

## **Aggregate Reflections of Brand Loyalty**

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In the presence of re-labeling, and general consumer awareness, it is questionable whether brand loyalty still exists. However, brand loyalty is still believed to affect many product categories in the modern world market. Examples of brand loyalty promotion abound, showing the brand loyal customer is an asset to corporations. As brand names continue to revel in a history of consumer success, store brands are also becoming more common in the market place. With the ease of production and re-labeling, store brands are more readily available.

Stores carry a reputation based on their service and product quality. Based on store name recognition and potential loyalty, most stores carry store branded products. As national grocery chains have taken their share of the grocery market, the small store and chains have had to develop strategies for competing with the larger chains. These strategies have been successful for Harris Teeter, Ukrop's, Trader Joe's, and Fresh Market, stores spanning a few states and providing a more personalized shopping experience. These stores have built up store loyalty and have entered the market with their own in-store brands. With success of niche market suppliers, as is the case with some of the products carried by these chains, the question remains how far does their store loyalty extend and does it create a brand loyalty for their products. Although a national grocery chain's store brand is more likely to be considered a generic product, a smaller store's name brand may not necessarily be viewed as such by the consumer. These stores and their products provide for an interesting investigation of product brand loyalty.

### **I. Literature Review**

Most studies of this topic have identified specific consumer loyalties through attempts to analyze individual demand. These include Farley (1964); Frank, Douglas, and Polli (1968); and Krishnamurthi and Raj (1991). The first study had limited data, 12 products and 199 households, the second study, 44 products and 491 households. The third does not specify the number of participating households. Farley looked at choice from the most pure economic model, based on Stigler's theory, as a function of opportunity and monetary cost. Frank, Douglas, and Polli advanced this work by adding in more socioeconomic factors such as educational level and home location. Krishnamurthi and Raj took a different approach and focused entirely on the consumer decision. They decided to view the decision as two parts, what brand, and how much, in a non-integrated decision assuming brand loyalty.

Though logically, Farley's method seems appropriate, it is outdated because the cost of finding information about products has significantly decreased since his publication. In the study done by Frank et al. (1968), the relevance of socioeconomic factors to brand loyalty is more questionable now as some of the assumptions made in the paper are also dated. Even at the time of the study, Frank et al found very limited relationships in their socioeconomic characteristics to brand loyalty and found price to have the highest coefficient. Krishnamurthi and Raj's approach is more modern, looking at the decision process.

This study is an analysis of three product categories. A "category" for the rest of this analysis will refer to food products with the same approximate package size and contents with one or more competitors of different brands within that category. The aggregate brand loyalty in three different product categories is analyzed based on the regression results from the store brand in each category. Different from previous studies, this study will be looking at supply side data. This should reflect aggregate perception of the product and its reputation through the elasticities of demand.

This paper will attempt to answer the question: Is there brand loyalty for the Ukrop's name brand? The standing hypothesis will be that there is a level of brand loyalty for Ukrop's brand items. This is supported by the reputation built up by Ukrop's and its loyal patronage. Logically, this type of loyalty should transfer to the

Ukrop's product line. However, no studies have looked at the demand for a product from a supplier's side to this point.

The findings should interest retailers considering store loyalty as it applies to their store brand's loyalty. Given the hypothesis is correct, research should show that the demand for Ukrop's brand products will show a similar pattern of price elasticities as a situation in which Ukrop's has identified brand loyalty.

## II. Theoretical Analysis

This research will apply the theory of demand to consumer spending on store-brand goods, and several national name brands in each category. The theory of demand states that demand is a function of consumer income, product price, substitute price, complement price, and consumer tastes. In this analysis, quantity sold is a function of the prices of the good in question, substitutes, holiday purchasing, and the level of economic activity in the state of Virginia.

This analysis reviews data from three product categories: canned peas, milk, and prepared dinner rolls. High price insensitivity through own price or cross price elasticities should reflect brand loyalty to a product within a category. If the Ukrop's brand in the pea, milk, and dinner roll categories all reflect high price insensitivity, then there is a relationship between store-brand loyalty and store loyalty. These three categories of food products reflect a broad range of traditional grocery food products.

This analysis will reflect the aggregate loyalty to one particular brand as opposed to the brand loyalty of individual consumers. Despite the fact that these two concepts are related, at the household level, there is a large variety of variables that could be related to brand purchase on a day-to-day basis. Therefore, aggregate data should provide a better overall view of brand image and loyalty through the price elasticity.

