Determinants of Price Rigidity: The Role of Psychological Prices, Price Changes and Sales Promotions

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The study of price rigidity has received considerable attention from both economists and marketers in the last few years as the variations in price are considered crucial for understanding price adjustments. Rigid prices resist changes in market movements and thus can affect a firm's profitability. Various theories have been proposed to explain price rigidity or price adjustment. This paper studies the influence of psychological pricing on price rigidity in the retail sector. It also reviews literature on price rigidity, its implications, the role of psychological pricing, and sales promotions in causing price rigidity. Scanner data analysis of a retail chain—Dominick's located in the mid-west region of USA—provides evidence of price rigidity. It provides additional evidence that the theory of psychological pricing leading to price rigidity holds good.

Introduction

Retailing, one of the largest sectors in the US economy, is characterized by strong competition from independent grocers, supermarket chains, convenience stores, speciality markets, discounters, hypermarkets, and other formats. The rise in household income levels, changing lifestyle patterns, and the ageing baby boomers have created the necessity and requirement for several varieties of grocery formats.[1] Among the various formats, the large grocery retailers account for more than 50 percent of the US grocery retail market.[2] The dominance of these large grocery retailers is much higher at regional levels and accounts for more than 70 percent. Given this backdrop, it is often argued that the market power of these large grocery retailers has significantly increased as opposed to the manufacturers. The increased concentration along with their growing buyer power has heightened the concerns of many about the retailers' ability to influence prices charged to the consumers and prices paid to the suppliers. Hence, understanding the retailers' pricing strategies is critical for many reasons. Analyzing market mechanisms that establish prices (food products) has been one of the goals of microeconomics (Blinder *et al.,* 1998). Economists often describe price as the primary mechanism for "efficient resource allocation". Thus, pricing strategies of firms are essential in economic analysis of market performance.

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1 "Food Market Structures: Food Retailing", USDA Economic Research Service, http://www.ers.usda.gov/Briefing/FoodMarketStructures/foodretailing.htm
2 "Overview of the Retail Grocery Market in the US South Central States", Agri-Food Trade Service, June 2005, www.atn-riae.agr.ca

In addition, it helps marketers to address three important questions—what to produce, how much to produce and for whom to produce (Muller *et al*., 2006).

While price setting behavior of the firm and price dispersion have been extensively studied (Lee, 1998; Brynjolfsson and Smith, 2000; Clemons *et al*., 2002; Baharad and Eden, 2004; Fabiani *et al*., 2006; Kauffman and Lee, 2005), few have addressed the price changing behavior or price rigidity and factors influencing price rigidity. Price rigidity is defined as a tendency to avoid frequent changes of price, perhaps preferring instead non-price forms of competition. In other words, price rigidity is defined as the inability/resistance of the firm to change prices despite the presence of nominal forces or market forces that suggest change in prices (Blinder *et al*., 1998). It is measured as the mean duration of unchanged prices (Powers E T and Powers N J, 2001). Economists refer to price rigidity as 'nominal rigidities' (Blinder *et al*., 1998). Other terms used to describe the price rigidity include price stickiness, price inertia, and price inflexibility (Kauffmann and Lee, 2005). Price rigidity must be considered as a relative rather than absolute matter (Sheehan, 2006). Understanding price rigidity and the reasons for price rigidity are important for theory of price adjustment; hence it is of particular interest in the context of economics, industrial organization, and marketing literature.

Means (1935) observed that prices are administered and insensitive to fluctuations in supply and demand situations. Subsequently, a wide range of partial equilibrium theories such as menu cost, coordination failure, contract- and demand-based psychological pricing points, cost-based pricing, non-price competition, quality signal, price readjustment, asymmetric information, implicit and explicit contract and managerial costs have been proposed to explain why prices are rigid (Kaas and Hay, 1984; Kashayap, 1995; Bergen *et al*., 1998; Blinder *et al*., 1998; Gedenk and Sattler, 1999; Wolman, 2000, 2003; Rotemberg, 2002; Levy and Young, 2004; Bergen *et al*., 2005; Muller *et al*., 2006; and Herrmann and Moeser, 2006).

Blinder *et al*. (1998) in their research on how firms set prices and reasons for price stickiness, found that psychological pricing points is one of the 12 determining factors for rigid prices. The theory of psychological pricing points states that the nominal price points are psychologically so important for consumers, that if the price goes beyond these psychological pricing points, the demand decreases strongly. The firms following psychological pricing strategies would thus start from the presumption of a kinked demand curve. Hence, psychological pricing points are an important cause of price rigidity in profit maximizing situations.

