Spatial Price Competition in the Non-Alcoholic Beverage Industry in the United States

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Background

Non-alcoholic beverage market in the United States is a multi-billion dollar industry growing steadily over the past decade (American Beverage Association, 2011). According to the U.S. Department of Labor, Bureau of Labor Statistics (2011), the consumer price index (CPI) for all urban consumers for non-alcoholic beverages is on the rise. Furthermore, there is a wide variation in non-alcoholic beverage prices in the United States both regionally as well as locally within a region (Todd and Leibtag, 2010; Todd *et al*, 2011).

Although the extant literature has discussed price variation, to the best of knowledge, we could not find any article attributing variation in prices either merely to random events or to patterns of spatial price dependence and/or competitiveness.

Spatial price competitiveness among products and locations has been used by economists, market researchers and strategists to identify patterns of substitutability (Kalnins, 2003), and market boundaries (Stigler & Sherwin, 1985; Tirole, 1988). Spatial price correlation of a given product speaks to substitutability among locations where the product is purchased or in other words, competition among stores for consumers at different locations (Kalnins, 2003). Also, this work will reveal patterns of spatial dependence of prices of a given product. This information will be vital to retailers in the competitive marketplace in determining an appropriate pricing strategy for their products.

We will center attention on brand level non-alcoholic beverage product prices, delineating spatial dependence across different channel types where the product is sold such as grocery stores, drug stores, convenience stores and mass merchandisers. Initially, as a pilot study, we will concentrate on these aforementioned channel types dispersed across the state of Texas for a given branded non-alcoholic beverage category such as carbonated soft drinks manufactured by Coca Cola®.

Objectives

(1) to identify spatial price correlation of branded non-alcoholic beverage product delineated by different channel types, such as grocery stores, drug stores, convenience stores and mass merchandisers;

(2) to identify location (channel type) substitutability for specific non-alcoholic beverage products purchased by consumers, hence determining market boundaries;

(3) to determine appropriate pricing strategies for branded non-alcoholic beverage products in the light of spatial price dependence across channel types.

Data

Nielsen Homescan scanner data for calendar year 2009 is used.

First, we identify the specific brand-level non-alcoholic beverage product (such as carbonated soft drinks by Coca Cola®) and filter all transactions (focusing on quantity consumed in ounces and total expenditure in dollars) made in the state of Texas delineated by channel type such as grocery stores, drug stores, convenience stores and mass merchandisers.

We generate prices/unit values (dollars per ounce) for each transaction by taking the ratio of total expenditure to quantity.

Price information are merged with demographic control variables obtained at the zip-code level from the 2010 US Population Census to generate the complete data set.

Methodology

Reduced-form spatial price competition model (such as in Kalnins, 2003) is used to determine whether any spatial relationship of prices of selected brand-level non-alcoholic beverage products is merely random or responds to a pattern of spatial dependence. Spatial econometrics has been used extensively in the past in development economics (Case, 1991), sociological and technological diffusion processes (Anselin et al, 1997), clustering of contract types among gasoline retailers (Pinkse and Slade, 1998), and price competition among gasoline wholesalers (Pinkse et al, 2002). Extensive theoretical foundations of spatial econometrics can be found in Anselin (1988).

The reduced-form spatial price correlation model can be represented by two autoregressive models given by:

$$y = \sum_{a} \rho_a W_a y + X\beta + \epsilon$$

$$\varepsilon = \sum_{b} \lambda_b M_b \varepsilon + \xi$$

y =vector of *n* observations of prices at different channel types

ρ_a =is the autoregressive coefficient associated with matrices W_a

W_a=*nxn* spatial weight matrices, where a=1,2,…,A the total number of matrices

X=matrix of exogenous variables

β =vector of *k* parameters

ε=vector of *n* error terms with $E[\varepsilon|X] = 0$

λ =autoregressive coefficient associated with matrices M_b

M_b =*nxn* spatial weight matrices, where b=1,2,…,B the total number of matrices

ξ=vector of *n* spherical-error terms

Two approaches are used to define the value of each element within the *W* and *M* matrices.

- distance-based approach
- contiguity-based approach.

distance-based approach: assume a mileage threshold within which all channel types *j* are competitors of focal observation *i* and outside of which they are not.

contiguity-based approach (Hotelling model of spatial competition): assumes the level of competition between two outlets is driven by whether they share a market boundary.

Results and Discussion

- We are in position to glean information about spatial correlation of brand-level non-alcoholic beverage product prices across grocery stores, drug stores, convenience stores and mass merchandisers, for the state of Texas.
- These price correlations help us shed light on location substitutability of selected brand-level non-alcoholic beverage products by consumers, hence market boundaries.
- Finally, spatial price correlations would help us determine appropriate pricing strategies across competing stores for the particular brand-level non-alcoholic beverage product.

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