## III. Data

The data used in this study comes from Ukrop's Supermarkets, Inc. headquartered in Richmond, Virginia. Ukrop's 28 locations center primarily around the Richmond area, however, approximately seven stores lie on the edge of this area and two stores are approximately one hour (along major highways) from the Ukrop's headquarters, in Williamsburg and Fredericksburg. Virginia employment rate is the best representation of economic activity and income level as opposed to employment statistics from Richmond only.

The gross sales and number of units sold for the most popular unit size and top brands (by quantity of units purchased) from each category was provided over the 52-week period from November 3, 2001 till October 26, 2002. The price variable is computed from the gross sales in a given week divided by the number of units sold in that week to produce the average price. The variation in price for these food products is mostly provided by weekly specials from using a free "Ukrop's Valued Customer Card." Since Ukrop's is a store primarily used by repeat consumers, the bulk of customers have and use one of these cards when they make their purchase by cash, check, foodstamp card, or credit to receive the weekly discounts at the register when they finalize their purchases.

## IV. Empirical Testing

Data for each brand within the three categories was subjected to a double log regression to estimate its demand equation. In a generic form, the equation is as follows:

$$\ln(\text{Units of the Brand Sold}) = f[\ln(\text{Brand Price}), \ln(\text{Price of each other Brand within the Category}), \ln(\text{State Employment Rate}), \text{Holiday}]$$

The expected signs are shown below:

**Table 1: Expected Signs**

<b>Variable</b>	<b>Description</b>	<b>Expected Sign</b>
Brand Price	Gross Sales/Units Sold	-
Competing Brands Price	Gross Sales/Units Sold	+
State Employment Rate	Monthly State Employment Rate Distributed as is over 4 week period	+
Holiday (Dummy Variable)	1- Nationally Recognized Holiday within a week, else 0	+

This double log functional form reflects diminishing marginal returns. It will also provide the price elasticities and cross price elasticities. In order to determine what level of price elasticity indicates brand loyalty, a regression was performed on data for a brand identified as brand loyal by Ukrop's Supermarkets. The data compilation follows the same methods as those described above in the data section. Based on these results, a low (between 0 and -3.9) significant price elasticity in this study will indicate brand loyalty. This regression's results are shown below:

**Table 2: Brand Loyal Double Log Regression**

**Dependent Variable: ln(Units of Brand Loyal Good Sold)**

Method: Least Squares

Sample: 11/03/2001 10/26/2002

Included observations: 52

<b>Variable</b>	<b>Coefficient</b>	<b>t-Statistic</b>	<b>Prob.</b>
<b>C</b>	11.14386	5.049286	0.0000
<i>ln(Price of Brand Loyal Unit)</i>	-3.893484	-16.3349	0.0000
ln(Price of Competing Brand Unit)	-0.566254	-0.4732	0.6385
ln(Price of Competing Brand Unit)	0.073774	0.300412	0.7653
Ln(Price of Competing Brand Unit)	-0.056425	-0.20162	0.8412
Ln(Price of Competing Brand Unit)	0.001018	0.001697	0.9987
ln(Price of Competing Brand Unit)	-1.374779	-0.43109	0.6686
<b>HOLIDAY</b>	0.218348	2.830611	0.0070
<b>VAEMPLOYMENTLOG</b>	-21.3742	-1.4144	0.1644
<b>Adjusted R-squared</b>	0.844955	<b>Prob(F-statistic)</b>	0.0000
<b>Durbin-Watson stat</b>	1.821559	<b>F-statistic</b>	35.74201

The double-log regressions summarized in the subsequent tables will be compared with the brand-loyal elasticity determined above. The first category to be analyzed will be canned peas, made up of Del Monte, Green Giant, Le Sueur, and Ukrop's brands. In the table below, the italicized coefficients are those which are statistically significant according to their t-statistics in parentheses.

