

Identifying and characterising price leadership in British supermarkets

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Abstract

Price leadership is a concept that lacks precision. We propose a narrow, falsifiable, definition and illustrate its feasibility using the two leading British supermarket chains. We find both firms engaging in leadership behaviour over a range of products, with the larger being somewhat more dominant but the smaller increasing leadership activity over time. More price leadership events are price reductions than price increases, but the increases are of larger monetary amounts (so average price increases over time) and the events appear not necessarily related to cost changes. Price leadership appears to play some role in price increases.

1. Introduction

The concept of price leadership lacks precision in existing literature. We see a precise definition as fulfilling at least two criteria. First, it must incorporate a careful and *falsifiable* definition of the concept. Second, a suitable starting point for observation must be chosen. Unfortunately, both are more difficult than it might seem. To illustrate the first point, the OECD definition “Price leadership refers to a situation where prices and price changes established by a dominant firm, or a firm are accepted by others as the leader, and which other firms in the industry adopt and follow”² seems rather circular. Similarly, in characterising three types of price leadership, Dominant firm, Collusive and Barometric, Scherer and Ross (1990, p.249) suggest as distinguishing characteristics for the last of these “occasional changes in the identity of the price leader ... the absence of leader power to coerce others into accepting its price; a tendency for the leader formally to validate price reductions that other sellers have already initiated ...”. Since this well-established text is a common source of reference for subsequent work, the situation remains confused. Some analyses have argued from effect to attribution of leadership, for example the limited analysis in Competition Commission (2000, ch.7), rather than from an exogenous starting point to examination of the phenomenon. Finally, we need to accommodate the fact that firms are multiproduct in nature.

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² See <http://stats.oecd.org/glossary/detail.asp?ID=3285>. Theoretical analyses (e.g. Deneckere and Kovenock 1992) can simplify the overall framework to the extent that an obvious definition of price leadership exists given their assumptions, but this is of little use in empirical settings.

As an empirical illustration, we examine leadership behaviour in the British supermarket industry. Here, for reasons we spell out below, there are two obvious leadership candidates, Tesco and Asda. We examine their pricing behaviour using a new leadership concept seeking to avoid the various pitfalls. In our illustration, we take a particular neutral starting point, at which both key firms charge the same price for the products we examine.

We propose a new *definition* of what constitutes price leadership (and, by implication, what does not):

Price leadership occurs when one firm makes a change in its *Regular Price* (Nakamura 2008) that is followed within the next two weeks by the other (another) firm making a Regular Price change of exactly the same monetary amount in the same direction on the *same product*.

This definition therefore excludes temporary price changes, simultaneous price changes, those followed with a long lag, price changes of similar monetary amounts, or on a similar but not the same product. It is clearly falsifiable in the sense that it may not occur. More positively, the definition reveals which firm is engaging in leadership on which products when. It is deliberately defined narrowly, with the choice of two weeks interval reducing the possibility that chance movements are included, but allowing time for reaction. Since we start from a position where both firms charge the same price, our approach is not affected by the starting point.

However, the definition does imply deliberate action and reaction, which cannot be demonstrated but only be inferred from the data we have, since we have no direct evidence of intent. Given this, following our basic characterisation of the phenomenon, we discuss in section 5 how leadership as defined can be distinguished from random behaviour. Before that, we describe the industry (section 2), the nature of our sample data (section 3) and pricing behaviour in the industry (section 4).

2. The British supermarket industry

Grocery retailing is the largest retail sector in the UK and an important market. Verdict Research (2008), a market research organization, estimates that in 2007, food and grocery retailing accounted for around 42% of total UK retail spending. They predicted that this share would rise thereafter, to around 45% in 2012. The sector is dominated by four players. Table 1 below, extracted from Competition Commission (2008), shows that in 2007, nearly 2/3 of these retail sales are made by Tesco, Asda, Sainsbury's or Morrisons.³

As can be seen from the table, Tesco is by far the biggest of these, with Kantar putting its share at around 30% in 2011. In other words, Tesco alone accounts for over 1/8 of British retail consumer spending, on these figures. In recent years Tesco, and to a lesser extent, Asda, now the second largest firm, have grown significantly. In fact, on Kantar figures up until 1995, Sainsbury's was the largest firm, but first Tesco then, during 2003, Asda overtook it and Asda has maintained second position ever since.⁴

³ Kantar Worldpanel (2011), a rival source of market share information, gives them a total of around 72% of the market in 2011, on a slightly different definition of the market.

