Holiday Price Rigidity and Cost of Price Adjustment

Daniel Levy
Department of Economics
Bar-Ilan University
Ramat-Gan 52900
ISRAEL
(03) 531-8331, levyda@mail.biu.ac.il

Georg Müller
Litholink Corporation
2250 West Campbell Park Drive
Chicago, IL 60612
(312) 243-0600, gmuller@litholink.com

Shantanu Dutta
Department of Marketing
University of Southern California
Los Angeles, CA 90089-1421
(213) 740-5038, sdutta@marshall.usc.edu

Mark Bergen
Department of Logistics and Marketing Management
University of Minnesota
Minneapolis, MN 55455
(612) 624-1821, mbergen@csom.umn.edu

Last Revision: December 26, 2001

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Abstract

Using unique retail and wholesale price data for 4,532 products carried by a major Midwestern grocery retailer, we find evidence of significant retail price rigidity during the Thanksgiving through Christmas holiday period relative to the rest of the year. We suggest that this pattern of holiday retail price rigidity is best explained by an increased opportunity cost of changing prices at these stores during the holiday period. Evidence based on discussions with retail managers suggests that during holidays the physical, managerial, and customer costs of changing prices rise considerably. Due to higher store traffic, performing tasks such as restocking shelves, handling customers' questions and inquiries, running cash registers, cleaning, and bagging, become more urgent during holidays and thus receive priority. As a result, the holiday-period opportunity cost of price adjustment increases dramatically for the stores. The data provide a natural experimental setting to study variation in price rigidity because the products, stores, and surrounding institutional features and arrangements, including the market structure, the contractual arrangements, and the nature of relationships, etc., do not change between holiday and non-holiday weeks.

1. Introduction

> "It's a madhouse during the holidays. There is no time to do anything that is marginal or incremental—you have to focus on the essential issues, keeping items in stock, keeping the registers manned, and making the store presentable. The key is to manage the flow of goods and customers through the store."
>
> Brett Drey, Retail Manager

The study of price rigidity is a central issue in economics in areas ranging from industrial organization (e.g., Stigler and Kindahl, 1970; Carlton 1986; Geroski, 1992; Genesove, 1999) to macroeconomics (e.g., Lach and Tsiddon, 1992 and 1996; Ball and Mankiw, 1995; Caplin, 1993; Warner and Barsky, 1995). In particular, the study of variations in price rigidity across dimensions such as time, markets and products has a long history in economics.[1] According to Gordon (1981, p. 517), understanding the reasons for the "Heterogeneity [in price rigidity] is crucial for the theory of price adjustment." Echoing similar thoughts, Caplin (1993, p. 21) suggests that "It is unfortunate that so little attention has been given to characterizing the circumstances that give rise to high and low levels of nominal price inertia. Progress in this dimension calls for more detailed empirical work and for increased understanding of the manner in which corporations actually arrive at pricing decisions."

A large body of the existing theoretical literature, including Mankiw (1985), Parkin (1986), Rotemberg (1982), Caplin and Spulber (1987), Ball and Mankiw (1994a, 1994b, 1995), Ball and Romer (1991), Slade (1998), Caplin and Leahy (1991), and Danziger (1983, 1999, 2001), among others, explores the macroeconomic implications of costs of price adjustment. In fact, much of the theoretical work in the New Keynesian macroeconomic literature has relied on menu costs as a critical theoretical lynchpin. However, very little is known about the actual empirical relevance of these costs (Ball and Mankiw, 1994a; Slade, 1998).

This study contributes to the literature by demonstrating the critical importance of price adjustment costs for price rigidity in the retail supermarket industry, an industry with a substantial economic significance. This is accomplished by documenting a variation in retail supermarket price rigidity across holiday and non-holiday periods.

The investigation of price rigidity during holiday periods was prompted by suggestions from practitioners. During our discussions with retail managers we repeatedly heard that prices during holiday periods are not changed as often as during the rest of the year. There is also a precedent in economics for studying variation in pricing patterns between holiday and non-holiday periods. See, for example, Pashigian (1994), Warner and Barsky (1995), and more recently, Chevalier, Kashyap, and Rossi (2000).

To study variation in price rigidity, we use a unique multi-product store-level weekly time series data set consisting of retail and wholesale prices for 4,532 different products in 18 consumer product categories over a four-year period at a large mid-western supermarket

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[1] Studies that emphasize variation in price rigidity include, Mills (1927), Domberger (1979), Gordon (1983, 1990), Bedrossian and Moschos (1988), Encaoua and Geroski (1984), Carlton (1986, 1989), Blinder (1991), Caplin and Leahy (1991), Hannan and Berger (1991), Geroski (1992), Neumark and Sharpe (1992), Carlton and Perloff (1994), Caucutt, et al. (1995), Hall, et al. (1997), and Slade (1996, 1998).

chain. See Table 1 for the list of the categories and the number of products included in each category per store. These product- and store-level price and cost data are particularly suitable for studying price rigidity and its variation, as emphasized by numerous authors. For example, Weiss (1993, p. 15) suggests "... incorporation of all relevant information at the level of the firm, including costs and demand data." Similarly, authors such as Danziger (1983), Carlton (1986), Gordon (1990), Lach and Tsiddon (1992, 1996), and Genesove (2000), have mentioned the benefits of firm level data, emphasizing the importance of using product-level price data because they "... most closely resemble the data envisioned by the cost of adjustment theory: price quotations at the level of the price setter" Lach and Tsiddon (1992, p. 351).

We find greater price rigidity during the holiday periods in comparison to the non-holiday periods. We argue that the pattern of greater holiday period price rigidity is best explained by the increased costs of changing prices at these stores during the holiday periods. The opportunity cost of using employee time to change prices rather than perform other tasks such as restocking shelves, handling customers' questions, and running the cash registers, rises significantly during holiday periods, which substantially increases the cost of price adjustment for the stores. Further, the customer costs of making mistakes during the price change process increase during these holiday periods making holiday-period price changes less profitable, ceteris paribus.

To support this conclusion, we discuss evidence on the steps undertaken during the price change process in retail supermarket chains, and argue that during holiday periods the opportunity costs of performing these tasks increase as a result of the need to perform other tasks during these periods. We also report the results of discussions we had with retail managers and executives at major U.S. supermarket chains as well as with industry experts and manufacturers, who seem to be keenly aware of the increased customer and managerial costs of changing prices during the holiday periods.