**Table 3: Double Log Regression- Canned Peas**

Independent Variables (identical for all regressions)	Dependent Variables			
	ln(Units Sold Del Monte)	ln(Units Sold Ukrop's)	ln(Units Sold Green Giant)	ln(Units Sold Le Sueur)
<b>C</b>	6.832781 (8.043732)	4.02016 (5.630459)	2.513841 (2.963092)	5.47191 (13.06188)
Ln(Price DELMONTE PEAS)	-3.915089 (-14.75391)	1.171243 (3.700106)	0.427053 (1.135419)	-0.718604 (-3.869216)
Ln(Price UKROP'S PEAS)	0.394539 (2.307257)	-3.282245 (-16.02079)	-0.203989 (-0.837966)	-0.183704 (-1.528265)
Ln(Price GREEN GIANT PEAS)	0.163901 (0.620677)	0.174557 (0.644915)	-4.846614 (-15.06992)	-0.249234 (-1.569419)
Ln(Price LE SUEUR PEAS)	0.143187 (-0.723105)	0.720383 (0.917379)	0.553928 (0.593671)	-6.640467 (-14.41286)
<b>HOLIDAY</b>	-0.046598 (-0.786032)	-0.011383 (-0.141627)	-0.057675 (-0.603906)	0.086418 (1.832524)
Ln(VIRGINIA EMPLOYMENT)	34.55200 (1.773323)	-37.65943 (-2.291801)	-36.67723 (-1.87848)	-28.63771 (-2.97035)
<b>AR(1)</b>	0.533815 (4.280616)			
<b>Adjusted R-Squared</b>	0.856073	0.8766	0.838	0.9153
<b>Durbin-Watson Statistic</b>	2.270327	2.1344	1.55	1.7259

Overall, the adjusted R-squared terms suggest that these equations fit the data. (Above 80% of the variation around each series' mean is explained by its respective regression.) The Durbin-Watson statistics and the correlograms showed that only DelMonte exhibited significant autocorrelation, which is corrected above with the inclusion of a single autoregressive term.

These results suggest that DelMonte may have a level of brand loyalty at -3.91. However the price of Ukrop's peas also influences the quantity demanded of DelMonte peas. The rest of the coefficients (cross price elasticities) are not significant so we cannot confirm definitively if DelMonte has brand loyalty, but this regression is similar to the regression of the brand deemed to have loyalty by Ukrop's Supermarkets.

Ukrop's also falls in the -3.9 and 0 range with its own price sensitivity. Its cross price elasticities are all insignificant aside from the price of DelMonte. This suggests that Ukrop's may have some level of brand loyalty, however, it is affected by the price changes of another brand therefore, it is cross price, and own price sensitive.

Green Giant shows high price sensitivity with a coefficient of -4.85. None of the other price elasticities are statistically significant for comparison and determined effect in this estimation. This high own-price sensitivity makes loyalty questionable as 4.85 less units are bought after a one cent increase in price. No conclusions can be made about Green Giant.

Le Sueur appears to be affected primarily by its own price, as indicated by the significance of that variable's coefficient. The coefficient for the price of Del Monte peas is also significant, however its negative sign is inconsistent with the predicted relationship.

In order to test for correlation between the independent variables, a correlation matrix was generated for the canned peas category. In the table shown below all values of .6 or greater are italicized:

**Table 4: Canned Pea Correlation Matrix**

Ln(Price of Del Monte)	1.00									
<b>HOLIDAY</b>	-0.07	1.00								
ln(Price of Green Giant)	0.26	-0.07	1.00							
Ln(Price of Le Sueur)	0.24	-0.19	0.12	1.00						
ln(Price of Ukrop's)	0.22	-0.23	-0.18	0.45	1.00					
ln(Units Sold Del Monte)	-0.90	-0.03	-0.30	-0.19	-0.13	1.00				
Ln(Units Sold Green Giant)	-0.21	0.03	-0.92	-0.13	0.14	0.29	1.00			
ln(Units Sold Le Sueur)	-0.44	0.26	-0.18	-0.92	-0.48	0.35	0.22	1.00		
ln(Units Sold Ukrop's)	-0.02	0.19	0.29	-0.37	-0.91	-0.05	-0.21	0.41	1.00	
ln(Virginia Employment)	0.24	0.00	-0.14	0.44	0.17	-0.12	0.04	-0.52	-0.22	1.00

As seen in the above table there is a high correlation between price and quantity of Le Sueur units sold, which is consistent with Le Sueur's own price sensitivity at -6.64. There is no significant correlation among the natural logs of the prices of the products and therefore should not affect the regression results. These regressions suggest that Ukrop's may have some brand following, but is still price sensitive to Del Monte.