⁴ Both our sources agree on the latter point.

Both these firms operate large stores extensively; in fact according to the Competition Commission (2008), substantially fewer than ten of Asda's stores are less than 1,400sq.m in size.⁵ Tesco operates more of a variety of store sizes. Its nearly 1,400 stores in 2008 consisted of four main groups, the two largest accounting for 564 stores (and undoubtedly a major share of their sales. It then has two smaller groups, styled Metro and Express. Tesco and Asda together account for well over 40% of grocery sales.⁶

TABLE 1 Grocery sales share of UK grocery retailers

	2002	2003	2004	2005	2006	per cent e2007
Tesco	20.2	22.4	23.8	25.4	26.8	27.6
Asda	12.3	12.9	13.3	13.4	13.7	14.1
Sainsbury's	12.8	12.5	12.6	12.8	13.4	13.8
Morrisons	3.8	4.2	10.3	9.6	9.7	9.9
Safeway	8.2	7.8	2.4	0.0	0.0	0.0
Somerfield Chain	2.9	2.8	3.0	3.7	4.1	3.9
M&S	3.3	3.4	3.4	3.5	3.6	3.8
CGL	2.8	3.2	3.0	2.9	2.8	3.8
Waitrose	2.5	2.6	2.8	3.0	3.2	3.3
Iceland	1.7	1.6	1.5	1.4	1.4	1.5
Aldi	0.9	1.0	1.1	1.3	1.4	1.5
Lidl	1.1	1.1	1.0	1.1	1.2	1.3
Netto	0.5	0.6	0.6	0.6	0.6	0.6
Kwik Save	2.0	1.8	1.6	1.3	0.7	0.0
Others	24.9	22.1	19.6	20.0	17.4	14.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Verdict, *UK Grocery Retailers 2008*, February 2008.

Table drawn directly from Competition Commission (2008) Appendix 3.1

A key feature of the industry (Competition Commission, 2003) is that these firms practise national pricing. In other words, whether shopping in Cornwall or the Scottish Highlands, the consumer faces the same prices in their larger stores. Asda operates a uniform national pricing policy (with very minor differences) across all its stores in Britain. Tesco operates a uniform national pricing policy across its large stores, and many of the Metro stores also adhere to these prices.⁷ These uniform prices hold across the whole of the country- there are none of the intricate variations in prices that characterise US grocery retailing. Thus national advertising, for example, will include (selective) price information. This feature of the market is in itself curious,⁸ since costs will differ from location to location, as do incomes and indeed the extent of competition from one or more of the other major players. However, for present purposes, we take it as a given.

Both Tesco and Asda are part of major international retailing groups, in Tesco's case the base is in the UK. Tesco is one of the world's top four retailers; Asda is the British subsidiary of Walmart. Hence their pricing strategies are backed by powerful groups in each case. They are the obvious candidates for price leadership in the market, given their size and growth. Tesco is a natural candidate as a price leader, since it is the dominant player in the market in terms of market share. Asda has been chosen because it has a reputation both as a keen pricer in relation to Tesco and an aggressive player in the market. At the start of our period, it was the third player in the market

⁵ Very recently, Asda has purchased a smaller operator, Netto, which will have increased its store numbers in the smaller category.

⁶ TNS (2009) puts it at almost 50%.

⁷ This has not always been Tesco's policy, but it was at least since 2003, when our data start.

⁸ This is studied in Dobson and Waterson (2008),

but has moved up to and sustained second place, ousting Sainsbury, which has been much less concerned to price match. Sainsbury's, the number three firm, is notably less aggressive in its pricing practices, preferring a quality image, whilst Morrisons is very much the fourth player, absorbed with consolidating a difficult merger with Safeway (a very different store) in late 2003 and without an internet arm. Various reports including official investigations (e.g. Competition Commission 2000, 2008) have described Tesco and Asda as leading market trends. Given their national pricing practices, we can examine their pricing interrelationship using these national prices as our key statistics,

3. The data sample

We have available, week-by-week, the store prices for 370 precisely defined products over seven years from late 2003 to late 2010 for both key players in the British supermarket industry. Our sample starts when Tesco started its "Tesco Pricecheck" website. This was an independently collected large scale weekly comparison of precisely defined products across these two store chains plus Sainsbury's and Safeway/ Morrisons. We supplement this with data, from 2008 onwards, downloaded from a website called mysupermarket.co.uk (who collected across Tesco, Asda and Sainsbury's) to create the seven year sample. Thus we have consistent data for Tesco, Asda and Sainsbury's over seven years.

