

Chapter 1

Market Consolidation and Pricing Developments in Grocery Retailing: A Case Study*

Ratula Chakraborty

*University of East Anglia
r.chakraborty@uea.ac.uk*

Paul W. Dobson

*University of East Anglia
p.dobson@uea.ac.uk*

Jonathan S. Seaton

*Loughborough University
j.s.seaton@Lboro.ac.uk*

Michael Waterson

*University of Warwick
michael.waterson@warwick.ac.uk*

Abstract

When large retailers merge, there is a concern that a sudden and marked increase in concentration will alter the intensity and nature of price competition to the detriment of consumers. This chapter considers just such a situation in regard to UK grocery retailing, which has witnessed steadily increasing concentration over recent years, advanced by a series of mergers. Specifically, we examine

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the nature of price competition amongst the major “one-stop-shop” retail chains before, during, and after the Safeway/Morrison merger in March 2004. We find the merger offered consumers an immediate windfall benefit — with average prices falling straight after the merger — and more intriguingly appears to have led to (or at least is associated with) a marked change in the character of price competition in the market.

Keywords: Price competition, concentration, pricing strategies, grocery retailing.

JEL Classification Codes: L40, L81, L11.

1. Introduction

Prices in the UK grocery sector fell in real terms by 7.3% in the early 2000s (Office of Fair Trading, 2006). Yet, over the same period, concentration increased sharply, with the top four UK supermarket retailers increasing their joint share from approximately 60% to 75%. Doubtless, costs might have been lowered through scale efficiencies, improved organization, and the exercise of buyer power. Even so, the falling prices may be symptomatic of changes taking place in regard to how retailers compete, and in particular, the pricing strategies that they employ, and not merely to do with passing on cost savings. To analyze this, we investigate pricing strategies with particular reference to a large merger. At issue is whether a change in market structure can fundamentally change market behavior in an unanticipated, but in this case apparently beneficial, manner with implications for evaluating future scenarios of how market outcomes might evolve post-merger.

This chapter explores this issue using a balanced panel sample from a novel dataset that covers prices for a wide range of grocery and household products across all four major supermarket chains jointly accounting for over 90% of the UK one-stop shopping grocery retail market (defined in the UK as grocery sales from stores greater than 1,400 sq. m). The dataset used is based on weekly-updated price data on individual items covering the period from November 2003 to November 2006, during which time, there was significant change in the structure of the market, the completion of the *Safeway/Morrison* (hereafter, S/M) merger in March 2004, consolidating the position of the fourth player. Otherwise, this time period is characterized by the macroeconomically benign environment of growth and mild inflation now called the Great Moderation. For the period investigated, we find a

strong incidence of net price reductions. The evidence suggests that the primary driver of falling prices during this period has been higher priced firms cutting prices (rather than lower priced firms cutting prices further) as they shifted from traditional high-low (“HiLo”) promotional-based pricing toward value-oriented every-day low pricing (“EDLP”), whilst retaining promotional elements — a hybrid strategy that all four major players appear to have adopted to a greater or lesser extent by the end of the period studied.¹

For this market, a move toward price convergence is associated with a change in the character of price competition triggered by increased concentration and an intensifying battle for market share. Yet, the real price reductions overall mask a more complex picture of price changes, with many falls at the same time as substantial increases in prices on other products.

Viewed in policy terms, this era may have an important bearing on how competition authorities should view retail mergers, with the need to distinguish those likely to promote a shift toward more intense, rather than less intense, competition to the benefit of consumers. The UK competition authorities were faced with four possible merger scenarios, out of which they chose one (with relatively minor restrictions regarding the small number of areas where the merging parties overlapped significantly). The short-term indications are that they got this right, in the sense that the other possible mergers would have led to a more asymmetric concentrated structure and an outside firm is likely to have found greater difficulty in delivering cost reductions.