The psychological pricing point theory hypothesizes that pricing tends to be stuck, i.e., rigid, at certain ending prices such as 99¢, $1.19 etc. (Kashyap, 1995). 'Rational inattention theory', as proposed by Bergen *et al.* (2003), provides the explanation for the existence of price rigidity. Consumers are inattentive to rightmost digits as they are constrained by time, resources, and information processing constraints. Since many consumers ignore the last digit, firms tend to keep the last digit as high as possible, i.e., equal to 99¢ or $9 (Basu, 1997, 2005). As a result, retailers maximize profits by keeping the price endings high.

The psychological pricing points are also referred to as 'odd pricing', 'threshold pricing', 'tantalizing pricing' and 'below-the-round-number-pricing'.

Herrmann and Moeser (2006) suggest the presence of a substantial amount of price rigidity in the German grocery retailing sector. They conclude that the number of price promotions is a significant determinant of the rigidity in food prices. They also suggest that psychological pricing of retailers do affect food price rigidity. Also, Weber and Anders (2007) conclude that when sales promotions are considered the level of price rigidity noticeably increases. This paper proposes new evidence of price rigidity in retail industry using a scanner data set. The aim of this study is to empirically analyze the influence of psychological prices, promotion and price actions on price rigidity using Dominick's supermarket data for ten brands of breakfast cereals. An additional contribution of this study is exploring the role of sales promotions on price rigidity.

Methodology

This study is based on the scanner data available for Dominick's supermarket. Dominick's is a Chicago (Illinois, USA) based grocery retailer operating mainly in the Midwest region. Dominicks' is a chain of approximately 100 retail stores in the Chicago metropolitan area, with a market share of about 25 percent. The pricing and promotion practices are similar to those followed by other major grocery retailers in the USA such as Kroger, Shoprite, and Jewel Osco.

The objective of the study is to examine the price rigidity of brands at the store level and not to examine the stickiness of prices from the consumer perspective. A distinction must hence be made between the content of scanner data from that of consumer panel data. The scanner data set provides information about the various brands—product categories and individual SKUs—at individual retail store level, unlike the consumer panel data,[3] which includes consumer switching from one store to another, and thus, a different type of price rigidity. The scanner data set contains retailers' price points notwithstanding the consumer switching behavior[4]. Therefore, this study pertains to price rigidity from the retailer's perspective.

The data used in this study is the property of the Marketing Group at the University of Chicago Graduate School of Business. The data used in this study is a set of 399 weekly observations of retail prices for ten brands of breakfast cereals across six stores. This comprises the data collected from scanning of products sold in the time period: September 14, 1989 to May 8, 1997. Of the ten brands chosen for this study, nine were national brands and one was a store brand (National Brands—Kix, Trix, Nabisco, Kellogg's, Cheerios, Wheaties, Golden Grahams, Cinnamon Cheerios, and Cocoa Puffs; Store Brand—Dominick's corn flakes). The description of the stores and the brands used for the study are summarized in Exhibits 1 and 2. The brands selected were of comparable package size and repute.

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[3] Several US studies are based on consumer panel data (Fenglar and Winter, 2001; Bils and Klenow, 2002; Loy and Weiss, 2003).

[4] The retailer scanner data do not provide socio-demographic variables of consumer as they are not typically captured in these data sets.

Exhibit 1: Description of the Stores Used for the Study		
Sl. No.	**Store**	**Store Description and Location**
1.	Store 1	River Forest, 7501 W. North Ave.
2.	Store 2	River Grove, 8355 W. Belmont Ave.
3.	Store 3	Bridgeview, 8825 S. Harlem Ave.
4.	Store 4	Crystal Lake, 6000 Northwest Hwy.
5.	Store 5	Downers Grove, 7241 Lemont Rd.
6.	Store 6	Chicago, 5829 S. Archer Ave.

