted at the final point of sale to consumers. However, the labels are restricted to fresh and frozen seafood at the retail level. Processed food items are excluded, such as coconut shrimp, shrimp cocktail, breaded shrimp[2]. Foodservice establishments, small retailers, and processed seafood products are exempt[3]. This partial implementation of MCOOL might incur for product diversion into unlabeled markets, particularly those from less developed and perceived by consumers to be of lower quality. Conversely, it creates more opportunities for domestic products in the retail market because it is identifiable through labels.

[1] The 2002 Farm Bill and the 2002 Supplemental Appropriations Act amended the 1946 Agricultural Marketing Act to add COOL provisions. This law requires retailers to provide country-of-origin labeling for red meats (beef, pork, and lamb), fish and shellfish, fresh fruits and vegetables and peanuts, starting September 30, 2004. However, continuing controversy over the new requirements within the food and agricultural industry led to a series of delays of the mandatory COOL implementations (detailed timeline for COOL implementation see Greene, 2015).

[2] See more about regulations for fish and shellfish covered commodities in 7 CFR Part 60: Country of origin labeling for fish and shellfish.

[3] S. Joseph et al. (2014) call this current implementation of the law ‘‘partial MCOOL.’’ They use a conceptual framework and analyze the impact of various forms and degrees of implementation of country-of-origin labeling by considering four alternate scenarios: no COOL, voluntary COOL, partial MCOOL, and total MCOOL.

Existing research on consumer-focused mechanisms, like country of origin and eco-labels, rely largely on attitudinal and knowledge surveys, consumer choice experiments, and experimental Auctions. Wirth, Love, and Palma (2007) found that U.S. respondents perceived domestic, farm-raised shrimp to be of higher quality than shrimp imported from other countries. Erickson, et al., (2007) did a survey and found that 50% of the consumers would buy both "Certified" shrimp and locally caught shrimp, most were willing to pay more for the former item but not for the latter. Roheim et al. (2012) used a conjoint experiment to evaluate seafood consumers' preferences for wild versus farmed seafood in Rhode Island, while providing an option for farmed products to be certified for best aquaculture practices, focusing upon salmon and shrimp. They found that consumers chose wild products over farmed even when farmed products were certified, and by an entity preferred by the consumer While these studies offer valuable insight and methodological approaches, one potential weakness is that they capture consumers' stated preferences and not actual behaviors. There can be wide disparities between consumers' stated preferences and their actual purchases (Hensher and Bradley, 1993).

In the revealed preference literature, Kuchler et al. (2010) exploit the partial implementation of MCOOL to examine its effect on shrimp consumption. They consider three types of shrimp products: random-weight, frozen bagged, and frozen bagged and breaded shrimp. They hypothesize that MCOOL should have the greatest effect on the consumption of random-weight shrimp (MCOOL requires country of origin and wild/farm indicator), and the least effect on frozen bagged and breaded shrimp (excluded from labeling under the law).4 Using weekly Nielsen Homescan panel data from 1998 to 2006, they find no significant effect of MCOOL on consumption. Hedonic price models have been widely used to estimate relative values for seafood product attributes such as catch method, fishing gear choice, country of origin, product color, and

environmental sustainability. As studies for seafood in the US retail market are scarce. Teisl et al. (2002) use consumer purchase data to confirm that the dolphin-safe tuna label increased the market share of canned tuna with the label. We follow studies using hedonic price function approach to scanner data in UK markets for seafood (Roheim et al., 2011; Hallstein and Villas-Boas, 2013; Sogn-Grundvag, Larsen, and Young, 2014).

The remainder of the article is organized as follows. In the next section, we specify the hedonic model; in section 3, data, variable construction and descriptive statistics are presented; section 4 discusses the results. Section 5 concludes.

Model Specification

Research on hedonic theory originates from Waugh (1928), but it is Court (1939) who developed the method using multiple regression techniques. Hedonic pricing was revived and further evolved by Grilliches (1961), Lancaster (1966), Rosen (1974) and Ladd and Zober (1977) etc (Polinsky and Shavell, 2007). Hedonic price modeling (HPM) rests on the assumption that consumers select goods for purchase as a function of product attributes, therefore maximize the utilities associated with each attribute given budget constraints. One of the most attractive components of HPM is that it is able to monetize those differences between levels of one attribute and across attributes.

Our model specification follows Rosen (1974) and specifies the price of a product as a function of the product attributes. In its most general form the model can be written as:

$$P_{it} = f(s_1, \ldots, s_n) \tag{1}$$

where P_{it} is the price of product i at time t, and $s_1, \ldots, s_n$ is a vector of attributes that determine the price of the product.

Linear and log-linear functional forms are frequently found in the literature for hedonic

price models (some studies use Box-Cox functional forms). For our model, we use a simple linear form as it is easier to interpret than a log linear form. In this analysis, the attributes are all expressed as dummy variables (see table 1).

