Supermarket Promotions and Food Prices: A Note

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Abstract

Using a sample comprising nearly 250,000 weekly prices from the largest seven UK supermarket chains, this note investigates two pricing practices that have attracted public interest: the tendency for promotions to 'disguise' rises in non-sale prices and the inflation of prices prior to sales which 'exaggerate' the discount. Analysing price dynamics before and after periods of promotional discounting results show post-sale prices are typically *lower* than pre-sale prices, contrary to the disguise hypothesis. We do however find evidence of exaggeration of the discount, which may potentially explain why prices fall after discounts, although the evidence is not sufficiently widespread for this to be the sole cause. Results parallel the competition authority's view of supermarket promotions and point to the useful contribution that retail price microdata might play in keeping prices in check in countries where highly concentrated retail sectors raise similar concerns.

Keywords: supermarket promotion, food prices

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1 Introduction

As in many European economies, UK food retailing is dominated by a small number of national supermarket chains. With a CR4 of 76% (Kantar WorldPanel, 2013) the UK's food sector has attracted unparalleled levels of scrutiny by the competition authorities in recent years - two statutory inquiries by the Competition Commission (2000, 2008) and a raft of investigations by the Office of Fair Trading (2010, 2011 and 2012). Similar issues and anti-trust activity is on-going elsewhere, as documented by the OECD Competition Roundtable and in the work of the EU's European Competition Network (see OECD, 2014 and ECN, 2014 respectively). One key area of focus to emerge has been the use of promotional activity or 'sales' in supermarkets; 68% of consumers always look out for sales and almost 40% of all groceries purchased in UK supermarkets are on sale (Wisson, 2012). While the theoretical and empirical literature on sales is substantial (see Berck et al., 2008, Ellickson and Misra, 2008, Hosken and Reiffen, 2004, Lloyd et al., 2012 and Pesendorfer, 2002) this note is motivated by two specific aspects of supermarket pricing that have caught media attention. The first involves the use of sales to disguise price rises in that promotions are designed to occur immediately before a rise in the regular non-sale price, potentially misleading consumers(Guardian, 2010). The second concerns artificial inflation of prices prior to a promotion, meaning the depth of the discount is exaggerated and the consumer is misled as to the extent of the bargain (Sunday Times, 2013).

The Office of Fair Trading (OFT, 2012) recently concluded that the way in which supermarkets used sales had not broken consumer law but it was minded to established a set of principles defining fair practice in the use of promotions, to which eight national UK food retailers have subsequently agreed.

Using a sample comprising nearly a quarter of a million weekly prices, this note presents findings relevant to these issues in a period prior to the establishment of these principles. While prices alone say nothing about the intention to 'disguise' a price rise or 'exaggerate' the depth of a sale, the price movements that give rise to such accusations are easily investigated. Mindful

of this caveat, we proceed to outline the microdata and following a brief discussion of the price dynamics involved, test them empirically.

2 A Dataset of Scanner Prices

We use the dataset detailed in XXXX (2012). While not constructed specifically to address the issues raised in this Note, it is well suited to do so, being one of the largest and most comprehensive panels of weekly supermarket food prices assembled in the UK. Prices derive from barcode scanners as products pass through the checkouts and have been acquired from Nielsen Scantrack. Each price represents the average revenue (the ratio of value to volume sold) at the barcode level in each retail chain in every week during 137 weeks from 8th September 2001 to 17th April 2004, giving some 231,069 prices in all. The dataset contains the prices of 507 products in 15 categories of grocery spending. Products are identified at a highly detailed barcode level; two products are distinct if they have different barcodes. Each retailer-product combination is assigned a Unique Item Code (UIC) so that the 100 gram jar of *Nescafe Gold Blend* sold in Tesco is one such item; the same product sold in Sainsbury is another. There are 1,704 items in the sample, so on average each product is stocked in just over three supermarkets; 92 products are stocked in all seven. Private label products account for nearly one-fifth of the items, a feature we exploit in the following analysis.[1]

Owing to national pricing strategies being the norm in UK retailing (Competition Commission 2000), average revenue prices can be reasonably thought of as neatly summarising each retail chain's price for barcode specific products. By their construction, average unit revenue prices fluctuate by small amounts week-on-week, reflecting store-level differences within each retail chain in a manner akin to measurement error (see Eichenbaum et al., 2014 for the US). Indeed, half of the price changes observed in the raw data are 1p changes. More importantly, however, average