Our 370 products are those for which we are able to form a good quality price series over the full period.⁹ Some are branded products (for example, Nescafe Gold Blend Coffee 200g), others are essentially identical store brand products (e.g. Own label fresh single cream, 568ml). Of the 370 products, within the first 6 weeks of the sample, a total of 331 products were priced identically by these two players, either right from the start or quite soon thereafter. These 331 products, as from the 7th week, were taken for further examination.¹⁰ Of these 202, or almost 2/3 of the products, were also priced identically at the end of the sample (within the final month). Of course, the prices were not identical at beginning and end, in fact the mean price at the start was a little over £1.50, but by the end it was £1.85 and had been up to £1.90. This raises the question of leadership's role in prices moving up by roughly 25% over the period.

We want to avoid complications introduced by temporary price offers. Hence, we identified temporary "V shaped" price offers and then eliminated them using a slight variant of the Nakamura algorithm (described in Nakamura and Steinsson, 2010). These were defined as decreases in price that were associated, up to 6 weeks later, with increases of the same amount, or moves to a new regular price. We eliminated these in favour of a regular price spanning this period. All subsequent discussion relates to regular prices. In fact, it probably should be emphasised that there is an element of nonlinear pricing in temporary offers made by these and other store chains (three for the price of two offers, etc). Since we examine regular prices we look only

⁹ The sample is clearly not random. However, appropriately weighted, it tracks the official CPI well (see Chakraborty et al, 2011). The correlation between baskets constructed from our supermarket prices to mimic the CPI index and the index itself is uniformly very high, in excess of 0.93.

¹⁰ Our justification on timing is that once the Tesco Pricecheck started, all players were able to compare prices easily, so initial moves to align themselves are allowed. In total we use 365 weeks of observations.

at prices for a single item, not package deals. This is in line with the Macroeconomic literature as cited above.

4. Characterising pricing in the industry

Before we move to examining leadership specifically, we discuss the nature of pricing behaviour in the industry more generally, to explain further why it is a good case study for examining price leadership and why we do not consider cost changes to be the sole, or even perhaps an important, drive of price changes.¹¹

The first thing to point out is that prices in the industry are very flexible, even when considering regular prices. In fact, they are much more flexible than could possibly be explainable through changes in costs. Figure 1 shows median duration of price across our products and time period. As can be seen, for most products at either of our two stores, the median duration is only a little over a month, whereas Sainsbury's prices tend to be rather more stable.

The second point to emphasise is the variety of experience across products in terms of pricing behaviour, implicit in Figure 1. Whilst in both stores milk (products) change prices only infrequently, perhaps as little as once per year, other products change rapidly; amongst these alcoholic drinks are one thing that stands out. Again this speaks to the proposition that costs are unlikely to be the prime driver of price changes.

A third feature of pricing in the industry, itself the subject of study in Chakraborty et al. (2011), is that at various times, markedly so in 2008, there is a welter of price cuts of very small monetary value. Indeed, penny price cuts are very common. Also, a feature of the market across these two and the other two major players is that there is remarkable concordance in the majority of small price changes made being cuts (up to values of around 8 pence) whilst the majority of larger price changes, above 10 pence, relate to price rises, rather than falls. Again, this is a pattern at the lower end that is unlikely to be related to changes in costs. Small value price changes, even as low as one penny, are seen on products costing several pounds on occasion.

Finally, in figure 2 below we show weighted basket prices calculated from our data sample of 370 products, using weights equivalent to those used in the CPI. As with other evidence, this shows how Sainsbury's takes a somewhat different path from Asda or Tesco, with somewhat higher pricing.

¹¹ Much more detail on general pricing behaviour is provided in Chakraborty et al, (2011).