Exhibit 2: Description of the Brands Used for the Study		
Sl. No	**Brand Name**	**Description**
1.	Kix	The first "puffed" cereal, was introduced in 1937 by the General Mills.
2.	Trix	Trix is a popular brand of breakfast cereal made by General Mills. It was first marketed in 1959.
3.	Nabisco	Nabisco is a popular cereal brand of RJR Nabisco.
4.	Kellogg's	Kellogg Company (often referred to as simply Kellogg or Kellogg's) is an American multinational producer of Kellogg's cereals.
5.	Cheerios	Cheerios is a brand of breakfast cereal created in 1941 and marketed by the General Mills cereal company of Golden Valley, Minnesota, as the first oat-based, ready-to-eat cold cereal.
6.	Dominick's	Is the private brand of Dominick's store based in Chicago.
7.	Wheaties	Wheaties, a wheat and bran mixture baked into flakes, is a breakfast cereal introduced in 1924 and marketed by the General Mills.
8.	Golden Grahams	Golden Grahams is a brand of breakfast cereal owned by General Mills. It consists of small toasted square shaped cereal pieces made of whole wheat and corn.
9.	Cinnamon Cheer	Manufactured and marketed by General Mills.
10.	Cocoa Puffs	Cocoa Puffs is a brand of chocolate-flavored breakfast cereal manufactured by General Mills.

The data set contained comprehensive information regarding the various breakfast cereal brands for more than 100 stores. The information for each product—Stock Keeping Unit (SKU)—was available in two data sets. The first data set contained information on UPC codes, product name, product size, and pack size, while the second data set consisted of prices for various brands and stores for 399 weeks, quantity sold, sales promotions, types of promotions offered, gross margin, and package sizes. Only those brand-store combinations, where the data set was available for a continuous period of more than 100 weeks, were considered. The primary interest was in culling out data regarding specific retailer price points and price actions for ten brands included in the study. SAS 9.1 was used to analyze the data.

The retail prices[5] of the brands and quantity moved at specific prices were used to calculate the following indices for the analysis—average price, price actions, price rigidity, and concentration ratio.

Average price (per unit) was calculated for ten brands across the six stores. Exhibit 3 provides the details of the average prices for the various brands.

Exhibit 3: Average Prices for Ten Brands Across Six Stores in US Dollars

Brand \ Store	Store 1	Store 2	Store 3	Store 4	Store 5	Store 6	Average (Brands)
Kix	3.42	3.34	3.32	3.21	3.27	3.43	3.33
Trix	4.31	4.14	4.05	4.00	4.02	4.15	4.11
Nabisco	2.80	2.60	2.55	2.50	2.53	2.53	2.59
Kellogs	2.21	2.25	2.22	2.20	2.21	2.24	2.22
Cheerios	3.23	3.11	3.02	3.10	3.03	3.13	3.10
Dominick's	1.67	1.61	1.56	1.52	1.55	1.60	1.59
Wheaties	3.28	3.09	3.085	3.03	3.05	3.13	3.11
Golden Grahams	3.94	3.78	3.70	3.65	3.69	3.78	3.76
Cinnamon Cheerios	3.24	3.10	3.05	3.03	3.01	3.13	3.09
Cocoa Puffs	3.46	3.31	3.27	3.18	3.24	3.29	3.29
Average (Stores)	3.156	3.033	2.9825	2.942	2.96	3.041	3.02 / 3.02

Those prices that remained unchanged for four weeks or less and showed at least 5 percent change in price compared with the previous price were considered as 'price actions'. If the price change remained for more than four weeks, the price changes were considered as normal price changes due to market movements (Madakom, 1999; and Herrmann and Moeser, 2006). The number of price actions observed for the ten brands across the six stores is presented in Exhibit 4.

Exhibit 4: Price Actions for Ten Brands Across Six Stores

Brand \ Store	Store 1	Store 2	Store 3	Store 4	Store 5	Store 6	Median (Brands)
Kix	6	7	6	8	9	10	7.5
Trix	6	7	8	6	10	5	6.5
Nabisco	4	2	4	5	3	5	4.0
Kellogg	23	15	15	34	52	43	28.5
Cheerios	40	39	45	49	43	32	41.5
Dominick's	56	39	42	43	35	47	42.5
Wheaties	26	26	25	24	21	26	25.5
Golden Grahams	10	8	9	11	10	8	9.5
Cinnamon Cheer	17	15	18	17	13	17	17
Cocoa Puffs	11	12	15	12	17	10	12
Median (Stores)	14	13.5	15	14.5	15	13.5	14.50 / 14.25

[5] The retail prices are the actual transaction prices, i.e., the price customers paid for the product at the cash counter.

