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AN EMPIRICAL INVESTIGATION OF THE RELATIONSHIP BETWEEN COUPONS AND MARKET SHARES OF NATIONAL BRAND AND PRIVATE LABEL FOOD PRODUCTS: AN EASI DEMAND SYSTEM APPROACH

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Abstract

No other form of promotional tools can substitute coupons in promotional campaigns. Due to their impact on consumption, coupons are widely used by different manufacturers and stores. However, to the best of our knowledge, no prior research has been done regarding the analysis of the impact of coupons on market shares of national brand and private label food products. To fill this void, the goal of this study was to examine the relationship between coupons and market shares in the context of national brand and private label food products by estimating the Exact Affine Stone Index (EASI) model and using the Nielsen Homescan panel data on household purchases of ready-to-eat cereal and spaghetti sauce from January of 2012 through December of 2014.

Estimation results revealed a significant relationship between coupon values and market shares of the food product brands considered. However, the effects of coupon values on the market shares were varied for national brands and private labels. In particular, for national brands, market share elasticities with respect to coupon values were positive, suggesting that market share of national brands increased with an increase in coupon values. For private label, market share elasticities with respect to coupon values were negative, indicating that an increase in coupon values led to a decline in their market shares.

Key words: coupons, market shares, brands, demand system, EASI

JLE code: D12

Introduction

Coupons are one of the most important marketing tools used by different companies to promote their products (Goodwin, 1992). They are the most popular promotional tools after shelf price reductions (Sethuraman & Mittelstaedt, 1992). The number of coupons used is increasing year by year. According to Nevo and Wolfram (2002), one of the biggest parts of the promotional budget is the cost of couponing. In 1996, the annual distribution of coupons for consumer packaged goods was 268.5 billion coupons, and only 5.3 billion (or about 2%) of these coupons were redeemed (Nevo & Wolfram, 2002). The average value of coupons used in 1996 was $0.69 which means that the value of all redeemed coupons was $3.5 billion (Nevo & Wolfram, 2002).

According to the Inmar Inc. (2014), the annual distribution of coupons for consumer packaged goods increased by 3.6% from 2012 to 2013 and reached the annual value of 329 billion. The total value of coupons was $513 million which means that each person in the United States had an opportunity to save $1,617 using coupons. However, from the total distributed coupons only $3.7 billion were redeemed ($11.6 saving per customer) (Inmar Inc., 2014).

Using coupons as a promotional tool for food products is very effective. In 2013, 129.8 billion coupons were distributed for food products (by 1.2% more than in 2012), and 1.9 billion coupons were redeemed. According to the Inmar Coupon Trends report, while only 40% of coupons distributed in 2013 was for food products, the share of food products in the number of redeemed coupons was more than 66% (Inmar Inc., 2014).

There are two major coupon categories, manufacturer coupons and store coupons, which are distributed to customers as mobile coupons, paper coupons, online coupons and ecoupons. Manufacturer coupons are issued by producers and customers can use these coupons in any store

they want. Unlike manufacturer coupons, store coupons are issued by certain stores and can be redeemed only in those stores. Thus, while manufacturer coupons are promotional tools for producers, store coupons are promotional tools for both producers and stores (Montaldo, 2016).

When coupons are issued, they have several effects on the consumption behavior (Sethuraman & Mittelstaedt, 1992). The first effect is the regular usage effect. Customers will use coupons when their perceived value obtained from redeeming a coupon is higher than the perceived effort of getting and redeeming it. Buyers who are already customers of one particular brand, and who already like it, will use coupons to get their favorite brand at reduced price if coupons are available. The second effect is acceleration effect, according to which regular customers will redeem a coupon and purchase more than they would normally buy in periods when coupons are not available. This will accelerate the sale of the product during the time when the coupon is offered, however, sales will decrease in the subsequent periods. The third effect of issuing coupons is the brand switching effect. Some customers that used to buy other brands will use the benefit of coupons and buy the couponed brand. Usually, in this case, coupons attract those customers who are very price sensitive and the perceived cost of getting and redeeming the coupons is not high. In this case, the market share of the brand will increase at the expense of competing brands. Gupta (1988) conducted a more comprehensive research on how coupons can impact brand switching and found out that about 84% of increase in sales is a result of promotional activities stemming from brand switching.