There remains a lingering concern that as the post-merger market settles, and positions stabilize, then competitive intensity may wane, leading to the prospect of future price rises. Yet, at least for the period studied here, examined purely in terms of the impact on consumer welfare through

¹Bolton and Shankar (2003) provide empirical support for the view that retailers’ pricing policies operate along a spectrum of positions (rather than simple “either–or” choices) in respect of the average price levels used, the frequency of price changes, and the nature of retail promotions. Moreover, as shown by Ellickson and Misra (2008) in the context of U.S. supermarkets, retailers may tailor their pricing strategy choices (e.g., EDLP, HiLo, or a hybrid position) at store level, according to prevailing local market conditions and the nature of local competition. This position is noticeably different to that applying in the UK where grocery retailers generally commit to a pricing strategy that applies across their entire store chain or at least to different store-size categories and linked to their retail brand and store fascia (e.g., Competition Commission, 2000).

effects on prices, our analysis provides support for the arguments made by the UK competition authorities in allowing the S/M merger (rather than the other contemplated mergers) in an already quite concentrated market. Our sample suggests that consumers saw an immediate windfall benefit from the merger — with price cuts across a wide range of products following completion of the merger; although, we establish close correlation in timing, this is clearly not the same as establishing causation.²

Beyond the rapid post-merger drop in prices, we also find evidence that the nature of price changes and competitor responses changed more generally over the period. In particular, leader–follower patterns and response timings appear to have shifted as the price gap narrowed across the main retailers. Indeed, there is evidence of asymmetric leader–follower positions, with one retailer tending to lead on price rises while another retailer tends to lead on price falls. We also find that, while an increasing number of products were identically priced across all the main retailers, even where price gaps remained, they were often as small as a single penny across the four retailers. A significant proportion of the price changes, particularly decreases, were a single penny, indicating a willingness to pass on lower costs and/or seeking to gain or maintain the lowest price position (and thus enhance their reputation with consumers) — and suggesting low menu costs.

The chapter is organized as follows. In Section 2, we briefly review developments in the UK grocery sector, examining changes in market concentration and the nature of the leading players in the “one-stop shopping” market. In Section 3, we discuss the source and nature of the pricing data used. In Section 4, we assess the four main retailers’ price change decisions in terms of patterns over time (particularly in view of the S/M merger, examining average prices, direction and magnitude of price changes, and the extent of price alignment across the retailers), patterns

²A quite different structural approach to the analysis of this merger is carried out by Skrianka (2012). He focuses on the geographic distribution of demand using TNS Worldpanel consumer micro-data. Given the structural nature of the model, he is able (subject to his maintained assumptions) to recover estimates of consumer welfare, as well as profits. His paper suggests that the S/M merger had little impact, but that a merger of Safeway with Tesco would have had a greater negative impact on consumers. His model relies on recovering marginal costs and also is comparative static in nature, so he is not able, for example, to investigate leader–follower behavior and the like.

across product types, and evidence of leader–follower behavior. Section 5 concludes the chapter.

2. UK Grocery Retailing and One-Stop Shopping

Grocery retailing is significantly the largest retail sector in the UK. Total sales through UK grocery outlets were around £120 billion (approximately \$200 billion) in 2005 (Office of Fair Trading, 2006). Of this total, around £95 billion comprised grocery sales, with the remainder made up of sales of non-grocery items. Groceries account for nearly half of all UK retail sales, and around 13% of all household spending (IGD, 2005). Four retailers — Tesco, Sainsbury, Asda (owned by Wal-Mart), and Morrison/Safeway — dominate the national market, accounting for around 75% of grocery retail sales (covering food and drink, cleaning products, toiletries, and household goods), and indeed 30% of all retail sales in the UK.³

These four supermarket retailers have primarily positioned themselves as “one-stop shops”, operating with very wide product ranges in large format stores. They jointly account for over 90% of grocery sales for stores with sales areas exceeding 1,400 sq. m (approximately 15,000 sq. ft) — the critical size above which the UK competition authorities view as distinguishing one-stop grocery shops, serving a separate economic market for primary shopping needs (where consumers could buy all their grocery needs in a single store, perhaps with a single weekly shopping trip), from smaller stores catering more for secondary (e.g., “top-up” and “convenience”) grocery shopping needs.⁴

With such high concentration and concerns about the exercise of market power, the UK authorities have investigated the sector several times in recent years. The Competition Commission’s market investigation completed in

³For further details, see IGD (2005) and Mintel (2005). Tesco alone is estimated to take more than one-eighth of UK consumer retail expenditure.