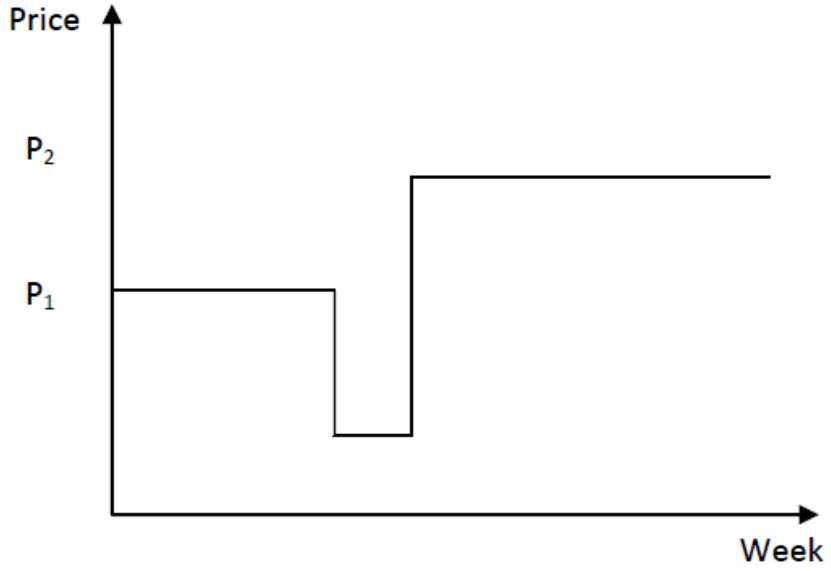
[1]The 15 categories are: orange juice, instant coffee, breakfast cereals, teabags, yoghurt, wrapped bread, tinned tuna, tinned tomatoes, tinned soup, corned beef, fish fingers, frozen peas, frozen chips, jam and frozen pizza. Retailers are annoymised in this paper but include both prestige and mainstream chains and soft discounters. For further details, see XXXX (2012).

revenue prices incorporate promotional activity effects, whether these are in the form of price reductions ('50% off') or quantity promotions ('buy one, get one free'). In the dataset, sale prices are identified as x% price reductions lasting no longer than 12 weeks. Given all such definitions are to some extent arbitrary, thresholds of 10%, 25% and 35% are considered. [2]

3 Do Sales Disguise Price Rises?

One specific practice that has attracted attention is the use of sales to mask increases in regular non-sale prices. The premise is that by acting as a barrier to the recollection of the previous regular price, a sale makes the price rise less noticeable in the consumer's memory, so 'disguising' the price rise. Such a situation is shown in Figure 1, where the price rises from $P_1$to P_2.

Figure 1: A sale disguising an increase in the regular price



A comparison of prices in the weeks adjacent to sales of 10%, 25% and 35% in the *Scantrack* data is presented in Table 1. It turns out that for the dataset as a whole, around one-fifth of

[2]Throughout this paper, a sale of 35% or more is referred to as '35% sale'; a sale of 25% or more as '25% sale' and; a sale of 10% or more as a '10% sale'. Hence the 35% threshold captures 'deep' sales only, whereas the other thresholds are progressively inclusive.

prices are higher after a sale. Interestingly, almost twice as many prices are actually *lower* after a sale than before it - contrary to the disguise hypothesis. This somewhat surprising result is more apparent the deeper the sale and in national brands (NB) rather than private labels (PL).

Table 1: Prices before and after a sale, by sales threshold and brand status

	Percent								
	10% Sale			25% Sale			35% Sale		
	All	NB	PL	All	NB	PL	All	NB	PL
Prices after a sale are higher	21.98	22.02	21.69	20.68	20.48	22.50	21.59	20.46	31.71
Prices are the same	39.76	38.99	46.20	36.86	36.19	43.00	30.12	29.67	34.15
Prices after a sale are lower	38.25	38.99	32.10	42.45	43.33	34.50	48.29	49.86	34.15

Note: Prices are recorded to the nearest penny. NB and PL refer to National Brands and Private Label products respectively.

Given the noise in average revenue prices, the simple frequencies in Table 1 may present a misleading picture because they take no account of the size of price changes. To address this Table 2 reports the average percentage change between pre- and post-sale prices for various classifications. The key finding, which echoes the previous result and holds for all depths of sale and across supermarkets and brand status, is that far from masking price increases, sales have a tendency to herald lower regular prices. [3] So, on the basis of our simple comparisons at least, evidence of the use of sales to disguise price rises is found wanting. The result begs an obvious question; why do prices fall after sales? One possible explanation is that prices are inflated prior to sales to exaggerate the depth of the discount, and we now turn to this issue.