The next effect of issuing coupons is the store switching (within brand) effect. In this case, customers will get coupons and shop in those stores where retailers offer special promotions and those coupons can be redeemed. However, this effect is present only in case of store coupons and in case of manufacturer coupons this effect is zero. The fifth effect is brand

and store switching effect when customers change both brand and store to use the coupon. This will strongly increase the sale of the couponed brand in the couponed store and decrease the market share of competing brands in other stores. Finally, the last effect of issuing coupons is the primary demand effect. This means that offering coupons may increase the demand for the couponed brand. Non-customers will start to buy the brand and the current customers will start to buy more than their normal quantities (Sethuraman & Mittelstaedt, 1992).

As such, it is important to understand how coupons impact the demand for food products. This study is focused on the analysis of the effects of coupons on market shares of food products at the brand level for different food groups (ready-to-eat cereal and spaghetti sauce). According to the Nielsen Homescan panel data for the calendar year of 2014, breakfast cereal and spaghetti sauce were amongst the top couponed food products. Overall, five groups of brands for each food product category were chosen for this analysis. From different brands, three most couponed brands were chosen for each food product. Besides these three brands for breakfast cereal and spaghetti sauce, the analysis also included private labels and other brands. All private labels were grouped under the label of "private label", and all other brands were grouped under the label of "other brands" for each of the two food products.

According to the Nielsen Homescan panel data for the calendar year of 2014, the most couponed breakfast cereal brands in 2014 were General Mills, Kellogg's, and Post. Based on the Nielsen Homescan panel data for the calendar year of 2014, the most couponed spaghetti sauce brands in 2014 were Ragu, Hunt's, and Classico.

Prior to this analysis, several studies have tried to assess the impact of coupons on the demand for food products. However, the present study differs from previous research in a few aspects. First, the present study was done at the brand level by explicitly considering top

couponed brands within each select food product category. Second, unlike previous studies, by utilizing a household-level data, the present analysis used a formal demand system approach to analyze the effects of coupons on market shares of brands for several highly couponed food products by conveniently taking advantage of the fact that the dependent variable of the demand system utilized is virtually brand-specific market share. Third, this study allows for the comparison of the impact of coupons on the market shares for national brands versus that of private labels. As such, the present study is a comprehensive analysis of the effects of coupons on the market share of national brands and private label food products, which represents a solid contribution to the current literature on coupons and their effects on brand competition.

This study proceeds in the following manner. The model is presented and discussed in the next section. Then, the data used in this analysis are presented followed by the estimation procedure and the results. Summary and conclusions comprise the final section.

Model

In this study, the Exact Affine Stone Index (EASI) model augmented by including the variable accounting for the coupon value was used. The original model introduced by Lewbel and Pendakur (2009) became one of the popular models in the demand analysis.

The augmented EASI model looks as follows:

$$w_{it} = b_i + \sum_{r=1}^{R} b_{ir} y^r + \sum_{k=1}^{n} a_{ik} \ln p_{kt} + \lambda_i Coupon_{it} + \varepsilon_{it}, i = 1, \dots n, \quad (1)$$

where at observation t, w_{it} is the market share (i.e., budget share) of the i^{th} brand, p_{kt} is the price of the k^{th} brand, $Coupon_{it}$ is the coupon value for brand i, b_i, b_{ir}, a_{ik}, and λ_i are the parameters to be estimated, ε_{it} is the disturbance term, and y is the real food expenditure given by:

$$y = ln\, X - \sum_{i=1}^{n} w_i\, ln\, p_i \quad (2)$$

where X is the total expenditure on the system of brands.