⁴More formally, the Competition Commission (2000, Paragraph 2.26) defined “one-stop shopping” as “the shop for the bulk of a household’s weekly grocery needs, carried out in a single trip and under one roof”. This is distinguished by the Competition Commission from other forms of shopping, characterized as “secondary shopping”, which typically involve the greater use of other types of grocery stores, a different product mix and a lower average basket spend.

Table 1. Market Characteristics in UK Grocery Retailing, 1998–1999

Main UK grocery retailers	General character and pricing policy	Total grocery stores	National market shares		
			All grocery stores (%)	Grocery stores >1,400 sq. m (%)	Grocery stores >2,300 sq. m (%)
<i>One-stop shops</i>					
Tesco	Value-led HiLo	642	23.0	28.5	29.5
Sainsbury	HiLo	424	18.7	24.8	27.5
Asda	EDLP	227	12.2	16.8	20.8
Safeway	HiLo	498	11.5	13.8	11.0
Morrison	EDLP + deals	95	3.9	5.4	6.6
<i>Other chains</i>					
Somerfield/ Kwik Save	HiLo Soft Discount	1,442	9.8	3.1	0.8
M&S	Premium	294	4.9	2.2	2.0
Waitrose	Premium	119	3.0	2.5	0.4
Aldi	Hard Discount	219	1.4	0.0	0.0
Lidl	Hard Discount	173	0.9	0.0	0.0
Netto	Hard Discount	120	0.7	0.0	0.0
Budgens	HiLo	177	0.7	0.0	0.0
Iceland	Specialized/deals	770	3.0	0.0	0.0
Booth	Premium	24	0.2	0.1	0.0
Co-operatives	HiLo	1,920	6.4	2.8	1.5

Source: Dobson and Waterson (2008) adapted from Competition Commission (2000; Tables 5.2 and 5.6, Appendices 5.2 and 7.1).

2000 provided a very detailed analysis of the structure of the relevant markets and the behavior and performance of the main supermarkets groups. Table 1 shows some of the key market characteristics identified at that time, with just five players dominating the one-stop shopping market as served by larger grocery stores.

In March 2004, the “Big 5” became the “Big 4” with the merger of Safeway and Morrison. This followed an investigation by the Competition Commission in 2003 into contemplated mergers with Safeway as considered by all four of the other top 5 one-stop shopping retailers. However, prospective mergers with Tesco, Sainsbury, and Asda/Wal-Mart were all blocked on grounds that competition would likely be significantly reduced

Table 2. Retailer Market Shares for Stores Greater than 1,400 sq. m in Great Britain, 1998–2003

	01/1998	01/1999	01/2000	01/2001	01/2002	01/2003	1998/2003 gain/loss
Tesco	28.5	28.8	29.5	29.9	30.8	31.3	2.8
Sainsbury	26.5	26.0	25.1	23.6	22.4	21.9	-4.6
Asda	17.1	17.6	18.7	19.8	20.4	21.5	4.4
Safeway	12.6	12.9	12.2	13.0	12.7	12.0	-0.6
Morrison	5.4	5.7	6.4	7.1	7.5	7.6	2.2
Others	9.9	9.0	8.1	6.6	6.2	5.7	-4.2

Source: Dobson (2005) adapted from Competition Commission (2003; Tables 3.2 and 5.17) (based on TNS till roll data).

(as identified by the Commission's consideration of potential unilateral and coordinated effects arising from such mergers). Morrison was allowed to proceed subject to a number of store divestments. Table 2 shows the trends in market shares identified in the Competition Commission's inquiry, revealing strong growth in the positions of Tesco, Asda, and Morrison, relative decline in the position of Sainsbury and some decline in Safeway and other retailers in the one-stop shopping market.

Nevertheless, continued concern about the market power held by the main players and increasing levels of concentration, as well as the move by some of the key players (notably Tesco and Sainsbury) to enter the convenience store sector, led to a further full sector inquiry in 2008. This latest inquiry focused on relations in the supply chain (with concerns about the buyer power of the major retailers), possible anticompetitive practices in retail markets (with concerns about below cost selling and targeted pricing), and entry barriers (notably, the role and implications of current planning restrictions in the UK and high levels of local concentration).