Price rigidity (PRIG) was calculated as the mean duration of unchanged prices (Powers E T and Powers N J, 2001). This is calculated as the ratio of number of weeks of available prices for the brand and number of weeks of price actions.

$$PRIG = w / w_{PCN}$$

where w is the number of weeks of available prices for the brand, and w_{PCN} is the number of weeks with price actions. Exhibit 5 describes the price rigidity of the various brands.

Exhibit 5: Price Rigidity (PRIG) for Ten Brands Across Six Stores

Brand \ Store	Store 1	Store 2	Store 3	Store 4	Store 5	Store 6	Median (Brands)
Kix	25.00	22.70	20.70	24.20	18.69	22.45	22.58
Trix	43.25	30.80	31.36	39.13	18.80	52.00	35.25
Nabisco	27.20	82.00	41.25	39.66	32.00	39.0	39.33
Kellogs	10.13	16.80	15.18	9.65	5.55	6.69	9.89
Cheerios	8.09	9.21	7.00	7.24	7.79	9.76	7.94
Dominick's	3.44	5.77	4.85	5.59	5.44	4.80	5.15
Wheaties	10.67	9.44	9.55	11.37	10.73	14.48	10.70
Golden Grahams	22.75	32.63	30.25	28.00	26.14	32.90	29.13
Cinnamon Cheer	15.61	17.80	17.95	19.05	25.93	17.24	17.88
Cocoa Puffs	21.69	21.77	14.20	19.00	15.00	25.82	20.35
Medians (Stores)	18.65	19.79	16.57	19.03	16.85	19.85	19.11 / 18.84

Concentration Ratio (CR) is the ratio of quantity moved of a specific brand at a psychological price point and the total quantity moved at all price points (Herrmann and Moeser, 2006). This ratio is expressed in percentages.

$$CR = q_{pp} / q$$

where q_{pp} is the quantity moved at a psychological price point, and q is the total quantity moved at all price points. Five psychological price points (based on maximum quantity moved) for each brand for every store was calculated (Exhibit 7). The CR for the five most important psychological prices is offered in Exhibit 6. The data set for breakfast cereals indicates a very large number of price points (even-ending price points, e.g., 2.10, 3.12; odd-ending price points, e.g., 2.11, 3.13; psychological prices which are odd-ending prices but below-the-round-figure-price point, e.g., 2.99 and 3.17).

Promotion ratio was calculated as the ratio of number of weeks of sales promotion for the brand and the total number of weeks. Exhibit 8 describes the promotion ratio of various brands.

$$p_R = w_{PR} / w$$

where w_{PR} is the number of weeks during which promotions were offered on the brand, while w represents the total number of weeks for which the data was available.

Exhibit 6: Concentration Ratio for the Five Most Important Psychological Prices for Ten Brands in Six Stores							
Brand \ Store	Store 1	Store 2	Store 3	Store 4	Store 5	Store 6	Median (Brands)
Kix	56.67	55.86	40.4	80.62	41.37	58.88	56.27
Trix	23.98	19.58	48.55	28.91	47.13	39.25	34.08
Nabisco	55.87	74.59	80.97	78.43	**92.49**	80.31	79.37
Kellogg	37.20	59.75	21.85	58.56	63.62	46.35	52.46
Cheerios	31.71	36.22	27.8	47.5	29.8	30.0	30.86
Dominick's	77.36	65.09	60.78	59.88	72.80	56.60	62.94
Wheaties	36.95	40.13	16.87	**12.21**	19.17	35.88	27.53
Golden Grahams	53.65	35.46	27.26	39.28	42.73	33.33	37.37
Cinnamon Cheer	61.82	34.28	26.21	40.66	35.45	32.18	34.87
Cocoa Puffs	24.21	28.16	31.99	56.97	26.65	27.65	27.91
Median (Stores)	45.43	38.18	29.90	52.24	42.05	37.57	36.12 / 40.11

Exhibit 7: Concentration Ratios of Five Most Important Psychological Prices for Cheerios in Store 3 (CR5)			
S. No	**Price Points**	**Quantity Moved**	**Concentration Ratio**
1	1.99	143	1.03
2	2.65	3950	28.32
3	2.84	27	0.19
4	2.95	1680	12.04
5	2.99	1359	9.74
6	3.09	1916	13.74
7	3.13	18	0.13
8	3.15	26	0.19
9	3.18	26	0.19
10	3.19	387	2.77
11	3.22	656	4.70
12	3.24	58	0.42
13	3.25	1825	13.08
14	3.29	45	0.32
15	3.3	29	0.21
16	3.34	647	4.64
17	3.35	1063	7.62
18	3.39	69	0.49
19	3.41	25	0.18
Total	**19**	**3874/13949**	**CR5 = 27.77**