The following theoretical restrictions were imposed on the parameters of the model:

adding-up: $\sum_{i=1}^{n} b_i = 1 \quad \sum_{i=1}^{n} b_{ir} = 0 \quad \sum_{i=1}^{n} a_{ir} = 0 \quad \sum_{i=1}^{n} \lambda_i = 0$ (3)

homogeneity: $\sum_j a_{ij} = 0$ (4)

symmetry: $a_{ij} = a_{ji}$ (5)

Based on the parameter estimates, price, expenditure, and market share elasticities with respect to coupon values were computed. Compensated own-price and cross-price elasticities for the EASI model were computed as follows:

$$e_{ij}^{c} = \frac{a_{ij}}{w_i} + w_j - \delta_{ij}, \quad (6)$$

where δ_{ij} is the Kronecker delta and $\delta_{ij} = 1$ if $i = j$; $\delta_{ij} = 0$ if $i \neq j$, w_i and w_j represent the budget shares of brands i and j, respectively. The following Slutsky equation was used to calculate uncompensated own-price and cross-price elasticities:

$$e_{ij}^{u} = e_{ij}^{c} - e_i w_j \quad (7)$$

where e_i is expenditure elasticity calculated following Zhen (2013) using the following:

$$E = \left(diag(W)\right)^{-1}[(I_N + BP')^{-1}B] + 1_N \quad (8)$$

where E is the (n x 1) expenditure elasticity vector, W is the (N x 1) vector of observed brand budget shares, B represents a (N x 1) vector where its i^{th} element is $\sum_{r=1}^{L} r b_{ir} y^{r-1}$, P is the (N x 1) vector of log prices, and 1_N is a (N x 1) vector of ones.

Market share elasticities with respect to coupon values (e_c) were computed as follows:

$$e_c = \lambda_i / w_i \quad (9)$$

Due to the law of demand, own-price elasticities were anticipated to have a negative sign. Considering the fact that within the same food product category brands are substitutes for each other, a positive sign was anticipated on cross-price elasticities. Expenditure elasticities were expected to have a positive sign, since the brands of cereal and spaghetti sauce are considered to be normal goods. Finally, the sign of market share elasticities with respect to coupon values was anticipated to be positive.

Data

For our analysis, weekly time series data derived from the Nielsen Homescan panels from January 1 of 2012 through December 27 of 2014 were used. Nielsen Homescan panel data include 60,000 U.S. households who use special in-home scanners to record their purchases and provide that information to Nielsen. They also provide information about their household socio-economic characteristics such as education, income, number of children, etc.

The dataset used in the analysis extended for 156 weeks and included information on weekly totals of quantities, prices (unit values), and coupon values of ready-to-eat cereal (General Mills, Kellogg's, Post, private label, and other brands) and spaghetti sauce brands (Ragu, Hunt’s, Classico, private label, and other brands).

The weekly totals of quantity purchased for each brand was developed by aggregating total purchases (in ounces) of the brand during the week and dividing it by the number of unique households that purchased the brand during that week. Since the raw data included just the total amounts that were paid, the weekly unit values for each brand (in place of prices) were developed by dividing total expenditures by total ounces. Then, unit values were adjusted for

inflation using Consumer Price Index (CPI) with the average CPI of 1982 to 1984 as a base period (United States Bureau of Labor Statistics, 2016)[1].

Estimation Procedure and Results

In this study, the EASI model was estimated for cereal and spaghetti sauce brands with parametric restrictions imposed. SAS 9.3 statistical software package was used in the estimation with the Iterated Seemingly Unrelated Regression (ITSUR) procedure applied. As the error terms in our model were assumed to follow a multivariate normal distribution, the ITSUR estimators are equivalent to the maximum likelihood estimators (Judge, Hill, Griffiths, Luekepoh, & Lee, 1988). Since the sum of budget shares equals unity, it causes the issue of singularity of variance-covariance matrix of disturbance terms. To solve this issue, the equation of private label was left out for the two food products and later the parameters of these omitted equations were recovered through the restrictions of adding-up, symmetry, and homogeneity. The R^2s for the private label equations were calculated by squaring the correlation coefficient between the predicted and actual values of the regressand. The Durbin-Watson statistics for private label was computed by dividing the sum of squared differences in successive residuals by the sum of squares of residuals (Durbin & Watson, 1951).

The issue present during the estimation of the system of equations was the endogeneity of total expenditure. According to Summers (1959), Lluch & Williams (1974), and Deaton (1980), this issue stems from the simultaneous equation nature of problem. The method proposed by Attfield (1983) was used to address this issue.

In 1962, Zellner took into consideration the impact of contemporaneously correlated disturbance terms for the estimation of system of equations. Berndt and Savin (1975) proposed first-order autoregressive correction procedure [AR(1)] to solve the issue of serial correlation.

