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Estimating organic, local, and other price premiums in the Hawaii fluid milk market

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ABSTRACT

With retail scanner data, we applied hedonic price modeling to explore price premiums for organic, local, and other product attributes of fluid milk in Hawaii. Within the context of revealed preference, this analysis of organic and local attributes, under a single unified framework, is significant, as research in this area is deficient in the existing literature. This paper finds both organic and local attributes delivered price premiums over imported, conventional, whole fluid milk. However, the estimated price premium for organic milk (24.6%) is significantly lower than findings in the existing literature. Likewise, the price premium for the local attribute is estimated at 17.4%, again substantially lower compared with an earlier, stated preference study in Hawaii. Beyond that, we estimated a robust price premium of 19.7% for nutritional benefits claimed. The magnitude of this estimated coefficient reinforces the notion that nutrition information on food is deemed beneficial and valuable. Finally, package size measures the influence of product weight. With each larger package size, the estimate led to a corresponding larger price discount. This result is consistent with the practice of weight discounting that retailers usually offer with fresh packaged food. Additionally, we estimated a fairly high Armington elasticity of substitution, which suggests a relatively high degree of substitution between local and imported fluid milk when their relative price changes. Overall, this study establishes price premiums for organic, local, and nutrition benefits claimed for fluid milk in Hawaii.

Key words: scanner data, hedonic price model, fluid milk, organic, local attribute

INTRODUCTION

Organic and local food products are rapidly gaining popularity in the US market. According to the Organic

Trade Association (2010), the market share of organic food in the United States has grown from 1.2% in 2000 to 3.7% in 2009, averaging 17% growth per annum. The availability of organic food has improved substantially, covering nearly all types of food retailers in the market place. Meanwhile, there is a growing belief that local will become the next organic in terms of customer preference (Cloud, 2007). Based on the 2008 Agricultural Resources Management Survey, Low and Vogel (2011) determined that, local food sales were 4 times larger than in the previous survey and represented 1.9% of total gross farm sales in the United States. Reflecting this trend, farmers' markets have grown more than 3 times during the past decade, quickly becoming not only regular weekly shopping events, but also great tourist destinations across North America.

As the proportion of organic and local food continues to expand, it is critical to understand how the markets are responding to their growing presence. Consumer preferences toward organic and local food products have been well documented in agricultural economics. The existing literature is stacked with studies relating to positive consumer perception and willingness to pay. Several studies have analyzed and commented on organic food (Huang and Lin, 2007; Lin et al., 2008; Smith et al., 2009), whereas other studies have focused strictly on local food (Loureiro and Hine, 2002; Carpio and Isengildina-Massa, 2009; Ulupono Initiative, 2011); however, several important issues remain unresolved.

First, most existing studies focused on fresh fruits and vegetables, whereas less attention have been devoted to dairy, meat, and other non-fresh fruit and vegetable commodities. This bias may arise because fresh produce represents the largest share of both organic and local food sales, although other products, such as dairy, also play an important role in both markets. Second, 2 approaches are commonly used to examine consumers' preferences: stated and revealed preference. Many studies used the stated preference approach, which offers the advantages of hypothetical survey choices and the inclusion of sociodemographic variables (e.g., age, sex, and income) in product analysis. One potential

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drawback of this approach is the unintended bias in estimated outcomes, resulting from the failure of consumers' responses to translate fully into their actual purchasing actions, even within a well-designed and administered stated preference survey. For example, Buzby and Skees (1994) found that among survey respondents who expressed a preference in purchasing organic produce, only a small proportion of them are actually regular purchasers.

The alternate, revealed preference approach, which often uses scanner data, can reflect consumers' actual purchases (or observed behaviors) in assessing price premiums for organic and local products. However, research efforts are often handicapped by the availability of this particular type of data set, and few studies prevail, specifically for local food. Among existing studies, Huang and Lin (2007), Lin et al. (2008), and Smith et al. (2009) provided empirical evaluation of organic price premiums for fresh produce and milk in the US market. Xu et al. (2015) and Keahiolalo (2013) analyzed the local price premiums for packaged lettuce and tomato products in Hawaii.

Third, as the market progresses, the sales of organic and local food become increasingly mingled. Consumers have expressed their desires to have both attributes in the same product (Cloud, 2007); thus, it becomes crucial to think of both attributes in the same context. Whereas the existing literature is concentrated on the study of organic and local independently, no revealed preference investigation has looked into both attributes under a single unified framework.

Our paper seeks to address these issues and start filling the corresponding research gaps. We used the Nielsen retail scanner data set and applied the hedonic price modeling approach to simultaneously explore possible organic and local price premiums of fluid milk products in Honolulu. When studying the local attribute, one further complication arises from the lack of a consensus on the definition of "local". The lack of a robust definition prohibits meaningful analyses, often blurring policy implications, and limiting potential application of the results. Several studies have adopted state boundaries as a definition for local (Jekanowski et al., 2000; Loureiro and Hine, 2002; Carpio and Isengildina-Massa, 2009). Alternatively, the Farm Act (US Government, 2008) defines 400 miles to be the maximum farm-to-table distance for local food. However, these simple geographic definitions have been questioned by researchers (Hand and Martinez, 2010; Martinez et al., 2010), as the meaning of local extends clearly to social, demographic, and other dimensions. Whereas a clear definition of local may encounter difficulties for most areas in the United States, the Hawaii market presents an unusual opportunity to study local

food. The distinct geographic, cultural, and historical background of Hawaii provides a clear definition, cut-off from other markets. In Hawaii, local food refers specifically to food grown and produced in the Hawaiian Islands, in contrast to imported food, sourced from the continental United States and elsewhere.

MATERIALS AND METHODS

Scanner data tracks detailed product information with respect to price, identification code, and several other attributes when the product is being purchased at the retail store. It has been applied to an increasing number of food products in the market valuation of product characteristics (e.g., Lusk, 2010; Kim and Chung, 2011; Roheim et al., 2011).

The Nielsen scanner data set used in the current study is sourced from 3 major grocery chains (Foodland, Safeway, and Times), with a total of 19 stores in the Honolulu metropolitan area. Weekly sales of local and imported fluid milk products were recorded over a 52-wk period in 2011. Key product information contained in the data includes weekly sales amount, weekly sales units, organic origin, nutritional benefits claimed (whether product claims additional nutritional benefits), fat content (whole, 2%, 1%, or fat-free), and package size (8, 16, 32, 64, 96, and 128 oz). Information on weekly sales revenue and count were combined with package size to compute the average price per pound for each product sold during the week. All Hawaii-produced milk carries a highly visible "Island Fresh" logo on its packaging and is easily recognized by consumers seeking to buy local milk.

In all, the Nielsen scanner data set contains 117 unique products with positive sale records in 2011, totaling 5,446 useable observations for analysis. Among these unique products, 6 originated from dairy farms in Hawaii, resulting in 312 observations; Table 1 presents a summary of the data set broken down into 4 categories by fat content. It can be seen that fat-free and 1% milk have the highest average prices among all categories reviewed. For the 3 categories where local products are available, a price premium against the average price of that category is observed, most notably for 2% and fat-free milk. It is also noteworthy that organic milk displays a high price premium across all 4 categories. This is consistent with results in the existing literature, indicating that the organic attribute commands a high price premium (e.g., Smith et al., 2009).

Hedonic Price Model

The hedonic analytical framework was developed by Lancaster (1966) and Rosen (1974) and proven useful

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