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Returns, Lags, and Complementarities in Brand and Generic Advertising: The Demand for Peanut Butter

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Abstract

This paper estimates the impact of generic and brand advertising on the demand for peanut butter in the U.S. An error correction model is estimated with quarterly data from 1985 to 2004 to study both the short- and long-run adjustments. The results indicate that brand advertising has a significant but short-lived effect on aggregate consumption while generic advertising has little short-run but significant long-run effects.

Introduction

The Farm Security and Rural Investment Act of 2002 (2002 Farm Act) caused a fundamental change in peanut production in the United States. The 2002 Farm Act replaced the quota system with the marketing assistance loan program. Peanut prices have fallen due this policy change, and the peanut industry is still adapting to the new policy regime. In the wake of the policy change, the demand for food-grade peanuts has risen, and, in particular, the consumption of peanut butter and snack peanuts has gone up. This boost may be attributed to the increased advertising and the promotion of health benefits as well as the lower price of shelled peanuts. It is important to understand the effect of advertising expenses on peanut consumption, but since the peanut industry is going through a structural change after the 2002 Farm Bill and since the National Peanut Board (NPB) started financing generic advertisement efforts only in 2000, more research is desired to the end. This paper is concerned with the effects of brand-specific and generic advertising on the consumption of peanut butter in the United States. We estimate an error correction model that accounts for short- and long-run impacts of generic and brand advertising as well as the relative importance of the two types of advertising. Our results suggest that brand advertising is effective in the short run but not in the long run. On the other hand, generic advertising is not effective in the short run but effective in the long run. We also find that although the effect of the two types of advertising is contrasting, they do not interfere with each other; in fact, they tend to go hand in hand with each other.

Methodology

After the abolishment of marketing quota in 2002, the U.S. peanut market has been going through adjustment. With the production quota removed, peanut producers are now free to grow

and sell food-grade peanut in the U.S. domestic market. The policy change reduced the price of peanuts shortly, but the demand for U.S. peanut is steady, and peanut growers in the Southeast are expanding. As the peanut producers are now affected by the market forces directly, it is important that they understand the shift in demand for peanut products. We thus consider peanut butter for a case study. Each year, peanut butter manufacturers spend millions of dollars on peanut butter brand advertising (\$29 million in 2004 with sales of \$1.6 billion). Since 2000, the National Peanut Board (NPB) has also been financing generic advertising conveying the message of the benefits of peanut-based products. It is therefore of much interest to evaluate relative efficiency of the two types of advertising (magnitude and duration of the sales impact) and to determine whether brand advertising is predatory or cooperative and if there are complementarities between the brand and generic advertising. A number of studies (Kinnucan and Belleza, 1995; Kaiser, 1997; Forker and Ward, 1993; Reberte et al., 1996; Kinnucan and Venkateswaran, 1990) found that generic agricultural commodity promotions collectively undertaken by firms in the industry have a greater impact on demand due to brand substitution effects of predatory advertising.

In order to accommodate both the short-run adjustment effects and the long-run equilibrium parameters of advertising, we estimate an error correction model (ECM) of demand for peanut butter. Unlike the ARIMA and VAR models that provide flexibility but ignore long-run equilibria, ECM models are generated by formulating an equation with an extended lag structure to produce an error correction term representing the extent to which the long-run equilibrium is not met (Greene, 2003; Kennedy, 2003). We estimate the following model:

$$\begin{aligned} \Delta QPB_t = & \gamma_1 \Delta QPB_{t-1} + \gamma_2 \Delta QPB_{t-2} + \gamma_3 \Delta PPB_{t-1} + \gamma_4 \Delta PPB_{t-2} + \gamma_5 \Delta ADV_{t-1} + \gamma_6 \Delta ADV_{t-2} \\ & + \gamma_7 \Delta NPB_{t-1} + \gamma_8 \Delta NPB_{t-2} + \gamma_9 PBO + \gamma_{10} NINC \\ & + m_0 (QPB_{t-1} - \alpha_0 - \alpha_1 PPB_{t-2} - \alpha_2 ADV_{t-2} - \alpha_3 NPB_{t-2}) + \varepsilon_t \end{aligned}$$

where QPB is peanut butter consumption, PPB and PBO are prices of butter and bologna (substitute), ADV and NPB are the brand and generic advertising expenditures, $NINC$ is the national disposable income, and m_0 is the error correction term.

Quarterly data from 1985-2004 are used in the estimation. Consumption data are collected from the Peanut Stocks and Processing (USDC). Stationarity and cointegration tests show that the nonstationary level variables are stationary in first differences. Hausman and Chow tests will determine, respectively, possible regressor endogeneity and structural breaks (calling for a vector error correction model (VECM) and data truncation).

Results

Table 1 presents the definition of variables along with their means and standard deviations.

Table 2 presents the results of Phillips-Perron stationarity tests for $I(0)$ and $I(1)$. The statistics in the table suggest that the variables are integrated of order 1. Table 3 presents the results of the Johansen's cointegration test.