In the market for milk there are only two competitors in Ukrop's Supermarkets in the one-gallon size, Richfood and Ukrop's. The summary of the double log regression results, including autoregressive terms added to correct for autocorrelation, are shown below.

**Table 5: Double Log Regression- Milk**

Independent Variables	Dependent Variables	
	ln(Units Sold of Richfood Milk)	ln(Units Sold of Ukrop's Milk)
<b>C</b>	6.847231 (-3.737193)	9.656163 (-6.579011)
Ln(Price Richfood Milk)	0.47923 0.364889	1.121805 1.059923
Ln(Price of Ukrop's Milk)	0.120425 0.775364	-1.303081 (-10.46959)
Ln(Va Employment)	1.992671 0.217927	4.889438 0.66803
<b>HOLIDAY</b>	0.01881 0.962869	0.028812 1.830378
<b>AR(1)</b>	0.304889 (-2.489261)	0.250333 (-2.085444)
<b>AR(2)</b>	0.615255 (-5.05375)	0.625068 (-5.236131)
<b>Adjusted R-squared</b>	0.722071	0.685351
<b>Durbin-Watson stat</b>	2.115446	2.118551
<b>Inverted AR Roots</b>	0.95 -0.65	0.93 -0.68

The results show that the price of Ukrop's brand milk affects the amount of Ukrop's milk sold with a price elasticity of -1.3 that falls in the -3.9 to 0 brand loyal range. The price of Richfood milk has no significant price coefficients, and so loyalty and price sensitivity are undeterminable for this brand. The adjusted R-squared terms at .72 and .68 suggest that there may be a determinant missing both of these regressions.

In the area of prepared dinner rolls Ukrop's and Pepperidge Farm both produce two types of ready to serve rolls. The double logged regression results appropriately adjusted for autocorrelation are as follows:

**Table 6: Double Log Regression- Prepared Rolls**

Independent Variables (identical for all regressions)	Dependent Variables			
	Ln(Units Sold Pepperidge Farm French Rolls)	Ln(Units Sold Pepperidge Farm Party Rolls)	Ln(Units Sold Ukrop's Cluster Rolls)	Ln(Units Sold Ukrop's Loose Rolls)
<b>C</b>	<i>8.786514</i> -7.106129	<i>9.811012</i> -4.765865	<i>8.006467</i> -5.489453	<i>10.13206</i> -10.38212
ln(Price of PF French Rolls)	<i>-3.045982</i> (-3.002674)	<i>-2.248899</i> (-1.559776)	<i>-0.446676</i> (-0.416105)	<i>-0.204687</i> (-0.284972)
ln(Price of PF Party Rolls)	<i>-0.265121</i> (-0.280549)	<i>-3.092427</i> (-1.612687)	<i>-1.238837</i> (-1.133322)	<i>-1.215806</i> (-1.662278)
ln(Price of Ukrop's Cluster Rolls)	<i>1.432971</i> -0.746215	<i>-15.45904</i> (-3.853009)	<i>-10.82523</i> (-2.837305)	<i>-7.18783</i> (-2.815574)
ln(Price of Ukrop's Loose Rolls)	<i>-1.844319</i> (-0.903374)	<i>17.24166</i> -4.061938	<i>10.84646</i> -2.806846	<i>7.242813</i> -2.80116
ln(VA Employment)	<i>-8.526537</i> (-0.631042)	<i>14.29963</i> -0.417887	<i>-26.12782</i> (-1.337829)	<i>-9.776028</i> (-0.7481)
<b>HOLIDAY</b>	<i>0.054984</i> (-1.69919)	<i>0.048551</i> (-0.553425)	<i>0.110093</i> (-1.223022)	<i>0.091469</i> (-1.518616)
<b>AR(1)</b>	<i>0.660039</i> (3.490942)	<i>0.633834</i> (4.753488)		
<b>AR(2)</b>	<i>0.180976</i> (0.818971)			
<b>AR(3)</b>	<i>-0.511597</i> (-2.799896)			
<b>AR(4)</b>	<i>0.308127</i> (1.401637)			
<b>AR(5)</b>	<i>-0.114309</i> (-0.690805)			
<b>Adjusted R-Squared</b>	<i>0.577887</i>	<i>0.775786</i>	<i>0.355903</i>	<i>0.389765</i>
<b>Durbin-Watson Statistic</b>	<i>2.301834</i>	<i>1.900455</i>	<i>2.12598</i>	<i>2.221433</i>

These summarized results suggest that there is high competition within the roll category. The italicized significant coefficients show that Pepperidge Farm French Rolls (which are similar to Ukrop's loose rolls) are affected by their own price, the coefficient of which falls within the -3.9 to 0 range, indicating possible brand loyalty. However, none of the other price coefficients are statistically significant to confirm or deny brand loyalty.

