
Private label price rigidity during holiday periods

Georg Müller^a, Mark Bergen^b, Shantanu Dutta^c and Daniel Levy^{d,*}

^a*Strategic Pricing Group, One Lincoln Center, 18W140 Butterfield Rd, 15th Floor, Oakbrook Terrace, IL 60181, USA*

^b*Department of Marketing and Logistics Management, University of Minnesota Minneapolis, MN 55455, USA*

^c*Department of Marketing, Marshall School of Business, University of Southern California, Los Angeles, CA 90089-1421, USA*

^d*Department of Economics, Bar-Ilan University, Ramat-Gan 52900, Israel*

Using weekly retail transaction scanner price data from a large US supermarket chain, significantly higher retail price rigidity is found for private label products than for nationally branded products during the Christmas and Thanksgiving holiday periods relative to the rest of the year. The finding cannot be explained by changes in holiday period promotional practices because it is found that private label promotions appear to diminish at least as much as national brands. The increased rigidity of private label products relative to national brands is only partially accounted for by increased rigidity of wholesale prices. After ruling out other potential explanations, it is suggested that the higher private label price rigidity might be due to the increased emphasis on social consumption during holiday periods, raising the customers' value of nationally branded products relative to the private labels.

I. Introduction

Although the study of variation in price rigidity across markets, industries, and products has received some attention in the literature, numerous authors have called for more studies in this area, arguing that understanding the reasons for the variation '...is crucial for the theory of price adjustment' (Gordon, 1981, p. 517).¹

In this paper we explore variation in price rigidity between private label and nationally branded products.² There is good reason to believe, *a priori*, that adjustment patterns may vary between private labels and national brands. For example, Barsky *et al.* (2003) find dramatically different markups for private labels than national brands across a wide variety of product categories. Dutta *et al.* (2002) document variation in cost shock

*Corresponding author. E-mail: Levyda@mail.biu.ac.il

¹See also Mankiw (1985), Carlton (1986), Cecchetti (1986), Caplin and Leahy (1991), Caplin (1993), Sheshinski and Weiss (1993), Basu (1995), Kashyap (1995), Blinder *et al.* (1998), Slade (1998), and Levy *et al.* (2002), and the references cited therein.

²Private labels are also known as 'store brands' and refer to the in-house brand, which is usually owned and sold by a particular retail supermarket chain. Nationally branded products are manufactured by big national producers and carried by most large supermarkets. Dominick's carries a large number of private label products in nearly all categories we study. See Barsky *et al.* (2003) for more details.

pass-through patterns between private labels and national brands.³

Holiday periods provide an interesting opportunity to study variation in price rigidity because studies have documented interesting pricing patterns during holiday periods.⁴ For example, Müller *et al.* (2002) provide evidence that retail prices are more rigid during holiday periods.⁵ Our discussions with retail managers also suggest that holiday periods are unusual for retailers in terms of their price adjustment activities.

We use store-level weekly time series data of actual retail and wholesale transaction prices for 4532 products in 18 categories over a four-year period at a large Mid-western supermarket chain. We find greater price rigidity for private label products in comparison to national brands during holiday periods. We argue that this is due to the increased emphasis on social consumption during holiday periods and the corresponding substitution of branded products for private label items, which increases the value of nationally branded products relative to store brands.

The paper is organized as follows. In Section II, we describe the data. In Section III, we report the statistical test results. Section IV discusses the role of social consumption in determining the extent of holiday price rigidity, and Section V concludes.

II. Data

The data come from Dominick's, a large Mid-western supermarket chain operating 94 stores in the Chicago area with a market share of about 25%.⁶ The specific time series we use come from the scanner data of six stores of the chain and contain the retail prices, which are the actual transaction prices at the cash register, and information on the stores' promotional activity. The data are weekly, which parallels the chain's weekly pricing cycle, as documented by Slade (1998).⁷ Our data include 4532 products in 18

Table 1. Product categories and the number of products in each category

No.	Product category	Number of products
1	Analgesics	1362
2	Bottled Juices	1578
3	Cereals	1740
4	Cheeses	2262
5	Crackers	822
6	Canned Soups	1824
7	Dish Detergents	1086
8	Frozen Entrees	3306
9	Frozen Juices	702
10	Fabric Softeners	1176
11	Laundry Detergents	2160
12	Paper Towels	510
13	Refrigerated Juices	672
14	Soft Drinks	3666
15	Snack Crackers	1368
16	Canned Fish	1008
17	Tooth Pastes	1530
18	Toilet Tissues	420
	Total	27 192