Exhibit 8: Promotion Ratio for (P_R) for Ten Brands Across Six Stores							
Store / Brand	Store 1	Store 2	Store 3	Store 4	Store 5	Store 6	Median (Brands)
Kix	0.0201	0.0201	0.0251	0.0301	0.0326	0.0301	0.0301
Trix	0.0369	0.0495	0.0424	0.0669	0.0777	0.0563	0.0529
Nabisco	**0.0169**	0.0170	0.0197	0.0196	0.0166	0.0168	0.0169
Kellogg	0.1157	0.1096	0.0992	0.1120	0.1230	0.0970	0.1108
Cheerios	0.1240	0.1117	0.1047	0.1044	0.1178	0.1105	0.1111
Dominick's	0.0495	0.0390	0.0386	0.0385	0.0410	0.0359	0.0388
Wheaties	0.1044	0.1170	0.0879	0.0829	0.1120	0.0914	0.0979
Golden Grahams	0.0780	0.0758	0.0613	0.0718	0.0799	0.0691	0.0738
Cinnamon Cheer	0.0496	0.0389	0.0458	0.0456	0.0421	0.0458	0.0457
Cocoa Puffs	**0.1641**	0.1246	0.1576	0.1451	0.1295	0.1541	0.1496
Median (Stores)	0.0654	0.0627	0.0535	0.0694	0.0788	0.0627	0.0634 / 0.0641

One-way ANOVA was used to investigate the pricing strategies adopted by the different brands and stores considered in the study. Multiple regression analysis was used to test whether the price rigidity was dependent on the price actions, psychological prices as represented by CR5 and promotion ratio. In addition, price rigidity was modeled across stores and brands using a regression analysis where the study considered concentration ratio, price actions, and price actions across the six stores (using dummy variables × price actions) as the main determinants of price rigidity.

Analysis and Discussion

The average prices of the different brands across the stores were used in one-way ANOVA. It is observed that the pricing strategies followed by the six stores were similar with no significant differences in the average prices of brands at the store level (Exhibit 9). This indicates that the stores follow a similar pricing strategy, irrespective of the location of the store. The small differences observed in the average prices (Exhibit 3) across stores might be due to differential promotional strategies and price actions taken at the store level. It is also

Exhibit 9: One-way ANOVA to Gauge Whether There Exist Difference in the Pricing Policy Followed by Various Stores					
Store Price					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	0.302	5	0.060	0.113	0.989
Within Groups	28.951	54	0.536		
Total	29.253	59			

observed that the store brand (Dominick's corn flakes) is priced lowest among all brands considered (40 percent-160 percent).

Further, ANOVA was carried out to explore whether there existed differences in pricing strategy among brands. The findings showed significant difference in the pricing strategies adopted by the various brands (Exhibit 10). Hence, it can be concluded that the pricing strategy is brand-driven and that the stores at the individual level do not follow differential pricing strategies. This observation indicates that pricing strategy is not driven by the store level demand and is determined at a more aggregate level.

Exhibit 10: One-way ANOVA to Gauge the Differences in Pricing Policy Followed by Various Brands

Brand Price

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.796	9	3.200	409.603	0.000
Within Groups	0.383	49	0.008		
Total	29.178	58			

It can be observed from Exhibit 4 that three of the national brands—Kix, Trix, and Nabisco—had few price actions when compared with the other leading national brands—Kellogg's, Wheaties, and Cheerios—and the store brand. The pattern of price actions of the store brand emerges similar to that of Kellogg's and Cheerios. Three brands—Golden Grahams, Cocoa Puffs, and Cinnamon Cheerios—fare moderately in terms of the number of price actions. The median number of price actions across the stores is observed to be similar while the median price actions seem markedly different across brands. Therefore, the study concludes that the number of price actions are brand dependent and not store dependent. Median number of price actions is considered instead of average since price actions are counted as discrete numbers of specific price changes.

Exhibit 5 summarizes the price rigidity (PRIG) for the ten brands. It is observed that there is substantial degree of differences displayed in the price rigidity by the ten brands. The mean duration of unchanged prices ranges from 82 weeks (Nabisco) to 3 weeks (Dominick's). It was also observed that the price rigidity is lower for brands with large number of price actions (Nabisco—Price Actions: 4, PRIG: 44; Dominick's—Price Actions: 44, PRIG: 5).