[3]To check whether post-sale prices were lower owing to a staggered return to their non-sale level following a sale or due to possible deflation that characterised some of categories over the sample, all tests were repeated using prices upto four weeks after the sale and using de-trended prices respectively. Findings remain unchanged. Full details available upon request.

Table 2: The average percentage difference betwen pre- and post-sale prices in various classifications of the dataset

	%	t ratio
Sale Depth		
10%	-0.39***	(-6.88)
25%	-0.71***	(-7.41)
35%	-1.26***	(-6.53)
Retailer		
Retailer A	-0.34***	(-3.68)
Retailer B	-0.31***	(-3.04)
Retailer C	-0.14	(-0.94)
Retailer D	-3.08***	(-6.24)
Retailer E	-0.20*	(-1.75)
Retailer F	-0.78***	(-6.46)
Retailer G	-0.23**	(-2.05)
Brand		
National brand	-0.38***	(-6.79)
Private label	-0.48*	(-1.91)

Note: t ratios evaluate the null of no difference between pre and post sale prices. ***, ** and * denote that the null hypothesis is rejected at the 1% , 5% and 10% level respectively.

4 Do Price Rises Exaggerate Sales?

The OFT (2012) raised concerns over artificial inflation of prices prior to a sale, thereby exaggerating the true extent of the discount and thus misleading consumers. As alluded to above, it may also account for prices being lower after a sale than before. Figure 2 illustrates this stylised pattern.

Figure 2: Price rises exaggerate the depth of a subsequent sale

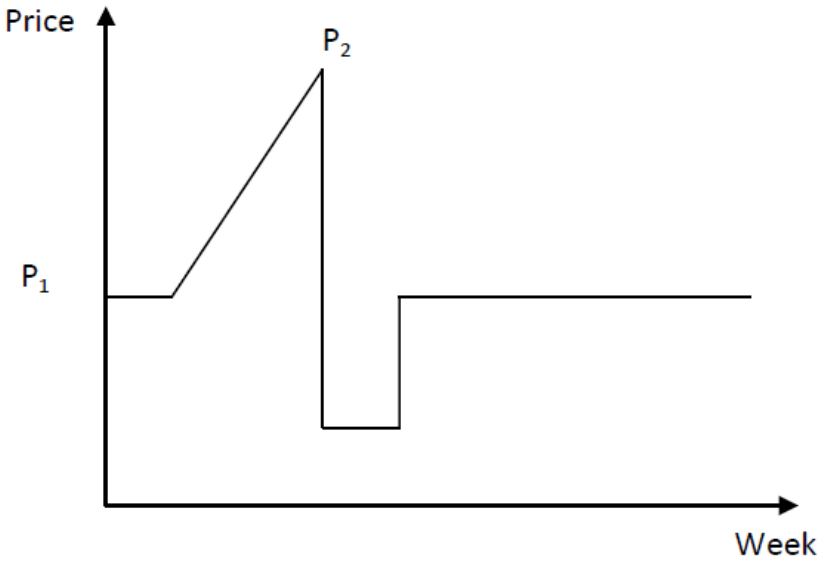


Table 3 reports the average percentage change in price of items in the three weeks leading up to 10%, 25% and 35% sales broken down by brand status. Notice that price changes are typically positive and tend to be larger the deeper the sale, as might be expected if exaggeration of the discount were responsible. While this pattern is stronger for brands than private labels, the magnitudes are not dissimilar so we will confine our discussion to the 'all products' classification. The results in the table suggest that one week prior to 10% (35%) sales, prices grew on average by 0.39% (1.86%) more than prices in spells of regular prices as a whole. Prices also typically rose two and three weeks prior to sales but thereafter no statistically significant changes can be detected (not shown here). While one price change is negative, it is statistically insignificant and small in magnitude, so that overall the results suggest that the growth in prices prior to sales is higher than at other times. This is consistent with the exaggeration hypothesis and may also potentially explain why prices fall after a sale.

To investigate whether these pricing patterns are common to all national chains or merely a distinctive feature of some, Table 4 reports results by retailer in the three weeks prior to a

Table 3: Percentage change in price in the three weeks prior to sales by sale depth and brand status

Week	10% sale			25% sale			35% sale		
	All	NB	PL	All	NB	PL	All	NB	PL
1	0.39***	0.35***	0.68***	0.82***	0.76***	1.28***	1.86***	1.77***	2.64**
	(8.94)	(8.10)	(3.58)	(9.44)	(8.65)	(3.65)	(8.38)	(7.74)	(3.18)
2	0.15***	0.16***	0.09	0.83***	0.86***	0.49	2.64***	2.65***	2.49*
	(3.38)	(3.31)	(0.60)	(6.50)	(6.32)	(1.41)	(8.02)	(7.63)	(2.41)
3	0.12*	0.11*	0.18	0.44***	0.44***	0.47	-0.06	-0.14	0.61
	(2.55)	(2.18)	(1.18)	(3.83)	(3.53)	(1.41)	(-0.20)	(-0.44)	(0.95)

Note: NB and PL refer to national brand and private label respectively. t ratios are in parentheses and evaluate the null hypothesis of no change. ***, ** and * denote that the null hypothesis is rejected at the 1% , 5% and 10% level.