[1] The descriptive statistics of the variables used in the analysis is available upon request.

One coefficient of AR(1), rho, was estimated for the entire system of equations (Berndt & Savin, 1975). Statistical tests were evaluated at the 5% significance level.

To determine the polynomial degree, the EASI model was estimated allowing for different polynomial structures. The degree of polynomial was subsequently increased from one to five, and the best model, which was the polynomial of degree one, was selected based on the Root Mean Square Error criterion. Table 1 presents the parameter estimates and p-values from the estimated EASI model for cereal and spaghetti sauce.

Table 1. Coefficients and p-values from the EASI Model

Parameter	Cereal		Spaghetti Sauce	
	Estimate	p Value	Estimate	p Value
b_1	0.4825*	0.0001	0.4530*	0.0091
b_2	0.2345*	0.0269	-0.3082*	0.0117
b_3	0.1102	0.3894	0.1174	0.6009
b_4	-0.1065	0.3169	0.5723*	0.0001
b_5	0.2794*	0.0041	0.1655	0.0910
b_{11}	-0.0617*	0.0001	-0.0393	0.1834
b_{21}	-0.0046	0.8330	0.0761*	0.0002
b_{31}	0.0200	0.4472	0.0274	0.4775
b_{41}	0.0666*	0.0027	0.5723*	0.0001
b_{51}	-0.0203	0.2994	-0.0020	0.9043
a_{11}	0.1218*	0.0001	0.0617*	0.0001
a_{12}	-0.0148	0.0604	0.0011	0.9139
a_{13}	-0.0501*	0.0001	-0.0013	0.9125
a_{14}	-0.0230*	0.0169	-0.0346*	0.0002
a_{15}	-0.0339*	0.0001	-0.0270*	0.0011
a_{22}	0.0602*	0.0001	0.0040	0.7899
a_{23}	-0.0172	0.0714	0.01723*	0.0424
a_{24}	0.0175	0.0758	-0.0056	0.5148
a_{25}	-0.0456*	0.0001	-0.0169*	0.0371
a_{33}	0.0805*	0.0001	0.0449*	0.0067
a_{34}	-0.0084	0.4260	-0.0345*	0.0001
a_{35}	-0.0049	0.5500	-0.0263*	0.0002
a_{44}	0.0313*	0.0462	0.0912*	0.0001
a_{45}	-0.0173	0.0618	-0.0165*	0.0103
a_{55}	0.1018*	0.0001	0.0867*	0.0001
z_1	0.0063*	0.0001	0.0043*	0.0001

z_2	0.0080*	0.0001	0.0004	0.5329
z_3	0.0020	0.0691	0.0051*	0.0001
z_4	0.0009	0.4695	0.0016	0.1195
z_5	-0.0172*	0.0001	-0.0115*	0.0001
rho	0.4845*	0.0001	0.2790*	0.0001
rho_2	0.4749*	0.0001	0.6008*	0.0001
t_0	2.5642*	0.0001	1.3825*	0.0001
t_1	-0.1102*	0. 0.0047	-0.1708*	0.0001
t_2	-0.1506*	0.0002	-0.1149*	0.0084
t_3	-0.1071*	0.0037	-0.2948*	0.0001
t_4	-0.1479*	0.0018	-0.2423*	0.0001
t_5	-0.0383	0.3136	-0.1335*	0.0001
t_6	0.0913*	0.0001	0.1125*	0.0001

Notes: [1]The parameters a_{ij} show interactive effects between brands. For cereal, the subscript 1 is for General Mills, 2 for Kellogg's, 3 for Post, 4 for other brands, and 5 for private label. For spaghetti sauce, the subscript 1 is for Ragu, 2 for Hunt's, 3 for Classico, 4 for other brands, and 5 for private label. a_{12} for cereal shows the price effect of Kellogg's on the budget share of General Mills.
[2]The estimates of b_5 and a_{55} were recovered using adding-up restriction as $b_5 = 1 - (b_1 + b_2 + b_3 + b_4 +$ lambda) and $a_{55} = 0 - (a_{15} + a_{25} + a_{35} + a_{45})$.
[3]rho, rho_2 are the autocorrelation coefficients.
[4]z_i are parameter estimates associated with coupon values.
[5]Asterisk indicates significance at the 0.05 level.