Note: The number of products is calculated using the data for all six stores combined.

categories as listed in Table 1. The data cover a four-year period, from 14–20 September 1989 to 16–22 September 1993, yielding a total of 210 weekly observations.⁸

There are many holidays throughout the year, but few are as closely associated with consumption of food as Thanksgiving and Christmas. Warner and Barsky (1995) and Chevalier *et al.* (2003) also suggest that the two holidays are the busiest shopping periods. Indeed, our analysis shows that unit sales are 6% higher (with $t=3.22$, significant at 1% level) during these holiday period. In fact, Dominick's managers describe the time just before Thanksgiving through to the end of Christmas as 'the holiday season'. Thus, we define the 6-week period from the week before Thanksgiving through the week of Christmas as the holiday period.⁹

³There is also a growing literature in marketing, documenting differences between national brands and private labels. See, for example, Hoch and Banerji (1993).

⁴See, for example, Pashigian (1994), Warner and Barsky (1995), and Chevalier *et al.* (2003).

⁵They, however, do not study variation in the rigidity across private label and national brand products.

⁶For more details see Müller *et al.* (2002), Barsky *et al.* (2003), or Chevalier *et al.* (2003). The data are available at www.gsb.uchicago.edu/research/mkt/MarketingHomePage.html.

⁷Dominick's has three price zones, and the six stores in our sample are in the mid-price zone. Prices for all stores within the chain are set centrally at corporate headquarters. During data collection, the chain was conducting pricing experiments, but the stores in our sample come from the 'control' group, which followed the same pricing strategy. We also analysed data for three other stores that faced a greater competition but the results we obtained were nearly identical to what we report here.

⁸Due to product additions and deletions, not all products have a full 210-week sales history.

⁹We also ran the analyses for other combinations of holiday weeks, including two weeks before Christmas and two weeks after Christmas, or focusing on each holiday individually. Our results were similar for all the alternative combinations we ran. In addition, we run a similar analysis by including other holiday periods such as Memorial Day, 4th of July, and Labor Day, but found that the holiday period price rigidity results primarily hold for the Thanksgiving and the Christmas holidays.

Table 2. Average number of price changes per week for national brand products

Category	Non-holiday	Holiday	Change (%)	<i>t</i> -statistic
Analgesics	74	64	-14	-1.33 ^c
Bottled Juices	152	125	-18	-1.90 ^b
Cereals	126	81	-36	-2.69 ^a
Cheeses	229	221	-3	-0.36
Crackers	87	72	-17	-1.25
Canned Soups	165	161	-2	-0.27
Dish Detergents	63	59	-6	-0.56
Frozen Entrees	336	210	-38	-6.05 ^a
Frozen Juices	93	85	-9	-0.80
Fabric Softeners	62	47	-24	-2.12 ^b
Laundry Detergents	109	87	-20	-2.44 ^a
Paper Towels	42	33	-21	-1.93 ^b
Refrigerated Juices	106	94	-11	-1.47 ^c
Soft Drinks	655	607	-7	-1.55 ^c
Snack Crackers	146	185	27	2.04 ^b
Canned Fish	81	67	-17	-1.90 ^b
Tooth Pastes	111	92	-17	-1.27
Toilet Tissues	51	39	-24	-2.39 ^a
Total	2688	2329	-13	-5.80 ^a

Note: Superscripts a, b, and c indicate statistical significance at 1%, 5%, and 10%, respectively. The corresponding critical values are 2.33, 1.64, and 1.28, respectively.

III. Findings

In Tables 2 and 3 we report the average number of price changes per week, during holiday and non-holiday periods for national brand and private label products, respectively. A price change here is defined as a price difference in two successive weeks. The number of price changes is calculated across all six stores to accommodate possible variation in product selection across stores. Overall, the figures indicate that prices are more rigid during holiday weeks in comparison to the rest of the year, and that holds for both national brands and private labels.¹⁰

Comparing the extent of holiday price rigidity between national brand and private label products, we find that the phenomenon is more pronounced for the private label products. For example, according to Tables 2 and 3, the frequency of price changes for national brand products declines by 13% on average (with $t = -5.80$, which is significant at 1% level). For private label products, in contrast, the frequency of price changes declines by 26% on average (with $t = -4.23$, which is significant at 1% level). In some categories, the size of the difference is particularly striking. These include Analgesics, 14% versus 58%, Cheeses, 3% versus 25%, Dish Detergents, 6% versus 38%, Frozen Juices, 9% versus 28%, Laundry

Detergents, 20% versus 60%, Paper Towels, 21% versus 65%, Canned Fish, 17% versus 65%, and Tooth Paste, 17% versus 61%, respectively.