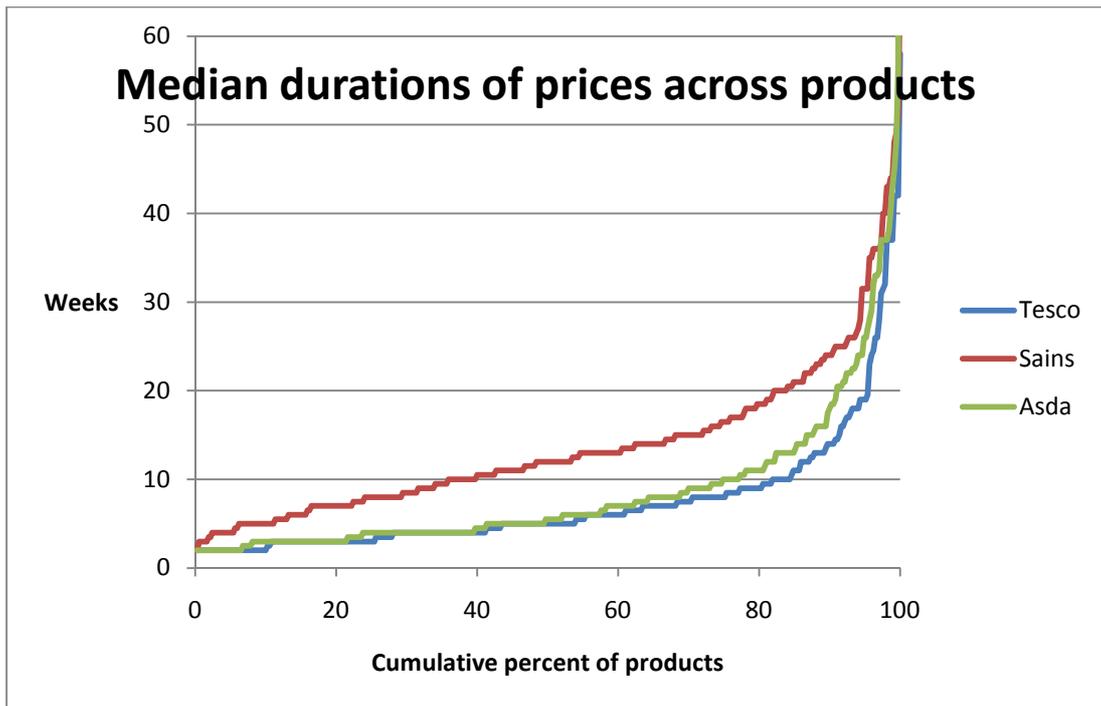


Figure 1: Median duration of prices in our data sample

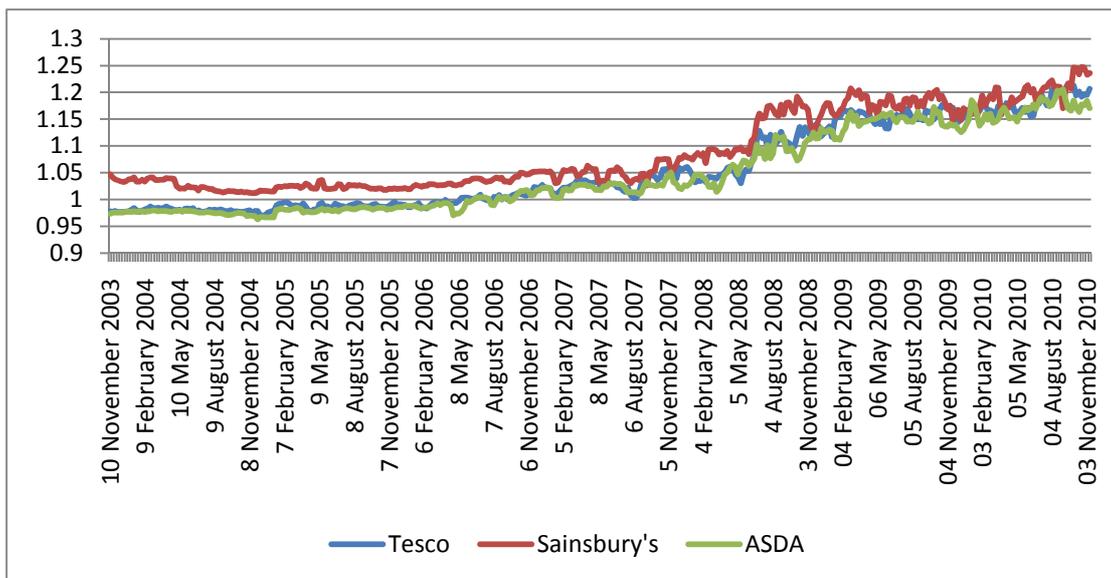


Figure 2: Prices indices calculated using CPI weights from our data sample

5. Leadership incidence, significance and impact

We identify two broad types of leadership. One is upward price leadership- a regular price movement upwards by one of the players that is associated with an increase of exactly the same amount one or two weeks later by the other player. Downward price leadership is defined completely analogously. Logically, there are four forms of price leadership that could exist here- it could come from Tesco or Asda, and it could be upward or downward. Within the sample, there are many examples of each over the period, as Table 2 shows.