Based on the parameter estimates presented in Table 1, corresponding elasticities were calculated. Market share elasticities with respect to coupon values for all brands across all products are shown in Table 2 (price and expenditure elasticities are available upon request). Out of 10 only six market share elasticities with respect to coupon values were statistically significant. Two of them were negative and the other four were positive. For cereal brands, the market share elasticity of General Mills with respect to coupon value was 0.0309, meaning that for every 1% increase in the redeemed coupon value of General Mills, its market share increased by 0.0309%, holding everything else constant. The market share elasticity of Kellogg's with respect to coupon value was 0.0372, meaning that for every 1% increase in the redeemed coupon value of Kellogg's, its market share increased by 0.0372%, holding everything else constant. The market share elasticity of private label of cereal with respect to coupon value was -0.1017,

meaning that for every 1% increase in the redeemed coupon value of private label of cereal, its market share decreased by 0.1017%, holding everything else constant.

For spaghetti sauce brands, the market share elasticity of Ragu with respect to coupon value was 0.0193, meaning that for every 1% increase in the redeemed coupon value of Ragu, its market share increased by 0.0193%, holding everything else constant. The market share elasticity of Classico with respect to coupon value was 0.0188, meaning that for every 1% increase in the redeemed coupon value of Classico, its market share increased by 0.0188%, holding everything else constant. Finally, the market share elasticity of private label of spaghetti sauce with respect to coupon value was -0.0753, meaning that for every 1% increase in the redeemed coupon value of private label of spaghetti sauce, its market share decreased by 0.0753%, holding everything else constant.

Table 2. Market Share Elasticities with respect to Coupon Values for Cereal and Spaghetti Sauce

	Cereal			Spaghetti Sauce	
	Estimate	p-value		Estimate	p-value
General Mills	0.0309*	0.0001	Ragu	0.0193*	0.0001
Kellogg's	0.0372*	0.0001	Hunt's	0.0034	0.5329
Post	0.0099	0.0691	Classico	0.0188*	0.0001
Other brands	0.0043	0.4695	Other brands	0.0073	0.1195
Private label	-0.1017*	0.0001	Private label	-0.0753*	0.0001

Notes: [1]All elasticities are calculated at the sample means.
[2]Asterisk indicates statistical significance at the 0.05 level.
[3]Numbers in parentheses are p-values.

As expected, the signs of the market share elasticities with respect to coupon values of major national brands were positive. The negative sign of market share elasticities of private labels of cereal and spaghetti sauce with respect to corresponding coupon values can be possibly explained by the fact that consumers must have redeemed store coupons mostly on national brands thus shifting from private label to national brands (Price & Connor, 2003).

The discussion above implies that coupons can have different impacts on market shares of national brands and private labels of food products. While the amount of redeemed coupons can have positive impact on the market share of major national brands, their impact on the market share of private labels can be negative.

Summary and Conclusions

The number of distributed coupons for food products in 2013 was 129.8 billion (Inmar Inc., 2014), and breakfast cereal and spaghetti sauce were among the most couponed food products from 2012 to 2014. In this study, the EASI model was estimated to evaluate the impact of coupon values on the market shares of national brand and private label food products (cereal and spaghetti sauce). The data derived from the Nielsen Homescan panels data were eventually aggregated into 156 weekly observations.

According to the estimation results, the uncompensated own-price elasticities for all brands of each of the two products were negative, statistically significant, and less than unity in absolute value, suggesting an inelastic demand. The latter implies that in order to increase total revenue, the manufacturers of cereal and spaghetti sauce brands had to increase their prices.

The expenditure elasticities of all brands of the two products were positive and statistically significant, meaning that all the brands were normal goods and the quantity purchased of all brands increased with the increase in total expenditure. According to the positive compensated cross-price elasticities, a substitutability relationship was established for the most of the brands.

Market share elasticities with respect to coupon values showed that coupon values positively impacted the market shares of General Mills, Kellogg's, Ragu, and Classico, and

negatively impacted the market shares of private label of cereal and spaghetti sauce. As such, coupons had varied effects on markets shares across national brands and private labels.

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