A particularly important and useful aspect of our data is that they provide a *natural experimental setting* to study variation in price rigidity, because they enable us to rule out many standard explanations for price rigidity. This is because the products, the stores, and the surrounding institutional features and arrangements do not change between holiday and non-holiday weeks. Blinder, et al.'s (1998) list of candidate explanations for price rigidity, we discuss other possible explanations but it turns out that they can be ruled out because the relevant factors do not change from holiday to non-holiday weeks at these stores.

The rest of the paper is organized as follows: In the section 2 we describe the data. In section 3 we discuss the findings of retail price rigidity during holiday periods. In section 4 we explain these findings by arguing that the patterns of holiday-period price rigidities we document are best explained by increased opportunity costs of price adjustment during the holidays. In section 5 we discuss how these findings may be related to other possible explanations of price rigidity. By process of elimination, we end up with cost of price adjustment as the best explanation of the holiday period price rigidity. In section 6 we conclude and discuss future research ideas.

2. Data

Our time series contain product-level retail price and wholesale cost scanner data from a large supermarket chain, Dominick's which operates 94 stores in the Chicago metropolitan area with a market share of about 25 percent (Hoch, et al., 1995). The chain is similar to other large, multiple-store supermarket chains currently selling in the US. In 1992 large multi-store supermarket chains of this type made up $310.1 billion in total annual sales, which constituted about 86.3% of total supermarket chain sales in 1992 (*Supermarket Business*, 1993). Multi-store supermarket chain sales in the US constitute 14 percent of the total retail sales of $2.25 trillion. Because retail sales account for about 9.3 percent of the GDP, our data may be viewed as representative of as much as 1.28 percent of the GDP, which is substantial. In other words, the supermarket chain we study is a representative of a major class of the retail trade with a quantitative economic significance.[2]

Our data set has numerous unique features that make it particularly suitable for studying variation in price rigidity. The most important aspect of the data set is that it consists of product-level retail prices and wholesale costs for over 4,500 products in 18 product categories.[3] In Table 1 we list the product categories and the number of products for which data were available in each category per store. The data are weekly and cover a four-year period, from the week of September 14–20, 1989 to the week of September 16–22, 1993, a total of 210 weeks, where a week is defined from Thursday to Wednesday. Having weekly time series offers an important advantage for studying price-setting behavior in a market where the actual pricing cycle is also weekly (Slade, 1998).

The price and cost data used in this analysis come from 6 stores of the chain.[4] Dominick's has established three price zones, and each store belongs to one of the zones. The 6 stores in our sample are in the mid-price zone. The chain defines the store type based on the competitive environment the store faces. Thus the stores belonging to the mid-price tier face similar competitive environments.[5] Prices for all stores within the chain are set centrally at corporate headquarters and implemented by the stores.

For the price to consumers at the retail level, we have weekly data from the scanner database of the supermarket chain. The prices are the posted shelf prices, and are usually the same as the transaction prices.[6] Price changes are performed once per week (on Wednesday nights), which is the standard practice in this industry, as documented by

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[2] The data are available through the University of Chicago's marketing department web page at www.gsb.uchicago.edu/research/mkt/MarketingHomePage.html.

[3] Dominick's scanner data actually include products in 29 categories but for many products the price/cost data are missing for many weeks because they were not always recorded.

[4] The data come from stores that were participating in pricing experiments. For this analysis we used only data from the control stores to avoid confounding effects.

[5] We also analyzed the data for three stores in the chain that faced the most price competition. We find that all the results reported in this paper for the six mid-tier stores also hold for the more price competitive stores. Therefore, to save space we do not report these results in the paper.

[6] We note that coupon data is missing. However, coupons are offered by the manufacturer and not the retailer and thus do not reflect a retailer's pricing decisions. Furthermore, only a small portion of customers redeems the coupon when it is available. By contrast, temporary price discounts are offered by the retailer and affect all sales. As a result, the omission of coupon data is not felt to be a major limitation.

Levy, et al. (1997, 1998). Thus, the prices we report are the actual shelf prices in effect for that week.[7]

The weekly wholesale cost data also come from the chain's scanner database and represent a weighted average of the amount the retailer paid for all their inventory.[8] Having access to cost data is particularly unique given that these data are usually proprietary and rarely available. It should be noted that our wholesale price data do not include lumpy payments like slotting allowances, manufacturer-provided services such as direct store delivery, or other manufacturer-level support. However, our discussions with managers who set retail prices indicated that they rely on the wholesale price series to make their retail pricing decisions. Other studies in this context (Hoch, et al., 1995; Chevalier, et al., 2000) confirm this observation. Further, our discussions with managers indicate that the use of the lumpy-payment schemes does not vary systematically between holiday and non-holiday periods, which is the focal interest of this study.

There are many holidays throughout the year, but few are as closely associated with the consumption of food as Thanksgiving and Christmas. Warner and Barsky (1995) suggest that these two holidays are the busiest period in the durable and semi durable goods market. Chevalier, et al. (2000, p. 20) state that "it is apparent that Christmas and Thanksgiving represent the overall peak shopping periods for Dominick's." Indeed, our conversations with supermarket managers indicate that these two holiday periods constitute the busiest shopping period in their stores and represent the "holiday season." Thus, in our analysis, the holiday weeks are defined as the week before Thanksgiving through the week of Christmas, for a total of six weeks in each year.[9]

3. Holiday Retail Price Rigidity

Our data allow us to evaluate retail rigidity along two dimensions. First, we assess retail

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[7] Silver and Heravi (2001) discuss the potential uses of scanner data to improve inflation measurements by correcting for substitution bias and adjusting for quality changes.

[8] Thus, the wholesale costs do not correspond exactly to the replacement cost. Instead we have the average acquisition cost of the items in inventory. Instead we have the average acquisition cost (ACC) of the items in inventory. So the supermarket chain sets retail prices for the next week and also determines AAC at the end of each week, t, according to the formula

$$AAC(t+1) = (\text{Inventory bought in } t) \text{ Price paid}(t) + (\text{Inventory, end of } t\text{-l sales}(t)) \text{ AAC}(t).$$

There are two main sources of discrepancy between replacement cost and AAC. The first is the familiar one of sluggish adjustment. A wholesale price cut today only gradually works itself into AAC as old, higher priced inventory is sold off. The second arises from the occasional practice of manufacturers to inform the buyer in advance of an impending temporary price reduction. This permits the buyer to completely deplete inventory and then "overstock" at the lower price. In this case AAC declines precipitously to the lower price and stays there until the large inventory acquired at that price runs off. Thus, the accounting cost shows the low price for some time after the replacement cost has gone back up.