Table 2: Summary of findings on price leadership

Occasions on which firm led	Tesco	Asda
On price rise	347	256
Average rise	15.2p	14.2p
Products illustrating leadership	58%	53%
Maximum leads/week	12	7
On price fall	562	1328
Average fall	5.3p	3.5p
Products illustrating leadership	62%	87%
Maximum leads/week	21	39

These results represent findings over 331 products for 369 weeks using “regular” prices

Table 2 summarises our broad findings on price leadership. Even given our tight definition, we see several hundred episodes of price leadership over our (large and quite lengthy) sample. Thus price leadership is extremely common, it resides in both players and it covers a majority of the goods at some stage or another over the seven year period we have examined. In this sense, neither player is “the” price leader. Yet, it is difficult to think how the definition of leadership could be made narrower than the one we have employed, to reduce the incidence.

Tesco is more often the price leader over price rises. In an echo of Walmart’s “rollback” programmes, Asda dominates leadership in price falls, although these are on average smaller in magnitude than rises. In fact, one of the most significant findings is that leadership over price falls greatly dominates leadership over price rises. Thus it is clearly not the case that price leadership as defined here is necessarily creating higher prices than otherwise would be observed.

The overall picture conceals some important temporal variation, illustrated in Table 3. Price leadership becomes more significant as a phenomenon over the seven year period, measured either in absolute terms or relative to the total number of price changes. It peaks in extent in 2009, with nearly a quarter of all the regular price changes made within the year (therefore covering almost 50% of price movements) being leadership moves. Moreover, over our time period, Asda comes to dominate in leadership on our definition, not only on price falls but also price rises, although it remains the smaller firm.

		Movements by year							
Table 3:		2004	2005	2006	2007	2008	2009	2010 (part)	Total
Up	Tesco	35	60	84	75	50	13	28	345
	Asda	4	15	19	10	99	69	40	256
Down	Tesco	7	13	42	47	138	259	54	560
	Asda	47	61	32	43	329	649	162	1323
	Sum	93	149	177	175	616	990	284	2484
Total price changes		826	1142	1240	1776	4247	3994	2412	15637
Proportion		0.113	0.130	0.143	0.099	0.145	0.248	0.118	0.159

Note: Excludes the closing weeks of 2003. 2010 ends in November.

The discussion above makes the presumption that the behaviour exhibited in table 3 is different in a temporal, directional or fascia sense from random behaviour. We can test this formally using a set of chi-squared tests, with the null hypotheses (i) that behaviour is random across the years in terms of upwards versus downwards movements, (ii) that the share of upwards movements by Tesco versus Asda is randomly distributed across the years, (iii) the same for downwards movements, (iv) that upwards and downwards movements are a random proportion of total price changes. In each case, the calculated chi-squared value is substantially in excess of the chi-squared value for six degrees of freedom at the 0.01 level, meaning we can reject each of these hypotheses. In all these senses, price leadership behaviour is not random.

Of course, firms are likely to be subject to common cost shocks. Hence, on one view, what we identify as leadership might be considered as merely the effects of common cost increases.¹² We are not able to get a clean identification of when this happens. However, it is important to recall the definition we use. In order to count as a leadership event, the price rise cannot be simultaneous. It also has to be the same number of pence. Moreover, it is rather likely that single penny drops in price that are followed do not have their origin in cost shocks. Given that around half the price fall leadership cases relate to such penny drops, this is a significant consideration.