Preliminary results indicate that, while brand advertising has a significant but short-lived effect on aggregate consumption, generic advertising has almost no immediate effect but does impact consumption significantly in the long run. This may be explained by possible differences between generic and brand advertising objectives. As opposed to profit maximizing goals of brand advertising, generic advertising strategies are designed not to provoke demand surges but

rather to boost consumer awareness of the product and thus to increase production and consumption in the long run. There are indications that generic advertising has been used to offset demand decreases and compensate for a temporary lack of brand advertising. The positive impact of brand advertising suggests that it is not entirely predatory (previous research finds that brand loyalty is not an important factor in the demand for many food items). The results also indicate that, in recent years, the peanut butter market has become more dynamic and less sensitive to advertising and short-run price changes. The income and price coefficients suggest that, in the long run, peanut butter is neither a normal nor an inferior good and that demand is persistent and subject to long-term habit formation. This conclusion is reinforced by the irrelevance of the price of a substitute.

Concluding Remarks

This paper estimated a vector error correction model that describe both equilibrium and disequilibrium adjustments. Since the generic advertising efforts started relatively recently, the data availability is a restricting factor for the present study; it is desirable that the results be verified with an updated data set with more recent observations. Nonetheless, the present study provides useful results in that the dynamic relationship between advertising expenditures and interaction between generic and brand advertisement are considered.

References

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Table 1. Descriptive Statistics

Variable	Description	Mean	Std. Dev.
ADV	Peanut butter advertisement expenditure (\$).	6129.15	2522.430
QPB	Quantity of peanut butter (1000 lbs).	196417.50	19823.94
PPB	Price of peanut butter (\$/lb).	1.85	0.116503
PBO	Price of bologna (\$/lb).	2.38	0.130691
CPI	Consumer price index with 82-84 as base.	150.33	24.23928
POP	Population.	264.66	15.96942
NINC	National personal disposable income.	5513.35	1659.676
D1	Dummy for first quarter.	0.247	0.433949
D2	Dummy for second quarter.	0.260	0.441367
D3	Dummy for third quarter.	0.247	0.433949
D4(dropped)	Dummy for fourth quarter.	0.247	0.433949
D5	Dummy for pre-Farm Bill periods.	0.104	0.307127
D6(dropped)	Dummy for post-Farm Bill periods.	0.208	0.408388
D7	Dummy for peanut institution.	0.416	0.496054
NPB	National peanut board spending.	282142.2	608940.1

Table 2. Phillips-Perron Unit Root Tests

Variable	I(0)	I(1)
ADV	-6.735***	-17.196***
QPB	-2.880*	-11.560***
PPB	-3.023**	-6.879***
PBO	-2.680*	-9.816***
CPI	-0.312	-6.207***
NINC	3.530	-10.333***
NPB	-2.209	-9.073***

Table 3. Johansen's Trace Test for Cointegration

Eigenvalue	Likelihood Ratio	5% Critical Value	1% Critical Value	Hypothesized No. of CE(s)
0.960611	107.8810	47.21	54.46	None **
0.749117	39.96164	29.68	35.65	At most 1 **
0.402790	10.92352	15.41	20.04	At most 2
0.004670	0.098308	3.76	6.65	At most 3

Table 4. Vector Error Correction Model Coefficient Estimates

Item				
Cointegrating Equation				
QPB _{t-1}	1.000000			
PPB _{t-1}	111700.7 (1.79221)			
ADV _{t-1}	31.18059 (2.54012)			
NPB _{t-1}	0.085154 (2.65467)			
Constant	-678746.3 (-3.72466)			
Error Correction Equations				
	Δ QPB _t	Δ PPB _t	Δ ADV _t	Δ NPB _t
Coint. Eq.	-0.031712 (-0.39098)	-1.37E-07 (-0.76676)	-0.041155 (-2.32114)	-3.862441 (-0.67159)
Δ QPB _{t-1}	0.053862 (0.15696)	-1.58E-07 (-0.21012)	0.145873 (1.94462)	-8.604497 (-0.35363)
Δ QPB _{t-2}	0.230604 (0.74910)	-7.67E-07 (-1.13459)	0.175406 (2.60654)	-2.134566 (-0.09779)
Δ PPB _{t-1}	-9367.866 (-0.07934)	0.214084 (0.82551)	-31708.05 (-1.22851)	3387728. (0.40465)
Δ PPB _{t-2}	-171209.4 (-1.34920)	-0.109518 (-0.39293)	-55410.21 (-1.99751)	3406712. (0.37862)
Δ ADV _{t-1}	-0.514009 (-0.27659)	1.80E-06 (0.44113)	-0.358026 (-0.88130)	115.0311 (0.87296)
Δ ADV _{t-2}	-1.943512 (-1.34073)	5.14E-06 (1.61479)	-0.461838 (-1.45745)	50.56526 (0.49195)
Δ NPB _{t-1}	0.006648 (1.09443)	-6.35E-09 (-0.47585)	0.001340 (1.00893)	0.057173 (0.13274)
Δ NPB _{t-2}	-0.002588 (-0.41502)	-2.00E-09 (-0.14582)	0.001313 (0.96271)	-0.010199 (-0.02306)
PBO	-3704.329 (-0.16339)	0.049766 (0.99938)	-6297.398 (-1.27066)	-279772.0 (-0.17404)
NINC	1.300703 (0.18684)	-1.60E-05 (-1.04856)	1.799898 (1.18274)	81.56351 (0.16524)
R-squared	0.455438	0.611907	0.775709	0.233970