In the period after the 2000 Competition Commission market investigation, it was noticeable that the positions of the leading firms changed somewhat, especially with regard to their pricing policy. In particular, "HiLo" promotional pricing was largely abandoned, with Safeway's extreme HiLo pricing being replaced by Morrison's more consistent value-oriented pricing policy, and a move by Sainsbury toward a similar value-oriented position, operating with broadly low everyday prices with some

promotional deals. This is also the position essentially adopted by Tesco and even Asda modified its EDLP approach to encompass promotional deals. Thus, the previously more polarized positions gave way to a more common value-led approach shared by all leading players, if to slightly different degrees and with different emphases.⁵ The common emphasis became building chains with consistent national appeal through the adoption of national pricing and marketing policies, rather than tailoring offers to local markets (as may be more common in other countries and other retail sectors). For example, local price flexing (that is adjusting prices according to local competitive conditions) largely gave way to a situation where all four major players adopted national prices in the UK one-stop shopping market (i.e., for large sized stores) — a market feature that will prove particularly useful in the context of our price comparison analysis over what has what has turned out to be a very important period in the development of this sector.

3. The Data

Our price data are drawn from a price comparison service provided by tesco.com (at www.tesco.com/pricecheck) — the UK's leading Internet retail operation and run by the UK's leading retailer, Tesco plc. Starting from late 2003, this website provided price comparisons, updated weekly, on initially about 4,000 items, growing to over 10,000 individual items, across the leading four supermarket retailers in the UK — Tesco, Sainsbury, Asda, and Safeway (replaced later with Morrison).⁶ The reported prices, stated by Tesco as being independently collected, are based on the most common (i.e., mode) value for one to three similarly sized superstores (i.e., excluding

⁵For details on the points of difference in the nature of the pricing policies used by the key players, see Verdict Research (2005), also Competition Commission (2003, 2008) on pricing policies more generally.

⁶The Pricecheck service was used by Tesco as a marketing ploy to allow it to demonstrate how many lower prices it had compared to rivals in its advertising claims. Of course, it is possible that the presence of the website itself led to behavioral changes. Certainly, we see some price alignment taking place between Tesco and Asda in the early weeks (Seaton and Waterson, 2013). The Tesco Pricecheck service ended in late 2008 with a move to a different marketing ploy and advertising campaign, Tesco Baskets, showing comparisons across baskets of products, rather than individual items.

smaller store formats operated by these retailers, such as Tesco Metro and Sainsbury's Local) around Great Britain for each of these four retail chains and the prices relate to single items/packages (i.e., they do not cover multi-buy offers such as "buy one, get one free", "three for the price of two", etc.).⁷

Crucially (and very different from countries such as the U.S. and France, where retailer chains invariably price locally), these retailers have adopted uniform national pricing policies. Specifically, in keeping with their publicly stated commitments, the "Big 4" retailers, i.e., Tesco, Sainsbury, Asda, and Morrison, each use a national pricing policy at superstore level with no local price deviations in this market (Competition Commission, 2003). Accordingly, the reported prices would normally be expected to apply across every superstore operated by that retailer for the whole of Britain.⁸ Hence, this price comparison service should provide reliable coverage for individual item prices for the supermarkets that account for over 90% of the one-stop shopping grocery market expected to operate in Britain.

Our data covers a complete three-year period. Data collection began with the published comparisons for November 10, 2003, on the basis of prices ordered by "aisle" within the store. All available price comparisons made in respect of "aisles" were then subsequently collected from the Tesco

⁷In operating the Pricecheck service, Tesco stated that they tried to ensure that the prices displayed on the website were fair, representative, and accurate. Tesco argued there was no bias in the choice of products for comparison with equivalent products always compared (e.g., Tesco's "Value" brand was always compared with the other supermarkets' own budget brands). More broadly, it was claimed that a like-for-like basis was consistently used for comparisons. If the price collector did not obtain a comparable size for a product, then the nearest size was taken and the price converted pro-rata. If there was no size that would fairly compare with the Tesco product, then it was not included. If a product was found to be sold out in a store, then the price recorded on the shelf was used. If a product had a price mark that was different from the shelf price, then whichever was the lower price was taken.