[9] We 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 of the alternative combinations we ran. In addition, we run a similar analysis by including the Memorial Day, 4th of July, and the Labor Day holidays, but we found that the holiday-period price rigidity results we report primarily hold for the Thanksgiving and the Christmas holidays.

price rigidity by counting the frequency of price changes. Second, we consider retail price rigidity by examining retail prices in response to changes in costs.

Frequency of Retail Price Changes

In order to compare the number of price changes during holidays to those that take place during non-holiday periods we compare the mean number of price changes during holiday and non-holiday periods. In Table 2, we report the weekly average number of price changes per store during holiday and non-holiday periods, by category, over the four-year period along with the percentage difference between them.

In the last column of the table we report for each category the *t*-statistic for testing the null hypothesis that the average number of weekly price changes during holiday and non-holiday periods are equal against the alternative hypothesis is that the average number of weekly price changes during the holiday period is less than the average number of weekly price changes during the non-holiday period. To calculate the statistic, we use $n_1 = 185$ and $n_2 = 24$, where 185 is the number of non-holiday weeks in the sample of $n = n_1 + n_2 = 209$ (210 weekly observations minus 1, where the latter is necessary to account for "changes"), while 24 is the number of holiday weeks (six weeks of holidays period each year) in the four-year sample period. Thus, the critical values we use are $t_{\alpha, n-2} = t_{\alpha, 207}$.

We find that there are fewer price changes in supermarkets during holiday periods than during non-holiday periods. With the exception of just one category (snack crackers), the average number of price changes per week during the holiday period is less than the average number of price changes per week during the non-holiday period. For 15 of these 18 categories, the price change frequency for the holiday period is less than for the non-holiday period by more than 10 percent, and for 11 categories the difference exceeds 15 percent, with the maximum difference of 38 percent. Moreover, for 13 of the 18 cases, the difference is statistically significant.

When aggregated over all categories, we find that there are 14% fewer price changes during holiday weeks in comparison to non-holiday weeks (with a statistical significance of 1 percent).

Retailer's Promotional Activity

We considered the possibility that the retailer may emphasize greater promotional activity instead of price changes during the holiday period. In this analysis promotions are defined as any combination of in-store display and newspaper featured advertisement; usually these promotional activities are accompanied by a temporary price decrease. Our data on promotions are product-specific. We do not account for storewide promotions such as holiday decorations since we cannot measure the effort put forth for these promotions.

The number of promotions per week is listed in Table 3, by category, and by holiday versus non-holiday periods. For 11 categories the average number of weekly promotions during the non-holiday period exceeds the average number of weekly promotions during the holiday period. Further, this pattern holds when we aggregate across all product categories. Thus, we do not see an increase in promotional activity as we move from non-

holiday to holiday period. To the contrary, we find that during holiday weeks promotional activity decreases on average. Since both retail price change activity and promotional activity decrease during the holidays, there is evidence of a general decrease in pricing activity as we move from non-holiday to holiday weeks.

Price Response to Changes in Costs

Price rigidity is defined as lack of response of prices to changes in costs or demand (Carlton and Perloff 1994; Blanchard 1989). In order to further explore the holiday period price rigidity, we us the following logistic regression to assess the likelihood of a price change during holiday and non-holiday periods, controlling for influential factors:

$$\text{Log } [p_t /(1 - p_t)]) = \alpha + \beta_1 \text{ Holiday}_t + \beta_2 \text{ Promotion}_t + \beta_3 \text{ Impact of Cost Change}_t + \gamma_i\, d_j + \varepsilon_t$$

where p_t denotes the probability of a price change during week t, the variables "Holiday," "Promotion," and d_j's, are all dummy variables, and the variable "Impact of Cost Change" measures the magnitude of the economic effect a cost change might have.

The "Holiday$_t$" dummy variable equals 1 if week t belongs to the six-week holiday period from Thanksgiving to Christmas and 0 otherwise. If prices are indeed more rigid during holiday periods, then the likelihood of a price change will be low during holiday periods, and therefore the coefficient on the "Holiday" dummy variable is expected to be negative ($\beta_1 < 0$).

Another factor that influences the likelihood of a retail price change are promotions initiated by product manufacturers by offering incentives such as cost discounts and trade allowances with the expectation that the retailer will react to these incentives and change prices. Since our focus is on the likelihood of a price change, we need to take into account any promotional price changes of this sort mandated by the manufacturer. The variable "Promotion$_t$" is a dummy variable for such a promotion and it equals 1 if during week t there is a promotion, and 0 otherwise. We expect that when there is a promotion, there is a greater likelihood of a price change ($\beta_2 > 0$).

The variable "Impact of a Cost Change$_t$" is a measure of the potential impact a cost change might have on profits and the corresponding parameter estimate is a measure of the resulting effect on the likelihood of a price change. In order to assess the impact of a cost change on profit, we assume that the retailer can do one of two things in response to a cost change: (i) it can maintain the current price (i.e., do nothing), or (ii) it can pass through the entire cost change.[10] We define the impact of a cost change as the difference in expected profit between passing through the change and doing nothing. That is, the variable "Impact of Cost Change$_t$" is an estimate of the profit that would be earned if the price were changed by fully passing through the cost change minus the profit that would

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[10] This formulation assumes 100 percent passthrough rate when the retailer changes its price in response to a cost change. While this assumption may not hold for all items, the empirical results with respect to the holiday variable are not dependent on the rate of pass-through. Also, recent studies by Dutta, et al. (2002) and Müller and Ray (2001) report a very fast (often within 1–2 weeks) and complete passthrough of cost changes (i.e., changes in the wholesale price) onto prices. Our assumption, therefore, is a reasonable approximation of what is actually going on in this market.

be earned if the price were not changed. We expect that the greater the likely impact of a price change, the greater the likelihood of the price change ($\beta_3 > 0$).

To construct the impact variable, we first estimate the profit when managers maintain the current price and no price change is undertaken in response to a cost change. This is estimated as the new per-unit profit margin times the number of units sold in the previous week. We use the prior week's sales volume because given that there is no price change, ceteris paribus, expected unit sales would not change either:

$$\pi_{\text{do nothing}} = (p_{t-1} - w_t)\, m_{t-1}$$

where p_{t-1} =   price in prior period
        w_t =   new wholesale cost
        m_{t-1} =   units sold in prior week

Second, we estimate the profit when managers pass through the entire cost change. If the manager were to adjust price in order to accommodate a change in cost, the expected profit is given by:

$\pi_{\text{change price}}$ =   [old price + adjustment – new cost] *
                                           [previous number of units sold + expected change in units sold due to price change]

                 = $[p_{t-1} + (w_t - w_{t-1}) - w_t] * [m_{t-1} + ((w_t - w_{t-1})/ p_{t-1}) * E * m_{t-1}]$

where E denotes the average price elasticity for the category.