We considered the possibility that the finding may be related to changes in holiday period promotional practices. For this we computed the average number of promotions per week for national brands and private labels during holiday and non-holiday periods. According to the results, which are reported in Tables 4 and 5, promotional activity goes down for both national brands and private labels for most categories. On a percentage basis, however, private label promotions go down at least as much or more as national brands with the exception of two categories, Bottled Juices and Soft Drinks.

An alternative explanation for the difference in the extent of holiday price rigidity between national brand and private label products may be related to differences in the extent of rigidity in their wholesale prices across the holiday/non-holiday periods. To examine this possibility, we calculated the average frequency of wholesale price changes during the holiday and non-holiday periods for both national brand and private label products. The wholesale price data also come from the chain's scanner database and is calculated from retail margins, which are included in the database. Despite their shortcomings,

¹⁰ This finding, however, is not the focus of this paper, because it is reported and discussed in Müller *et al.* (2002). Their explanation for the greater holiday price rigidity is higher opportunity costs of price adjustment during holiday periods. In this paper, our focus is on the differences between national brand and private label products.

Table 3. Frequency of price changes per week for private label products

Category	Non-holiday	Holiday	Change (%)	t-statistic
Analgesics	7.6	3.2	-58	-3.23 ^a
Bottled Juices	13.0	9.1	-30	-2.07 ^b
Cereals	11.0	5.7	-48	-2.98 ^a
Cheeses	56.0	42.0	-25	-1.97 ^b
Crackers	4.5	4.6	2	0.08
Canned Soups	8.3	8.3	0	0.00
Dish Detergents	7.4	4.6	-38	-1.83 ^b
Frozen Entrees	There are no private label products in this category			
Frozen Juices	13.0	9.4	-28	-2.28 ^b
Fabric Softeners	5.4	2.3	-57	-4.19 ^a
Laundry Detergents	4.0	1.6	-60	-4.01 ^a
Paper Towels	2.0	0.7	-65	-3.81 ^a
Refrigerated Juices	8.0	6.2	-23	-1.39 ^c
Soft Drinks	72.0	62.0	-14	-0.91
Snack Crackers	4.9	3.1	-37	-1.73 ^b
Canned Fish	3.7	1.3	-65	-3.64 ^a
Tooth Pastes	1.8	0.7	-61	-2.29 ^b
Toilet Tissues	3.0	1.5	-50	-1.88 ^b
Total	225.6	166.3	-26	-4.23 ^a

Note: Superscripts a, b, and c indicate statistical significance at 1%, 5%, and 10%, respectively. The corresponding critical values are 2.33, 1.64, and 1.28, respectively.

Table 4. Frequency of promotions per week for national brand products

Category	Non-holiday	Holiday	Change (%)	t-statistic
Analgesics	18	32	78	2.89 ^a
Bottled Juices	79	61	-23	-2.41 ^a
Cereals	66	40	-39	-4.11 ^a
Cheeses	85	96	13	0.77
Crackers	39	59	51	4.96 ^a
Canned Soups	57	100	75	1.67 ^b
Dish Detergents	32	26	-19	-1.64 ^b
Frozen Entrees	172	75	-56	-4.73 ^a
Frozen Juices	46	48	4	0.27
Fabric Softeners	34	20	-41	-4.67 ^a
Laundry Detergents	69	42	-39	-7.12 ^a
Paper Towels	26	25	-4	-0.43
Refrigerated Juices	56	44	-21	-2.88 ^a
Soft Drinks	357	314	-12	-2.07 ^b
Snack Crackers	58	106	83	2.15 ^b
Canned Fish	23	92	300	18.45 ^a
Tooth Pastes	83	56	-33	-3.16 ^a
Toilet Tissues	28	28	0	0.00
Total	1328	1264	-5%	-1.26

Note: Superscripts a, b, and c indicate statistical significance at 1%, 5%, and 10%, respectively. The corresponding critical values are 2.33, 1.64, and 1.28, respectively.

as Barsky *et al.* (2003) note, these wholesale price data are quite unique given that cost data are usually proprietary. According to Dominick's managers, they rely on these wholesale prices for making their pricing decisions. The results suggest that the increased rigidity of private label products relative to national

brands is only partially accounted for by increased rigidity of wholesale prices in either case: the wholesale price changes decline only by 5% for national brands and by 8% for private labels. This finding holds for most of the individual categories as well.¹¹

¹¹ Chevalier *et al.* (2003) also find that changes in wholesale prices at this chain are small in absolute as well as in relative terms.