⁸It is this feature of national pricing policies that makes this particular price comparison service and more recently developed ones, like mysupermarket.co.uk, extremely useful and amenable in allowing analysis of prices in the present UK context. Clearly, such a service would be less useful in other countries (e.g., the U.S.) where local pricing in the retail grocery sector predominates (e.g., Montgomery (1997), Chintagunta *et al.* (2003), and Ellickson and Misra (2008)).

Pricecheck website for each week in which the data were updated through to November 13, 2006. While prices were updated for most weeks, there were a number of early weeks in which prices were not updated on the website. For the 158 weeks covered in this period, we were able to collect data for 129 weeks (i.e., 29 missing weeks).⁹

In any given week, only around a third of the items had comparisons across all four retailers. Also, the goods on which all four comparisons were made changed over time, and even from week to week.¹⁰ In addition, there were changes in the composition of products covered, as well as individual product introductions and deletions over time. The net result is that we were left with 539 items on which we had prices at all four retailers for every week in which data were collected to allow us to construct a balanced panel over this period of three years. These items cover products in 9 of the 12 broad categories (“aisles”) identified on the website, with a mix of branded and own-label goods, a range of different package sizes, and broad spread of prices, thus providing a wide but not full representation of products stocked.¹¹ Table 3 provides some summary details.

⁹Prices were updated weekly up to mid-December 2003 but then were updated more erratically (sometimes only twice a month) through to July 2004, after which they were updated more consistently on a weekly basis through to December 2004, but then again erratically (though often fortnightly) through to July 2005, after which the prices were mostly updated weekly. The most noticeable and consistent gap in the series relates to the two weeks covering each Christmas and New Year (which could be an indication that store prices were themselves not changed significantly over this interval — as found by other studies, e.g., Müller *et al.* (2006)).

¹⁰Absences on the website were shown as “not found” (“N/F”), indicating that the product (or its like-for-like equivalent) could not be found in the retailer (which may have been because it was not stocked, but could also have been due to the researchers not having sufficient time to locate and record the price — hence accounting for the fluctuation in weekly recorded prices and why coverage varies across categories and across retailers). Four-way comparisons ranged from as high as 40% of the items covered in some weeks to as low as 25% in other weeks, though commonly around 30–35% of items covered.

¹¹In particular, we note that there is an absence of “fruit and vegetable” and “meat, fish, and poultry” prices as these only became available from mid-2004 onwards. Also, there were no recorded prices in the “newsagent” aisle (e.g., cigarettes) during this period. In addition, there were certain “shelves” within “aisles” where either recorded prices commenced at a later date or were never covered (e.g., “sweet morning goods” in the bakery aisle and “bags of sweets” in the grocery aisle, amongst several others).

Table 3. Sample Characteristics

Aisle	Number of items	Own-label (%)	Minimum price (£)	Maximum price (£)	Mean price (£)	Median price (£)	Mode price (£)
Bakery	11	64	0.19	2.39	0.81	0.73	1.04
Grocery	289	28	0.15	5.86	0.99	0.84	0.64
Frozen foods	10	10	0.46	5.69	1.79	1.48	1.79
General goods	51	24	0.33	6.71	1.68	1.39	1.28
Deli and dairy	40	28	0.19	16.90	1.35	0.98	0.38
Health and beauty	37	14	0.29	9.25	1.86	1.67	1.68
Off-license	41	7	1.22	26.65	8.47	7.12	1.54
Pet foods	20	10	0.24	4.99	1.34	0.98	0.47
Beverages	40	18	0.13	6.58	2.01	1.93	2.98
Full Sample	539	24	0.13	26.65	1.81	1.05	0.98

4. Pricing Developments

We examine in some depth across various dimensions the pricing developments in the British grocery market as the S/M merger was taking place.