The elasticity measures are taken from Hoch, et al. (1995) who use the same database to estimate individual product demand elasticities using a constant elasticity model that includes store-specific and brand-specific effects, prior sales (to account for forward buying behavior among consumers), and various types of "feature and display" activities. The category price elasticity figures are calculated as a share-weighted average of the individual product price elasticities. The price elasticity model fit the data quite well – R^2 ranged from 0.76 to 0.94. Errors in the elasticity measure do not affect our results, even if the impact parameter is biased, because they are absorbed in the error term (Greene, 1997).

Combining the terms and simplifying, the impact of a cost change becomes:

Impact of Cost Change$_t$ = $\pi_{\text{change price}} - \pi_{\text{do nothing}}$
                                    = $m_{t-1}[(w_t - w_{t-1}) + (p_{t-1} - w_{t-1})((w_t - w_{t-1})/p_{t-1})* E]$.

The variables d_j are manufacturer specific dummy variables which are included in the model to account for individual manufacturers' effect on their products' retail prices through own company channels and tools that may not be captured by the "Promotion" variable. Also, some manufacturers may be more important due to higher profitability, greater promotional support, or slotting allowances and, as a result, may be treated

differently by the retailer. To test whether there are manufacturer-specific effects, we performed a log-likelihood test using the Schwartz Criterion to adjust for the number of terms in the model and the number of observations used. In all categories the manufacturer dummy variables are necessary, indicating that there is heterogeneity in rigidity across manufacturers.[11]

We estimated the model separately for each individual product category using the method of maximum likelihood; the results are reported in Table 4. The figures in the first column of Table 4 are the ones in which we are interested in most. With the exception of two categories, the estimated coefficients on the "Holiday" dummy variable are all negative. For the two categories with positive coefficients, dish detergents and tooth pastes, the estimated coefficients are not statistically significant. Of the 17 categories with negative coefficients, the coefficients for 13 categories are statistically significant.

Thus we find that the likelihood of retail price change in response to cost change is lower during the holiday than the non-holiday periods, even when we account for the impact of cost changes, the use of promotions, and the manufacturer specific effects.

The estimated coefficients on the "Promotion" variable are all positive and statistically significant at 1 percent for each product category. Thus, manufacturers' promotional activity tends to increase the log of the odds ratio in favor of a price change at the retail level, ceteris paribus. Also, the estimated coefficients of the "Impact of Cost Change" variable are all positive and statistically significant at 1 percent for each product category. As expected, ceteris paribus, the larger the likely impact of a cost change on the retailer's profit, the higher the log of the odds ratio in favor of a price change in response to the cost change. Finally, the manufacturer dummy variables are statistically significant in all categories, indicating that there is a manufacturer-specific variation in the retail price rigidity across holiday/non-holiday periods.[12]

4. The Role of Cost of Price Adjustment in Holiday Retail Price Rigidity

Given the documentation of greater retail price rigidity during holiday periods, the next issue is to explore the reason(s) for these rigidities. Our explanation for the rigidity is the higher opportunity cost of price adjustment the retailer must incur during holiday periods. The discussions we had with several retail managers suggest that the holiday period price rigidity is indeed due to higher physical, managerial, and customer cost of price adjustments. This conclusion is consistent with recent findings by Levy, et al. (1997 and 1998), Dutta, et al. (1999), and Zbaracki, et al. (2001), who study and provide direct measurements of price adjustment costs in various retail and manufacturing organizations.

During the holiday season the opportunity cost of using employee time to change prices rather than perform other tasks rises substantially, significantly increasing costs of price

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[11] The manufacturers' dummies enable us to capture any variation there may be across the different manufacturers. While there may also be a product-specific variation, an inclusion of the individual product dummies would exhaust all the degrees of freedom the data provide.

[12] We do not report these coefficient estimates because of their large number in each regression equation.

adjustment for the stores. This is due to the larger volume of customer traffic moving through stores during holiday periods. Warner and Barsky (1995) argue that during holiday periods there is an increase in shopping activity. Indeed, at the retailer we study, the volume of items sold (where the unit of measurement is a box, can, or other physical unit) increases 6% on average during holiday periods. Chevalier, Kashyap, and Rossi (2000) also document substantial increase in the sales volume for this chain during the Thanksgiving and Christmas holiday periods. The increase in the number of shoppers necessitates that more labor time be dedicated towards the tasks of running the cash registers, restocking the shelves, cleaning, handling customers' questions and inquiries, bagging, etc. Since the goodwill of customers is affected by these activities (Oliver and Farris, 1989), retailers emphasize these activities to maintain their goodwill during the busy holiday periods.

The greater price rigidity during holidays is also influenced by the increase in the costs of mistakes that commonly occur during the price change process. When prices are changed, the new price needs to be posted in both the shelf label and in the cash register that reads the barcodes of each product in the checkout line. Frequently a mistake is made, and there is a mismatch between the price posted on the shelf and the price programmed in the cash register. Levy, et al. (1997 and 1998) report that the cost of pricing mistakes which includes lost cashier time, scan guarantee refunds, stock-outs if the shelf price is lower than intended, average $20,140 per store per year (in 1991-92 dollars) and comprise about 19 percent of the total reported costs of price adjustment. The cost of pricing mistakes increases during holidays because the lines at cash registers are longer and a "price check" will create greater delay and dissatisfaction among customers.

The conversations we had with store managers and additional evidence we gathered from various supermarket trade publications confirm the existence of higher costs of price adjustment during holidays. For example, Brett Drey, a retail manager at both drugstores and mass merchandisers, states:

> "It's a madhouse during the holidays. There is no time to do anything that is marginal or incremental—you have to focus on the essential issues, keeping items in stock, keeping the registers manned, and making the store presentable. The key is to manage the flow of goods and customers through the store."

Bob Venable, an expert in the supermarket industry, stated that:

> "These costs of price adjustment increase substantially during holiday periods. The limited managerial resources are spent on other tasks, and the value of price changes is lower here."