Data and variable construction

Shrimp price data used to conduct this study are retrieved from the Nielsen Retail Scanner datasets, which consists of weekly pricing, volume, and store merchandising conditions generated by participating retail store point-of-sale systems in all US markets. In our sample, we have data from three types of retail channels: drug, food, and mass merchandiser and 95 retailers, located in 236 counties within 48 contiguous states and the District of Columbia.

Prices are the weighted average weekly prices, which have factored retailer discounts and specials (e.g. discounts associated with the use of a retailer's loyalty card or coupons). The average price for unbreaded shrimp is $0.56 per ounce or $ 8.92 per pound in 2013.

The data also contain information of product promotions, which is indicated by two variables: 1) feature – All retailer advertisements found in local newspapers, free standing inserts (FSIs), and free standing circulars, and may also include online ads from the retailer's website. The vast majority of featured items will include a price discount, but they don't have to. Features include Major Ads (which typically include an image as well as the price of an item), Line Ads (only has the name and price of the item), and retailer coupons that can be redeemed at the register; 2) display – a secondary location of an item in the store that is non-permanent and intended for merchandising purposes. Displays are located in the Store Lobby, Front of Store, End of Aisle, In Aisle, or Back of Store. Displayed items may or may not have an associated price decrease. Around 1% products are either featured or displayed in our sample.

One major advantage of the data is that it is at the Universal Product Code (UPC) level and has detailed product attributes information. For shrimp products, the type variable contains descriptions about product form, size, species, origin, wild caught, etc. We extract and construct attribute variables accordingly. White shrimp have the largest share (12%), followed by black tiger (3%). Brown shrimp and other species varieties take up the rest. Almost half of the shrimp are cooked, the approximately same percentage for peeled shrimp, and deveined shrimp. Only 7% of the products are labelled as American (such as American, gulf, Texas, Alabama, Key West, Maine).

In addition, Nielsen data also contain sustainability certification (such as organic) and retail channel and location information, which allows us to estimate the price premium for organic claim label and also control for retailer heterogeneity that may bias estimates of price premiums (Asche, Frank, et al., 2015).

Although shrimp products with private labels (store brands) dominate the market, we only include national/name brands. Because there is limited product attributes information associated with private label brands (treated as control brands) in the Nielsen data. Usually private label brands name reveal retail banner name (for instance, Kroger's Private Selection). UPCs associated with private label goods are altered by Nielsen to protect the identity of the retail banner and proprietary sales data associated with the product and the store.

Empirical Results

Table 2 reports the results for the linear hedonic price regression using the Nielsen weekly retail scanner data in 2013. Each column of the table contains estimates from a separate regression that adds fixed effects sequentially across columns in order to understand how each set of controls impacts our estimates.

In column 1, we include display, feature, organic, and type fixed effect (each type is a combination of product attributes), week and county fixed effects. Unexpectedly, coefficient for organic claim has a negative sign and high statistically significant, indicating that results may suffer from omitted variable bias. Plus, the absence of other product attributes variables provides little information about the pricing. To mitigate this problem, we replace the type fixed effects with specific product attributes in column 2 and further add retailer fixed effects in column 3. We focus on the results from column (3). The R^2 indicates that product attributes included explain 43.3% of the observed variation in the price of shrimp. The results indicate that there are statistically significant attributes in all categories, indicating that all the attribute groups influence the price of shrimp. Both feature and display are associated with reduced price by 10 and 2 cents per oz., respectively. Species has a strong influence on market price, as also found in earlier studies. The individual parameters indicate that on average brown shrimp obtains the highest price on the US market. This is because brown shrimp are mainly from the gulf states. Moreover, consumers are willing to pay an 8 cents per oz. premium for black tiger relative to other species. Raw shrimp have a higher value with a premium of 6 cents per oz. relative to cooked shrimp. This is probably because cooked shrimp are usually small sized shrimp, which are used for salad, pasta, etc. In terms of processed form, peeled, deveined, headless, tail on, butterfly all have higher premiums, relative to their corresponding counterparts. Among all sizes, colossal shrimp have the largest premium of 42 cents per oz. over the average price of all other sizes. Product of USA have a 2 cent premium relative to products without this label (presumably imported shrimp). There are significant premiums for wild caught and organic shrimp, 5 and 1 cents per oz., respectively.

Conclusions

This study provides new insights regarding the nature and heterogeneity of the seafood retail market in general and the US retail market for unbreaded shrimp in particular. The most notable contributions are the revealed price premiums for three credence attributes that have received little or no attention in the hedonic literature, i.e. substantial price premiums for fishing method (wild caught, organic operation); a premium for a home country origin (product of USA). These results signal that some consumers prefer wild-caught compared to fish captured by other methods. In this way, the market may help promote a more environmentally friendly fishing method at the expense of other methods perceived to be less so. Over time, this will however depend on consumers making repeat purchases and that sufficient premiums are maintained.