The data consists of prices, p_{fiw} , charged by firm $f = 1, \dots, 4$ (*Tesco*, *Sainsbury*, *Safeway/Morrison*, and *Asda*) for item $i = 1, 2, \dots, 539$ for weeks $w = 1, 2, \dots, 158$ (running from November 10, 2003 ($w = 1$) to November 13, 2006 ($w = 158$)). As 29 of the 158 time periods are missing, it proves convenient to redefine our observations to replace w with t covering observations $t = 1, \dots, 129$ — see Table A1 in the Appendix for details. With 129 weekly observations on 539 goods, we have 69,531 price observations for each retailer, 278,124 observations overall. The number of “valid” price change Δp_{fiw} observations is reduced measurably by missing observations; this can of course be addressed by both careful estimation and appropriate interpolation procedures.

A further complicating feature of the sample relates to the merger of Safeway and Morrison, formally completed on March 8, 2004 but with Safeway store conversions, into the Morrison format, taking place over subsequent months. Pricecheck recorded Safeway prices until mid-August 2004, after which it replaced Safeway with Morrison. Accordingly, our data can be split into three key sub-periods: “pre-merger” (from November 10, 2003 to February 23, 2004, i.e., $w = 1-16$, $t = 1-11$), “post-merger with

Safeway data” (from March 15, 2004 to August 16, 2004, i.e., $w = 19-41$, $t = 12-24$); and “post-merger with Morrison data” (from August 23, 2004 to November 13, 2006, i.e., $w = 42-158$, $t = 25-129$).

4.1. Firm-level average prices

To provide a broad indication of how prices developed over the observed time period, Figure 1 shows the indexed (unweighted) firm-level mean average prices for the sample of items. The market exhibits sharply declining prices in S/M¹² (labeled simply Morrison in the figure, for brevity) and more modestly declining prices in Sainsbury, after which the trend is more flat except in pre-Christmas periods where prices dip and then rise again each post-New Year. The latter feature appears to be driven by heavy discounting of particular relatively more expensive products in the sample, notably alcoholic beverages.

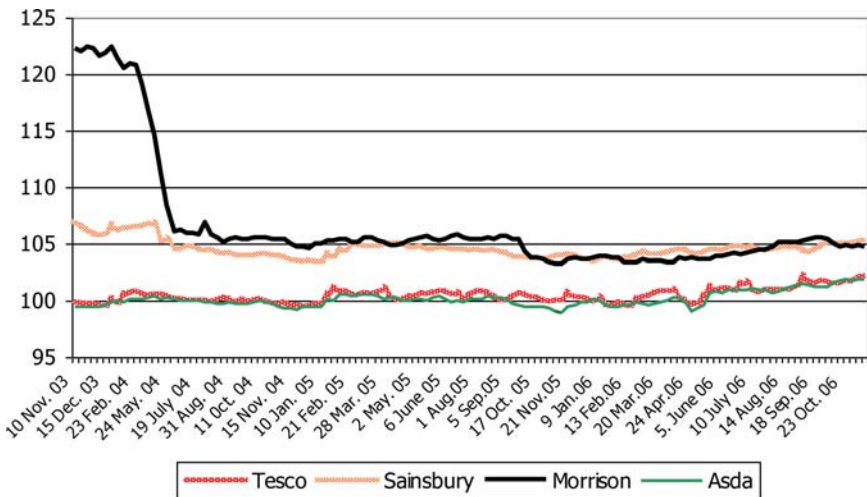


Figure 1. Mean prices over time (unweighted mean with Tesco first week as base = 100).

¹²This is consistent with casual speculation at the time that Safeway faced a relatively high cost base.

4.2. Direction of price changes

Tesco, the market leader and the retailer that changed its prices most, made 4,492 price changes, representing just over 5% of the data or equivalent to about eight price changes for each item over the entire period (i.e., a change approximately every 16 weeks). Asda, in line with its declared EDLP approach, changed its prices the least often, with 2,858 price changes, about five changes per item over the three years.