Debra Farmer, manager of a large supermarket, provided the following description of the difficulties her organization faces when it comes to changing prices during holiday periods:

> "Changing prices during the Thanksgiving and Christmas holidays? That's very difficult. We do not have enough people to do that. It is almost impossible. During regular weeks, we restock the shelves during late night and early morning hours. But during these holidays, we have to do it every hour, we do not have enough manpower to do that."

Lisa Harmening, a manager at a large packaged goods manufacturer stated that:

> "When talking with retailers they made it clear that they didn't want to deal with prices during the holidays. They wanted minimal pricing hassle during those seasons, and price changes were decided well in advance."

As a final example, when attending a price consulting meeting at a large department store chain's headquarters, the managers laughed at the suggestion of doing pricing experiments during the holiday season stating that it would be "crazy" to think of doing that during the holiday weeks.

In principle, retail supermarkets could resolve this labor shortage difficulty by hiring, say, temporary workers during such high demand periods as the Thanksgiving and Christmas holidays. However, according to Debra Farmer, a manager of a large supermarket:

> "... it is difficult to find temporary workers for the weeks of these two holidays because the high school and college students, which is the group from which the supermarkets usually hire their temporary workers for the summer months, are not available during these holiday weeks."[13]

Unable to adjust the number of workers during periods of high demand, supermarkets, according to Ms. Farmer, instead try to adjust the number of hours worked.[14] In many supermarkets, a number of workers are employed on a part time basis. During holidays they are asked to add extra hours (e.g., someone usually working 15 hours a week could work 25 or 30 hours a week during the holiday period.) for which they are paid overtime wage rates.[15] Further, changing prices require more specialized skills and tasks than many other activities (Levy, et al., 1998). According to Robert Venable, the number of people a store will trust to change prices is limited, so it is unlikely that the store would be comfortable giving this task to new, less skilled, or untrained employees.

But even then, these extra labor hours are not used to change prices during the holiday periods. Instead, according to Ms. Farmer, they are used to perform other, more urgent tasks like, packing bags, opening extra cash registers, bringing products from storage

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[13] An added difficulty in hiring college and university students is that they let out for the holiday season around the second week in December, making it difficult to properly train cashier help and other workers (Renee DeGross and Dena McClurkin, "Stores Starting Regular Holiday Hunt," *Atlanta Journal and Constitution*, November 18, 2000, Business Section, pages H1, H5).

[14] It turns out that the increased demand for temporary workers during holiday periods is not limited to the retail supermarket industry. According to a recent *New York Times* article, this is a more general and recurring phenomenon affecting many other types of retail as well as non-retail establishments including electronics stores and superstores, museums, bookstores, drugstores, high-priced boutiques and apparel chains, gift shops, furniture and home household goods, and jewelry stores. (See *the New York Times*, Monday, September 27, 1999, page A19, New York Report Section, "Retailers Scramble for Holiday Help," by Leslie Eaton.)

[15] For example, according to the above *Atlanta Journal and Constitution* article, holiday-period tight labor markets force the retailers "… to become more generous with wages, bonuses" (Renee DeGross and Dena McClurkin, "Stores Starting Regular Holiday Hunt," *Atlanta Journal and Constitution*, November 18, 2000, Business Section, page H1). According to the article some retail establishments are even forced to offer signing bonuses, "… a practice already familiar to many area retailers," as well as better discounts, flexible schedules, and bigger commissions.

rooms to shelves, checking prices, and customer service. Workers are routinely moved from task to task according the need. For example, Shayne Roofe, the manager of a Harp's Food Store in Rector, Arkansas, is trained to use a key-cutting machine located in the store (*Progressive Grocer*, February 1993, p. 43). Similarly, according to Jack Koegel, the President of Twin Value Foods headquartered in Green Bay, Wis., "... he and his executives are not averse to doing such chores as mopping a floor, if necessary" (*Progressive Grocer*, October 1992, p. 56).

Thus, the workers employed by the supermarket chains are always busy and the opportunity cost of changing price is positive. During the holiday periods, the opportunity costs increase substantially, making price changes more costly.

5. Ruling Out Other Sources of Price Rigidity

In this section we briefly discuss alternative explanations for the holiday price rigidity by going through a list of the existing price rigidity theories as provided by Blinder, et al. (1998), and discuss their potential relevance in explaining the increased price rigidity during holidays. It turns out that the unique nature of our cost and price data enables us to rule out most alternative theories. This is because many traditional explanations of the variation in price rigidity rely on variations in industrial structure, market organization, nature of long-term relationships, contractual arrangements, or product quality. However, for the products we study, the market structure, the nature of long-term relationships, and other aspects of the market environment do not vary back and forth between holiday to non-holiday weeks.

Theories based on the Nature of Costs

Clearly our cost of price adjustment explanation falls in this category. Specifically, the marginal cost of production explanation of price rigidity due to Hall (1986 and 1988), is consistent with this explanation because the marginal costs of production, where marginal cost is defined to include labor costs, will vary between holiday and non-holiday periods because of the variation in the opportunity cost of changing prices. In this sense, Hall's marginal cost explanation is what we really mean by the opportunity cost of price adjustment argument. However, other cost-based theories are not likely to be relevant in the context of our data because they require a variation between holiday and non-holiday periods. For example, theories of cost based pricing with lags (Gordon 1981, Blanchard 1983) are also not applicable in this setting. There is little reason to believe that cost changes should pass-through more slowly through the channels during holidays in comparison to the rest of the year, without relying on our cost of price adjustment explanation.

Another possible explanation for the decrease in retail price change activity during the holiday period is that it is driven by decreases in the wholesale price change activity at the manufacturers' level. In order to assess this possibility, we calculated the average number of wholesale price changes that the retailer encounters per week, by category, during holiday and non-holiday periods and the results are reported in Table 5.

We find that the manufacturers' overall price change activity declines by only 5% ($t = -3.64$) on average during holiday periods in comparison to the rest of the year. However, the retail price change activity decreases by far more, 14% on average (see Table 2). Moreover, according to Table 5, there are statistically significant more frequent holiday cost changes for only 8 categories, in contrast to 13 categories for the retail prices.

Further, in some categories the differences in the frequency of price and cost changes are substantially bigger than the factor of 2.8 = 14%/5%. For example, in the cereals category we find that during holiday weeks price change frequency drops by 36% (Table 2) in comparison to non-holiday weeks. In contrast, the costs change frequency in this category only drops by 1% (see the second column in Table 5). The differences are large also in the categories of laundry detergents (–21% versus –1%), refrigerated juice (–12% versus –1%), bottled juice (–19% versus –2%), cheese (–8% versus 0%), dish detergents (–10% versus –1%), and canned soups (–3% versus +3%). These findings suggest that the decrease in retail price change activity is unlikely to be driven by decreases in the number manufacturer cost changes.