10% sale. [4] Referring to the 'all products' results in panel (a), there is some evidence that most retailers had a tendency to increase prices prior to sales, although the magnitude and statistical significance appears stronger for Retailers D, E and F (soft discounters in the UK during the sample) rather than the others (mainstream or premium retailers), with one discounter (Retailer D) displaying marked increases in prices in the run-up to sales. While the observed price growth is similar for both national brands and private label products in Retailer D, the statistical significance of the private label estimates falls marginally below the 10% level, thus it is only in the pricing of national brands where the behaviour finds statistical backing.

So, while results lend some support to the exaggeration of promotions, the evidence becomes more patchy as we drill down through the various classifications of the data, and is really only apparent in the branded products sold by a single discount chain. While important in itself, the results seem unlikely to be the sole reason behind the general tendency for prices to fall after a sale.

[4] Results for 25% and 35% offer a similar picture although degrees of freedom are small in some instances, confounding statistical inference.

Table 4: The average percentage change in price in the weeks prior to 10% sales by supermarket and brand status

Week	Retailer A	Retailer B	Retailer C	Retailer D	Retailer E	Retailer F	Retailer G
(a): All Products							
1	0.11*	-0.05	-0.01	0.78***	0.39***	0.57***	0.12
	(1.81)	(-1.05)	(-0.13)	(5.66)	(4.42)	(5.98)	(1.28)
2	-0.03	0.13**	-0.05	0.44***	-0.00	0.14	0.17*
	(-0.46)	(2.53)	(-0.48)	(2.79)	(-0.04)	(1.31)	(1.66)
3	0.13	0.04	0.11	0.64***	-0.08	-0.09	-0.11
	(1.60)	(0.52)	(0.69)	(4.54)	(-0.73)	(-0.67)	(-1.16)
(b): National Brands (NB)							
1	0.09	-0.05	-0.06	0.76***	0.42***	0.34***	0.13
	(1.43)	(-1.05)	(-0.69)	(5.53)	(4.51)	(4.45)	(1.30)
2	-0.05	0.13**	-0.01	0.48***	-0.03	0.22**	0.08
	(-0.69)	(2.26)	(-0.13)	(2.84)	(-0.31)	(2.28)	(0.72)
3	-0.00	0.05	0.12	0.65***	-0.09	-0.06	-0.10
	(-0.01)	(0.66)	(0.76)	(4.19)	(-0.75)	(-0.41)	(-0.97)
(c): Private Label (PL)							
1	0.09**	-0.04	0.79	0.91	-0.14	2.80***	0.08
	(2.12)	(-0.39)	(1.61)	(1.60)	(-0.78)	(4.32)	(0.36)
2	-0.01	0.10	-0.79	0.16	0.33*	-0.65	0.44**
	(-0.05)	(1.03)	(-1.61)	(0.36)	(1.96)	(-0.92)	(2.21)
3	1.40***	-0.07	-0.33	0.58*	-0.04	-0.51	-0.13
	(2.75)	(-0.43)	(-0.70)	(1.77)	(-0.16)	(-0.65)	(-0.66)

Note: t ratios are in parentheses and evaluate the null hypothesis of no change. ***, ** and * denote that the null hypothesis is rejected at the 1% , 5% and 10% level.

5 Conclusion

In an attempt to shed light on two allegations about supermarket pricing, this note has investigated the dynamics of UK food prices before and after sales. While results can at best point to simple associations in the data and say nothing about firm behaviour, we do not find evidence that sales 'disguise' subsequent price rises, although we do find evidence of prices rising prior to sales, consistent with the exaggeration of a discount. Given the strongest evidence is only found in national brands sold by a single discount chain, other factors may also be responsible for the depression in post-sale prices that we observe and is the focus of on-going work. However, to the extent that evidence supporting the exaggeration of discounts has been found at all, its seems appropriate that the OFT sought sectoral agreement to avoid such conduct. Furthermore, the advent of retail price micro data makes it easier to scrutinise pricing in what are often highly concentrated markets.

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