One way of getting a handle on the impact of cost shocks as an explanation more broadly is to compare the figures in table 3 with simultaneous price movements on otherwise the same definition (i.e. identical price changes etc.). Table 4 lists these movements in our sample. We can thereby examine the likely extent to which what we are identifying as price leadership is in fact simple (but slightly staggered) responses to cost changes. If cost changes are the underlying cause, then what we style leadership would occur roughly as often as simultaneous price moves that otherwise fit our definition.¹³ When we make this comparison, we find on average a significant excess of “leadership” events compared with what would be expected given numbers of simultaneous price rises, as illustrated in the final two rows of the table. This is particularly true (a) in 2009 and 2010 and (b) in respect of price falls. The latter is certainly what might be anticipated, since the data exhibit many price falls and it is almost inconceivable that costs have fallen to suit. We test the null hypothesis of consistency in the ratio of “leadership” rises (falls) to simultaneous rises (falls) over time, versus non-consistency using a chi-squared test. Here the null is very clearly rejected. Along with the other evidence, this is a substantial confirmation that we are identifying real behaviour, although possibly what we call leadership has different causes on different occasions, sometimes relating to cost movements and sometimes not.

¹² An alternative view is that any event we identify as leadership is clear leadership, since someone has initiated the rise in the product’s price.

¹³ Of course, our definition of “leadership” involves the price change being over either of the next two weeks. Therefore, in making comparisons between simultaneous and staggered price movements, we must divide the latter by 2.

Table 4: Examining simultaneous price movements

	2004	2005	2006	2007	2008	2009	2010 (part)	Total
Any	20	50	43	75	180	44	13	425
Up	15	30	32	43	57	11	10	198
Down	5	20	11	32	123	33	3	227
Ratio prices led up to simultaneous	1.30	1.25	1.61	0.99	1.31	3.73	3.40	
Ratio prices led down to simultaneous	5.40	1.85	3.36	1.41	1.90	13.76	36.00	

A tentative negative finding is that there is no clear pattern to the set of products where one firm leads. In other words, it is not the case that Tesco for example tends to lead on packaged goods and Asda on fresh goods. Table 5 cuts the sample another way, looking at the set of products led by each firm, focusing on upward price leadership only. The way to read this is as follows: Almost 30% of the products are led upwards by each firm at some point in time (that it by one firm at least once and by the other at least once) across the period. In terms of the range of products covered by our definition and sample, Tesco leads upwards more than Asda does, leading on 58% of our products over the period. The maximum number of occasions in seven years that a particular product is led upwards by one firm is six. But only 19% are not led upwards at all within the period. Looking specifically at “own brand” products, there are 96 such products in our sample, i.e. just under 30%. Perhaps surprisingly, it appears that these are slightly more likely to be led upwards than are branded products, but the excess movement is not large.

Table 5: Upward leadership on prices across products

	Asda	Leads	Follows
Tesco	Leads	29.6%	28.4%
	Follows	23.0%	19.0%

The impact of price leadership is also important. Examining upward price leadership, a legitimate question given our narrow definition is whether those products exhibiting most price leadership episodes also increase most in price, there being several other means whereby prices can rise (for example, simultaneous price rises). We examined the percentage price changes over time across all 331 products we use for this exercise and correlated these with the number of upward leadership episodes by each player. So far as Tesco leadership episodes are concerned, these appear important in explaining price rises, with a simple correlation of 0.307, significant at conventional levels, although this does not of course demonstrate causation. But for Asda, the correlation is insignificant at 0.076.

We also find that within the most numerous sub-categories of goods in our sample,¹⁴ those that experience more Tesco price leadership episodes also exhibit greater overall price increases. For example, within the largest category within our sample, Bread and Cereals, the mean price increase across the seven products with five or six instances of such leadership was 68.6%, whereas for those 16 with zero instances it was 34.4%, a figure which is significantly lower, based on a t-test for mean differences.

6. Conclusion

We propose a very tight definition of price leadership. Nevertheless, our main finding is that identifying a single firm as the clear food market price leader from our sample is doomed to failure, although under our definition Tesco appears the more successful in using price leadership as a mechanism to raise prices over the period. Our definition does not have a clear causal implication, in that we cannot infer intent. Indeed, one reflection of our work here is that the existing concept of price leadership lacks not only precision but also causation. But that cannot be inferred from prices alone. However, it does appear that leadership, even narrowly defined, has become more important in recent years as a phenomenon in the British supermarket industry.

¹⁴ We look at sub-categories since within these there are likely to be very similar cost pressures. For example, if wheat rises in price, this will affect all bread products similarly. Smaller sub-categories exhibit too few degrees of freedom to examine this question with any degree of confidence.

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