The only cost-based theory that could apply to holiday/non-holiday differences is related to inventories. There is some evidence that inventories are used to smooth the variability of production (Fair, 1989; Krane and Braun, 1991). While we do not know whether the supermarket chain we study increases inventories in anticipation of the holidays, we do know that: (i) stores keep no inventory in a back room – all excess inventory which does not fit on the shelf is held at a central warehouse facility; and (ii) planograms do not get altered for the holidays. The store is generally stocked to capacity and cannot be expanded. Further, we do know that inventory levels vary across categories. It is this last point that helps to show that inventories are not driving holiday price stickiness. In categories such as frozen juice and cereal, this retailer keeps one week of inventory (on average, throughout the year) while in other categories there is much more inventory (Müller, 1996). Yet the price stickiness we see does not vary systematically by inventory levels across categories. In Müller (1998) prices are stickiest for the orange juice products—precisely the products for which there is the least amount of inventory, which is counter to the inventory theory.

Theories based on the Nature of Contracts

Contracts between various channel participants in this industry, where they exist, are unlikely to vary between holiday and non-holiday periods regardless of whether they are implicit or explicit. The relationships between these channel participants are usually long-term in nature and written contracts cover long periods of time. These contracts may include specific terms and requirements during holidays on such issues as feature and display, and possibly price level (although only in broad terms, given the restrictions on resale price maintenance in the U.S.). To our knowledge, however, there are no contracts, implicit or explicit, that restrict the retailer's ability to change prices during holiday or non-holiday periods. Thus, we do not think contracts, either explicit or implicit, are likely to be the cause of the variation in price rigidity between holiday and non-holiday periods.

The other theory Blinder, et al. (1998) suggest in this area is guaranteed price protection.

If a firm guarantees its customers that it will retroactively apply all discounts that may appear within a specified time period after a purchase, the firm may have a strong incentive to not cut prices, leading to price rigidity. This kind of pricing practice is often observed in some consumer durable goods markets (for example, in the computer industry), but is not applicable to the retail supermarket industry.

Theories based on the Nature of Market Interactions

Clearly, holiday periods are too short to exhibit large-scale changes in the market structure of the retail supermarket industry. Thus, theories that rely on variation in the market structure such as the kinked demand curve (Stiglitz, 1979) do not apply in this setting.

The theories of oligopolistic price wars during booms (Rotemberg and Saloner, 1986) may have some relevance here because at the manufacturer level, some markets may be characterized as oligopolistic. To the degree that demand increases during holiday periods, perhaps holidays could share common features with booms, as suggested also by Chevalier, et al. (2000). But because holidays last such short periods, we do not believe they really qualify as booms in economic parlance. Even if we were to identify the holiday weeks as booms, this theory would predict that prices should be less rigid during holiday periods, as there are gains to defection, which is counter to what we find. Therefore, this theory cannot explain our findings on holiday price rigidity.

The theory of coordination failure (Ball and Romer, 1991) could explain greater price rigidity during holidays. In the case of a cost increase that affects several competing supermarkets, each individual supermarket may be reluctant to be the first to increase prices out of fear that others will not follow. Without a price leader to coordinate price changes, a lack of coordination may lead to price stickiness. In our case, the question is whether price coordination between our chain and its competitors may be more difficult during holidays. One possibility is that the supermarket chain we study, which we know employs a cadre of price checkers who go to the competitors' stores to check prices, may use these price checkers to run the store during the holiday instead of checking prices. If so, the coordination mechanism would certainly be weaker during the holidays, leading to greater price rigidity. In this case, the cost of price adjustment argument is extended to explain coordination failure. To that end, this suggests that coordination failure and costs of price adjustment may be related in that coordination requires the kinds of resources that make up the costs of changing prices.

We can also rule out two other theories discussed by Blinder, et al. (1998) under this category. The first is changes in macroeconomic policy, and the second is hierarchical structure of large firms. It is unlikely that these two would vary between holiday and non-holiday periods.

Theories Based on Imperfect Information

Imperfect information theories such as judging quality by price (Stiglitz, 1987) seem less appropriate for the retail supermarket setting. Many of the grocery items are frequently purchased items and therefore the public is familiar with their quality prior to purchase.

Further, it is not clear why these price/quality effects would vary between holiday/non-holiday periods.[16] Also, it is not clear that the relative uncertainty about the profit consequences for changing prices versus changing quantities are likely to change between holiday and non-holiday periods, which rules out these theories (Greenwald and Stiglitz, 1989). Further, there is no evidence that the cost of capital varies systematically between holiday and non-holiday periods, ruling out the related theories (Phelps and Winter, 1970, and Greenwald and Stiglitz, 1988) in our context.

Theories based on the Nature of Demand

We suspect that demand factors are unlikely to change enough between holiday and non-holiday periods to explain the differences in the extent of price rigidity we observe. We know that there is greater store volume and traffic during holidays: during the sample period our data cover, we find that overall there was a 6% increase in the volume of products sold during the holiday period as opposed to the non-holiday period. Further, this volume increase was statistically significant ($t = 3.22$). It is not clear, however, how existing theories of variation in demand would explain the existence of price rigidity during holiday periods. For example, theories of pro-cyclical elasticity of demand would suggest that during holidays customers become even more price sensitive which would suggest increased price flexibility during the holidays, rather than the price rigidity we observe.

What about non-price adjustment mechanisms? Carlton (1989), among others, has suggested that markets may use non-price mechanisms, such as product quality or service quality, to clear. According to this explanation, instead of altering the price, firms may choose to alter the products' quality or service quality, in order to accommodate changes in production costs or changes in demand.

For our chain, product quality is clearly consistent between holiday and non-holiday periods. Also, as demonstrated above, production costs (wholesale costs) do not change radically between holiday and non-holiday periods, thus there is no cost-based reason to alter pricing activity. Chevalier, Kashyap, and Rossi (2000) also find that changes in wholesale prices at this chain are "… small, not only in absolute terms, but also in relation to retail margin changes" (p. 34).

In our case, since demand increases and prices remain the same, we need to consider the possibility that perhaps there are non-price adjustments that lower the value of the products sold. Perhaps a case can be made that store appearance is more important during the holidays, which leads to installation of special holiday decorations. However, if the shopping experience is augmented during a high-demand period, then the theory would predict that prices should increase, which they do not.