Pepperidge Farm Party Rolls (similar to Ukrop's cluster rolls) exhibit high cross price sensitivity to both types of Ukrop's rolls. The coefficients from Pepperidge Farm Party Roll regression show that the quantity sold is affected by the prices of both versions of Ukrop's Roll. However, the sign on the Ukrop's Cluster Rolls is not positive as expected. This unusual occurrence continues in the regressions of the quantity demanded of Ukrop's

Cluster Rolls and Ukrop's Loose rolls also. This unforeseen sign problem may be an indicator of multicollinearity. Following is the correlation matrix for the entire category.

**Table 7 : Correlation Matrix-Ready to Serve Rolls**

ln(Price of Pepperidge Farm French Rolls)	1.00									
ln(Price of Pepperidge Farm Party Rolls)	0.87	1.00								
<b>HOLIDAY</b>	-0.15	-0.09	1.00							
ln(Price of Ukrop's Cluster Rolls)	0.11	0.10	0.12	1.00						
ln(Price Ukrop's Loose Rolls)	0.06	0.09	0.15	0.96	1.00					
ln(Units of PF French Rolls Sold)	-0.75	-0.77	0.32	-0.04	-0.02	1.00				
ln(Units of PF Party Rolls Sold)	-0.73	-0.70	0.27	-0.02	0.10	0.74	1.00			
ln(Units of Ukrop's Cluster Rolls Sold)	-0.54	-0.50	0.22	-0.11	0.00	0.69	0.71	1.00		
ln(Units of Ukrop's Loose Rolls Sold)	-0.57	-0.54	0.25	-0.09	0.01	0.73	0.78	0.97	1.00	
ln(VA Employment Level)	0.53	0.55	0.00	0.16	0.18	-0.54	-0.41	-0.38	-0.34	1.00

The correlation matrix shows that there is significant (above .6) correlation between the prices of Pepperidge Farm products in this category and among the prices of Ukrop's products. There also appears to be correlation across brands among the quantities of each product sold in this category, which should not effect each individual regression since only the quantity of the brand in question is used in the regression equation as the dependent variable.

The adjusted R-squared terms for both Ukrop's roll regressions at .36 and .39 respectively, suggest that there may be an important component missing from the regressions, as a significant amount of the variation in units sold is unexplained in each regression. Based on the high price elasticities, only Pepperidge Farm French Rolls appear to have product loyalty. The Ukrop's brand does not appear to exhibit loyalty within the category.

**VI. Conclusion**

Store brands have become a competitor to major brand names in supermarkets. Small chains have an interest in this trend as the cost of re-labeling a product has decreased. Loyalty to store-brands provided by higher quality chains might be suspected because of repeat patronage. The data provided for the brand loyal scenario in Table 2 provided the reference range for a brand loyal price elasticity of demand from -3.9 to 0. Based upon the brand loyal range, this analysis has shown that both Ukrop's milk and canned peas exhibit product loyalty. Ready to serve rolls have a significantly different coefficient pattern showing that Ukrop's is a strong competitor with the popular national brand. Overall, the results show that Ukrop's has not developed brand loyalty among its line of products.

The adjusted R-squared terms on all of these regressions suggest that there may be a missing component in the model of quantity sold for the brands. The identification of a variable for consumer tastes, complement price, and advertising would be a helpful addition to this study. Better price data with the number of units sold at each price (purchased with the free shopping card, or without the card) may also clarify the regression results. A longer time series would also increase the degrees of freedom and also provide more conclusive results.

Future studies of this specific topic should consider gaining more supply side data from small chain supermarkets. A future study would ideally identify levels of store loyalty through customer survey or cross sectional shopping card data showing regular repeat visits by customers. After collecting data on store loyalty, it might then go on to look at the level of store-brand loyalty for each store using an improved model for quantity sold. The study would then go on to look at multiple categories and subgroups of products to identify store-brand loyalty in various areas.

## VII. References

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