Table 5 Frequency of promotions per week for private label products

Category	Non-holiday	Holiday	Change (%)	<i>t</i> -statistic
Analgesics	8.2	14.0	71	1.47 ^c
Bottled Juices	7.7	6.2	-19	-1.23
Cereals	5.3	2.8	-47	-2.64 ^a
Cheeses	25.0	28.0	12	0.55
Crackers	4.8	4.0	-17	-0.67
Canned Soups	1.8	2.9	61	0.73
Dish Detergents	2.6	3.7	42	0.67
Frozen Entrees	There are no private label products in this category			
Frozen Juices	8.9	7.0	-21	-1.20
Fabric Softeners	1.4	0.8	-43	-1.16
Laundry Detergents	0.9	0.3	-67	-2.16 ^b
Paper Towels	2.2	0.3	-86	-5.47 ^a
Refrigerated Juices	9.2	7.0	-24	-1.49 ^c
Soft Drinks	50.0	48.0	-4	-0.22
Snack Crackers	0.4	0.5	25	0.28
Canned Fish	3.1	0.5	-84	-4.13 ^a
Toothpastes	1.4	0.0	-100	-5.50 ^a
Toilet Tissues	1.1	0.0	-100	-5.26 ^a
Total	134.0	126.0	-6	-0.67

Note: Superscripts a, b, and c indicate statistical significance at 1%, 5%, and 10%, respectively. The corresponding critical values are 2.33, 1.64, and 1.28, respectively.

IV. The Role of Social Consumption

We believe that at least some of the holiday price rigidity of private label products may be due to the increased emphasis on social consumption during holiday periods, which leads to an increase in the value of nationally branded products relative to store brand products. A large literature in marketing suggests that national brand products may be more valuable during holiday periods because they are consumed in social settings, with friends and family members.¹²

People want to leave positive impressions, and show they care, by buying the 'best', or at least do not want to appear cheap. Thus, social consumption that takes place during holiday periods decreases the value of private label products relative to nationally branded products.

This makes a price change for private label products less effective during holiday periods. This will be particularly true if costs of price adjustment are indeed higher during holidays, as reported by Müller *et al.* (2002). We would expect, therefore, that it would be store brand products, i.e. those products whose price changes have lower marginal value, which would see fewer price changes relative to national brands. Indeed, this is what we find.

We considered alternate explanations but they seem inconsistent with our findings. Consider Blinder *et al.*'s (1998) list of price rigidity theories. Theories based on the nature of contracts, imperfect information, or the nature of market interactions seem unable to explain these results because these factors are unlikely to vary between holiday and non-holiday periods and between national brand and private label products. Similarly, theories of price rigidity based on the nature of costs can be ruled out because cost factors are unlikely to vary between holiday and non-holiday periods.¹³ Finally, demand based price rigidity theories are not likely to provide a satisfactory explanation because these factors do not vary between holiday and non-holiday weeks. For example, theories of pro-cyclical elasticity of demand actually predict greater price *flexibility* because during holiday periods, customers become more price-sensitive. Finally, quality or other non-price aspects of the products, as far as we know, do not vary between the holiday and non-holiday weeks.

V. Conclusions

Using a unique data set on actual retail transaction prices for thousands of products at a major retail chain, we demonstrate that prices are more rigid for

¹² See, for example, Belk (1976), Cheal (1987), and Otnes *et al.* (1993).

¹³ The costs of price adjustment theory, which, as Muller *et al.* (2002) have argued, lead to the holiday price rigidity for both branded and private label products, is obviously an exception.

private labels than for national brands during holiday periods in comparison to non-holiday periods. We find that social consumption theory provides the best explanation for the phenomenon. This explanation lends credence to the importance of customer considerations in determining price change activity as suggested by Okun's (1981) customer market theory, and more recently by Blinder *et al.* (1998), Rotemberg (2002), Ball and Romer (2003), and Zbaracki *et al.* (2004), who emphasize the importance of customer considerations in firm-level price setting decisions. More generally, this study underscores the importance of studying price adjustment behaviour during holiday periods, and the value of holiday periods as a 'natural laboratory' for economists for studying various issues.

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