To the extent that shopping during holiday weeks involves standing in long lines at cash registers (despite the store's management efforts), then perhaps we should view standing in line as a substitute for higher prices. In this case, we would conclude that the market

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[16] The only possible variation of this type we identified was an increase in the social consumption of branded products in comparison to store brand products.

clearing mechanism during the holiday period relies more heavily on waiting in line at the cash register (which in Carlton's framework could be termed "adjusting delivery time"), rather than price adjustment. The implication then would be that the holiday period price rigidity isn't necessarily inefficient.[17]

It is not clear how relevant Kashyap's (1995) psychological price points theory is for explaining the holiday period price rigidity we document here. According to his theory, demand curves have a kink at certain psychological "price points." Consequently, prices may get stuck at these points and not move in small increments. To the extent that such psychological price points may vary between holiday and non-holiday periods because of social consumption or because of thick market effect (Kashyap, 1995, footnote 17, and Warner and Barsky, 1995), then this theory may be relevant in explaining the holiday period price rigidity. How relevant? We cannot tell.

Summary

After surveying the existing price rigidity theories, we are able to rule out most of them as unable to explain the specific form of price rigidity we document here. We conclude that the cost of price adjustment theory seems to be the most relevant for the holiday period price rigidity we find. While some other factors, such as a combination of psychological price points and thick market effect may play some role in the price rigidity mechanism, it seems that broadly defined costs of price adjustment are the most important factors responsible for the holiday price rigidity we document here.

7. Conclusion

Using unique data set on actual retail transaction prices for thousands of products over a four-year period at a major retail chain, we demonstrate that prices are more rigid during holiday periods than non-holiday periods. These findings extend the work of Carlton (1986 and 1989), Gordon (1990), and others who have emphasized the importance of studying heterogeneity in price rigidity. Our work also substantiates much of the prevailing wisdom of store managers in this industry. The variation in price rigidity we document across holiday/non-holiday periods is particularly interesting because it occurs within just a one-year period of time. As such, it offers a natural experiment because most factors that have been traditionally proposed as explanations for price rigidity, such as industry concentration, implicit and/or explicit contracts, the nature of long-term relationships, or in the market structure, are constant between holiday and non-holiday periods.

We argue that the most likely reason for this holiday period price rigidity is the cost of price adjustment. The anecdotal data we present based on our conversations with retail price managers confirm in a consistent and convincing form that indeed these opportunity costs of price adjustment are higher during holiday periods. We are able to rule out almost all other possible explanations of price rigidity we find in the literature. Thus, we believe we provide compelling evidence of the role of costs of price adjustment in price

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[17] We thank Susanto Basu for drawing our attention to this idea. See Epstein (2001).

rigidity.

This is important because much of the theoretical work in the New Keynesian macroeconomic literature has relied on cost of price adjustment as a critical theoretical lynchpin. These price adjustment costs have by now become "one of the main strands of New Keynesian theorizing" (Blinder, et al., 1998, p. 21). A large body of the existing theoretical literature explores the macroeconomic implications of these costs of price adjustment. However, very little is known about the actual empirical relevance of these costs. The current study contributes to the literature by demonstrating the critical importance of price adjustment costs for price rigidity in a retail supermarket industry, an industry with a substantial economic significance. Our findings, therefore, reinforce the likely importance of costs of price adjustment as a source of price rigidity, at least in the retail multi-product setting.

Based on our experience in the field, we suspect that the findings of holiday price rigidity would generalize to other multi-product retail settings with posted prices such as Target, Dayton-Hudsons, Sears, Best Buy and thousands of other major retail outlets. Future research can go in several directions. Theoretically, this study suggests a more important role for costs of price adjustment when studying holiday pricing patterns than the existing literature recognizes (Pashigian and Bowen, 1991, and Warner and Barsky, 1995, and Chevalier, et al., 2000). Empirically, it will be useful to go beyond this data set to see whether the results indeed generalize across other retail formats, markets, and industries.[18] These issues could also be studied in other countries with different holidays, and with different costs of price adjustment and retail market structures.

As a future extension, scanner data of the type we use offer the possibility of exploring the relationships between price change activity and many common behavioral and marketing variables. For example, holidays are often associated with social consumption of food. An interesting question these data may help answer is whether nationally branded products are treated differently than private label products during the holidays. Another promising area of future research is to investigate the variation in the level of price change activity across product categories. Combining the information in Tables 1 and 2, one can see that the number of price changes across categories varies tremendously, even after adjusting for the number of products in the category. This fact raises some interesting questions regarding the cross-category allocation of retailer's efforts, and may reflect important competitive factors.

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[18] It should be noted that Lach and Tsiddon (1996) also use retail transaction price data (from Israel) to determine which of the four broadly defined models (the signal extraction model, search models, sticker price model, and cost of adjustment model) provide the best explanation for their data behavior in terms of staggering and synchronization of price changes. They conclude that the predictions generated by the cost of adjustment theory are the most consistent with the data. Thus, our conclusion that the cost of adjustment model provides the best explanation for holiday period price rigidity is consistent with their findings and thus underscores the importance of costs of price adjustment in the process of price determination in a multi-product setting.

Table 1. Product Categories and Number of Products per Store

No.	Code	Description	Number of Products
1	Ana	Analgesics	227
2	Bjc	Bottled Juices	263
3	Cer	Cereals	290
4	Che	Cheeses	377
5	Cra	Crackers	137
6	Cso	Canned Soups	304
7	Did	Dish Detergents	181
8	Fre	Frozen Entrees	551
9	Frj	Frozen Juices	117
10	Fsf	Fabric Softeners	196
11	Lnd	Laundry Detergents	360
12	Ptw	Paper Towels	85
13	Rfj	Refrigerated Juices	112
14	Sdr	Soft Drinks	611
15	Sna	Snack Crackers	228
16	Tna	Canned Fish	168
17	Tpa	Toothpastes	255
18	Tti	Toilet Tissues	70
		Total	4532