Results suggest opportunities for advancing niche market strategies, including the development of organic shrimp, indoor tank farming. For example, domestic origins of food items may be promoted to local consumers, whereas certain foods with foreign origins may be promoted and priced as premium products (e.g., Argentinian beef). Practitioners may also be able to couple COO information with information from other certification and labeling programs (‘‘organic,’’ ‘‘certified humane’’) to enhance perceptions of their products and garner premium prices (Loureiro and Umberger 2007). New method of growing shrimp that uses indoor tanks and recirculating water to make a zero waste operation that produces domestic, healthy, and safe shrimp in the United States, specifically the Midwest (Daniels, 2015). As the organic and health trends take effect in the US, the nutrient-dense and low calorie shrimp is growing in popularity.

Nielsen data are limited to discrete product attributes, they don’t have information regarding sustainability or eco-friendly labels, such as Dolphin safe seal, Responsibly Farmed label, Marine Stewardship Council (MSC)-certified, and color-coded sustainability status rankings by partnering organizations, Blue Ocean Institute and Monterey Bay Aquarium, Global

Aquaculture Alliance's Best Aquaculture Practices (BAP) program.

In addiction, private labels have substantial market shares and provide consumers with important decision cues. There are usually price differences between different private retailer labels or brands and national brands, i.e. brands owned by manufacturers. Due to data limitations associated with scanner data, notably a lack of detail on individual retailers' brands and how these are priced, our study has not been able to explore the value of private labels. This calls for further research by using more detailed product attributes data, like SognGrundvag, Larsen, and Young, (2014) did for whitefish in the UK retail market.

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Table 1. Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
Price $/lb	8.92	2.98	3.84	40.00
Price $/oz	0.56	0.19	0.24	2.50
	Promotion			
Feature	0.01	0.07	0	1
Display	0.01	0.10	0	1
	Species			
White	0.12	0.33	0	1
Black Tiger	0.03	0.17	0	1
Brown	0.002	0.04	0	1
	Product Form			
Cooked	0.44	0.50	0	1
Peeled	0.44	0.50	0	1
Deveined	0.46	0.50	0	1
Headless	0.10	0.30	0	1
Tail on	0.18	0.38	0	1
Butterfly	0.00	0.05	0	1
	Product Size			
Small	0.00	0.02	0	1
Medium	0.01	0.12	0	1
Large	0.01	0.11	0	1
X Large	0.01	0.10	0	1
Jumbo	0.02	0.15	0	1
Colossal	0.01	0.11	0	1
	Credence attributes			
Product of USA	0.07	0.26	0	1
Wild Caught	0.03	0.18	0	1
Organic	0.002	0.04	0	1

Table 2. Coefficient Estimates for Hedonic Regressions of Weekly Retail Shrimp Price ($/oz)

Independent variable	(1)	(2)	(3)
Feature	-0.091***	-0.088***	-0.091***
	(0.001)	(0.002)	(0.002)
Display	-0.023***	-0.030***	-0.019***
	(0.001)	(0.001)	(0.001)
White		-0.042***	-0.033***
		(0.000)	(0.000)
Black Tiger		0.104***	0.079***
		(0.001)	(0.001)
Brown		0.204***	0.167***
		(0.003)	(0.003)
Cooked		-0.049***	-0.057***
		(0.000)	(0.000)
Peeled		0.021***	0.026***
		(0.000)	(0.000)
Deveined		0.029***	0.022***
		(0.000)	(0.000)
Headless		0.025***	0.030***
		(0.000)	(0.000)
Tail on		0.066***	0.108***
		(0.000)	(0.000)
Butterfly		0.057***	0.031***
		(0.003)	(0.002)
Small		-0.147***	-0.098***
		(0.008)	(0.007)
Medium		-0.030***	-0.028***
		(0.001)	(0.001)
Large		0.038***	-0.013***
		(0.001)	(0.001)
X large		0.131***	0.074***
		(0.001)	(0.001)
Jumbo		0.068***	0.090***
		(0.001)	(0.001)
Colossal		0.558***	0.424***
		(0.001)	(0.002)
Product of USA		0.010***	0.024***
		(0.001)	(0.001)
Wild Caught		0.028***	0.051***
		(0.001)	(0.001)
Organic	-0.111***	0.019***	0.012***
	(0.004)	(0.003)	(0.003)
Constant	0.484***	0.513***	0.553***

	(0.001)	(0.001)	(0.001)
Type fixed effects	Yes	No	No
Week fixed Effects	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes
Retailer fixed effects	No	No	Yes
Observations	1,668,390	1,668,390	1,668,390
R^2	0.474	0.265	0.434

Note: Standard errors in parentheses. *** represents statistical significance at 1% level of significance.