Concentration ratio was analyzed for the ten brands across the six stores. Concentration ratio is the percentage of quantity moved at a specific psychological price point. We defined psychological price as just-below-the-round-figure pricing (Fengler and Winter, 2001; and Hermann and Moeser, 2006). Exhibit 5 presents the quantity moved at five most important psychological prices expressed as a percentage of the total quantity moved at all price points. A general observation across the brands and stores is that psychological pricing contributes to a bulk of the sales volume (12.21 percent to 92.49 percent).

Promotion ratio was analyzed for the ten brands across the six stores. Promotion ratio is the percentage of the number of weeks during which promotion was offered for the brand to the total number of weeks for which the data was

available on the shelf. Exhibit 8 summarizes the promotion ratio for various brands. Also no significant correlation was observed between promotion ratio and price actions.

From the observation of the variables described earlier, it was of interest to analyze whether psychological pricing, promotion ratio, and price actions cause price rigidity. It might be noted that the price actions, sales promotions, and the psychological pricing variables are strategic and tactical tools that are used by the marketer to improve sales and therefore it is reasonable to expect that the price rigidity is determined by these variables. Hence, price rigidity was regressed across brands and stores using price actions, sales promotion ratio, and concentration ratio (CR5) as main determinants. In addition, the individual store-specific variables (Dummy 1, 2, 3, 4, and 5) are included to determine their effect on price rigidity. Several alternative model specifications used in the study are presented in Exhibit 11.

Exhibit 11: Determinants of Price Rigidity

Independent Variables	Estimated Coefficients			
	Model 1	**Model 2**	**Model 3**	**Model 4**
Constant	31.192***	26.561***	13.559***	27.197**
Actions	–0.613***	–0.594***	–.570***	–0.457
CR5		.080**	0.048	0.082*
Promotion			–30.573	
Dummy1				–0.165
Dummy 2				–0.202
Dummy 3				–0.157
Dummy 4				–0.120
Dummy 5				–0.747
Adj. R^2	**0.723**	**0.724**	**0.729**	**0.708**
F-statistic	146.056	53.549	36.786	14.611

Note: *** Significant at 99%.
** Significant at 95%.
* Significant at 90%.

The results indicate that price actions and psychological prices contribute significantly to price rigidity. Besides price actions, the concentration ratio is significant in all the specified models except in model 3. The coefficients appear to be stable. The slight change in model 3 could be due to the introduction of additional variable (sales promotion) which the other models do not specify. The dummy variables for the stores (Models 4 and 5) and the sales promotions (Model 3) are not significant in the models in which they were introduced. The coefficient for price actions on PRIG is negative and significant in all models (except Model 4) specified. This indicates that an increase in price actions by one percentage point reduces the price rigidity (average number of weeks with unchanged prices) by 6.13 percentage points (Model 1). The coefficients for CR5

on PRIG are positive and significant. Thus, it can be concluded from the results that the number of price actions and psychological prices are significant determinants of price rigidity in breakfast cereals. An increase in number of promotions reduces price rigidity, while psychological pricing strategy increases price rigidity.

Conclusion

The objective of the study was to determine the role of psychological pricing in the contribution to price rigidity of breakfast cereals in the US. Several inferences emerge from the analysis. First, the analysis indicates that psychological pricing points are extremely important for breakfast cereals retailing (median: 40.11% of sales as indicated in Exhibit 6). Second, it is notable that price point endings with the digit nine are by far the most important (Exhibit 7) and there is a strong concentration of prices on a few psychological prices. Third, there is strong heterogeneity across brands and not across stores. Fourth, price changes every 14 weeks across the brands and stores. The regression results confirm that psychological pricing and price actions are significant determinants of price rigidity. The patterns are consistent with those observed in studies carried out in European countries and the US (Baharad and Eden, 2004; Aucremanne and Dhyne, 2004; Dias *et al*., 2004; and Herrmann and Moeser 2006).

Limitations of the Study

These findings can be incorporated into the development of new models of pricing at the firm level. However, the findings of this study are limited to breakfast cereal brands sold in six stores in Dominick's supermarket chain and do not yet include other products that may be subject to different price change considerations and dynamics. For example, we need to ask: Will the same findings be obtained for other food product categories, consumer packaged goods or electronic durables that are subject to rapid price adjustments? Thus, a word of caution would be to avoid inappropriate generalization of the results beyond the limited context in which they apply.✠

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