Table 2. Average Number of Price Changes per Week per Store

Category	Non-Holiday	Variance	Holiday	Variance	% Δ	t-statistic
Analgesics	13.5	91.2	11.2	25.1	–17%	–1.87 [b]
Bottled Juices	27.5	286.1	22.3	106.9	–19%	–2.11 [b]
Cereals	22.8	601.1	14.5	113.9	–36%	–2.95 [a]
Cheeses	47.3	489.1	43.7	333.4	–8%	–0.90
Crackers	15.2	71.5	12.7	89.9	–16%	–1.23
Canned Soups	28.8	342.5	28.0	115.1	–3%	–0.32
Dish Detergents	11.8	42.6	10.7	31.8	–10%	–0.94
Frozen Entrees	56.0	748.0	35.0	191.9	–38%	–6.05 [a]
Frozen Juices	17.7	83.2	15.7	57.1	–11%	–1.19
Fabric Softeners	11.2	41.7	8.3	28.5	–25%	–2.38 [a]
Laundry Detergents	18.7	88.1	14.7	45.5	–21%	–2.60 [a]
Paper Towels	7.3	15.5	5.7	12.6	–23%	–2.14 [b]
Refrigerated Juices	19.0	54.1	16.7	41.9	–12%	–1.63 [c]
Soft Drinks	121.2	842.0	111.5	785.5	–8%	–1.58 [c]
Snack Crackers	25.2	197.6	31.3	224.8	25%	1.91 [b]
Canned Fish	14.0	61.9	11.5	30.1	–18%	–1.98 [b]
Toothpastes	18.8	136.3	15.5	133.7	–18%	–1.33 [c]
Toilet Tissues	9.0	22.7	6.8	15.4	–24%	–2.48 [a]
Total	485.0	4220.2	415.7	2382.9	–14%	–6.27 [a]

Note: In this and the following tables, superscripts a, b, and c indicate statistical significance at 1, 5, and 10 percents, respectively. The corresponding critical values are 2.33, 1.64, and 1.28, respectively. See text for details.

Table 3. Average Number of Promotions per Week for All Products per Store

Category	Non-Holiday	Var.	Holiday	Var.	% Δ	t-statistic
Analgesics	4.7	13.9	7.5	18.3	61%	3.09[a]
Bottled Juices	14.3	650.5	12.0	26.2	–16%	–1.80[b]
Cereals	11.8	46.2	7.0	23.2	–41%	–4.38[a]
Cheeses	18.2	219.3	20.5	130.1	13%	0.91
Crackers	7.3	14.7	10.5	10.8	43%	4.36[a]
Canned Soups	9.8	186.1	17.0	444.8	73%	1.62[c]
Dish Detergents	5.7	14.5	5.0	9.5	–12%	–0.97
Frozen Entrees	28.5	487.5	12.5	217.6	–56%	–4.68[a]
Frozen Juices	9.2	28.2	9.2	37.5	0%	0.00
Fabric Softeners	5.8	16.2	3.5	4.4	–40%	–4.48[a]
Laundry Detergents	11.7	20.9	7.0	7.0	–40%	–7.32[a]
Paper Towels	4.7	7.3	4.2	2.6	–11%	–1.29
Refrigerated Juices	10.8	21.0	8.5	12.2	–22%	–2.96[a]
Soft Drinks	67.7	189.8	60.3	297.2	–11%	–2.00[b]
Snack Crackers	9.8	139.9	17.8	318.1	81%	2.14[b]
Canned Fish	4.3	25.4	15.3	6.5	254%	17.24[a]
Toothpastes	14.0	73.8	9.3	39.3	–33%	–3.27[a]
Toilet Tissues	4.8	8.6	4.7	4.9	–3%	–0.33
Total	243.2	1621.7	231.8	1610.2	–5%	–1.30[c]

Table 4. Price Rigidity Estimation Results for All Products

Category	(Holiday) β_1	(Ad) β_2	(Impact) β_3
Analgesics	–0.1948[b]	0.4918[a]	0.5702[a]
Bottled Juices	–0.3093[a]	0.6431[a]	0.1966[a]
Cereals	–0.3671[a]	1.2690[a]	0.0764[a]
Cheeses	–0.2279[a]	1.3276[a]	0.1182[a]
Crackers	–0.2489[a]	0.5518[a]	0.2575[a]
Canned Soups	–0.1008[b]	1.5303[a]	0.0065[a]
Dish Detergents	0.0588	1.3866[a]	0.1735[a]
Frozen Entrees	–0.2192[a]	1.7355[a]	0.0912[a]
Frozen Juices	–0.1545[b]	1.8239[a]	0.0763[a]
Fabric Softeners	–0.1377	0.5439[a]	0.4205[a]
Laundry Detergents	–0.2513[a]	0.7818[a]	0.1855[a]
Paper Towels	–0.4895[a]	1.6889[a]	0.0110[a]
Refrigerated Juices	–0.2529[a]	1.0781[a]	0.0398[a]
Soft Drinks	–0.0073	1.2724[a]	0.0023[a]
Snack Crackers	–0.0192	0.5519[a]	0.3452[a]
Canned Fish	–0.4166[a]	0.9438[a]	0.0004[a]
Toothpastes	0.0228	1.3904[a]	0.5414[a]
Toilet Tissues	–0.5062[a]	0.9611[a]	0.0025[a]

Table 5. Average Number of Cost Changes per Week for All Products per Store

Category	Non-Holiday	Var.	Holiday	Var.	% Δ	t-statistic
Analgesics	33.5	101.0	31.3	67.3	–6%	–1.18
Bottled Juices	61.7	266.3	60.3	144.5	–2%	–0.49
Cereals	64.3	569.1	65.2	487.8	1%	0.17
Cheeses	109.0	426.1	108.5	341.8	0%	–0.12
Crackers	19.7	91.0	16.2	108.4	–18%	–1.56 [c]
Canned Soups	62.5	325.9	64.5	87.4	3%	0.86
Dish Detergents	23.8	53.7	23.5	35.3	–1%	–0.25
Frozen Entrees	104.5	718.8	90.0	534.3	–14%	–2.84 [a]
Frozen Juices	36.2	93.8	31.7	51.7	–12%	–2.76 [a]
Fabric Softeners	26.0	47.1	23.0	34.6	–12%	–2.30 [b]
Laundry Detergents	41.8	95.3	41.5	55.9	–1%	–0.20
Paper Towels	15.2	14.2	13.7	10.1	–10%	–2.13 [b]
Refrigerated Juices	38.7	60.1	38.2	51.1	–1%	–0.32
Soft Drinks	143.2	1247.1	129.0	960.2	–10%	–2.07 [b]
Snack Crackers	33.8	262.7	37.8	262.2	12%	1.14
Canned Fish	25.5	75.2	22.5	35.3	–12%	–2.19 [b]
Toothpastes	34.2	148.8	31.7	124.1	–7%	–1.02
Toilet Tissues	16.8	17.6	14.8	10.1	–12%	–2.79 [a]
Total	890.3	4613.8	843.3	3402.0	–5%	–3.64 [a]

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