Despite the appearance from Figure 1 of the trends in average prices for the retailers being broadly flat, with the notable exception of Safeway/Morrison, there were in fact substantially more price falls than price rises over the period, as shown in Figure 2. The falls tend to be small in size and the rises larger. Interestingly, this finding is the reverse of U.S. evidence, e.g., Levy *et al.* (2004) who found for a U.S. grocery chain that price rises outnumbered price falls but with rises typically being small compared to price falls, perhaps indicative of a different competitive dynamic at play than in the U.S. (Levy *et al.*, 2004; Hosken *et al.*, 2000).¹³

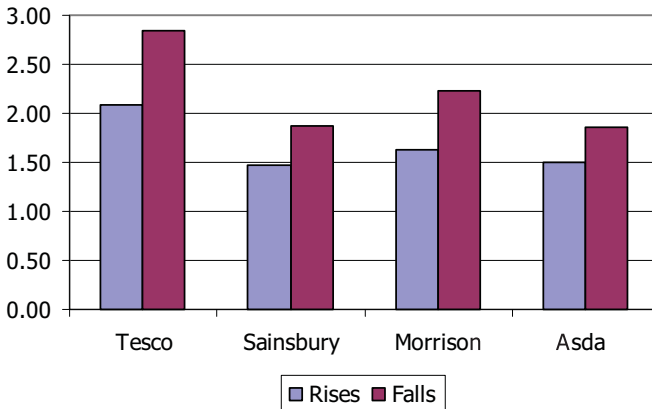


Figure 2. Percentage of price changes by each retailer (average percentage of falls/rises per week).

¹³Note there is little evidence of price stickiness in our data. Nakamura (2008), with a different U.S. supermarket sample, also finds scant evidence of price stickiness.

4.3. Magnitude of price changes

Examining the monetary amounts involved in the price changes reveals that, in a large proportion of cases, price changes involved just a few pence. Indeed, a change of just one penny was the most common price change. Figures 3a and 3b respectively show the cumulative frequencies for price falls and price rises (1p–50p) for each retailer.

Investigating further whether the patterns were different for price rises than price falls, and whether these altered over the three sub-periods associated with the S/M merger, Table 4 details the extent of price changes in percentage terms. The upper panel shows the price increases in the ranges up to 10% for all four retailers through each of three sub-periods. It can be observed that such price increases account for less than a sixth of all increases made by Safeway in sub-period one, whereas they account for around a half by the other three retailers, but the pattern is more similar for all four retailers in the two subsequent sub-periods. The lower panel shows the position regarding price falls. Here again we find that Safeway has a relatively small number of low price falls (see Figure 3a). Its price cuts tend to be larger, especially in sub-periods one and two but in sub-period three

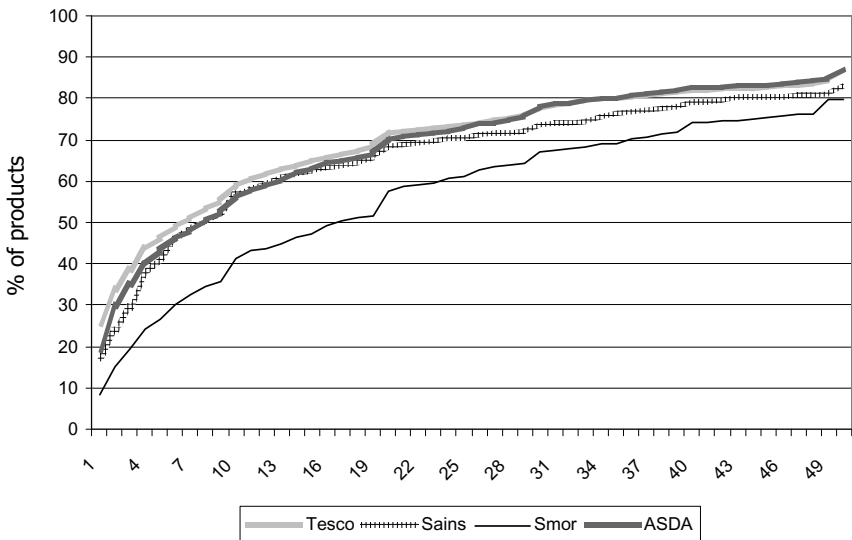


Figure 3a. Cumulative frequency: price falls (1p–50p).

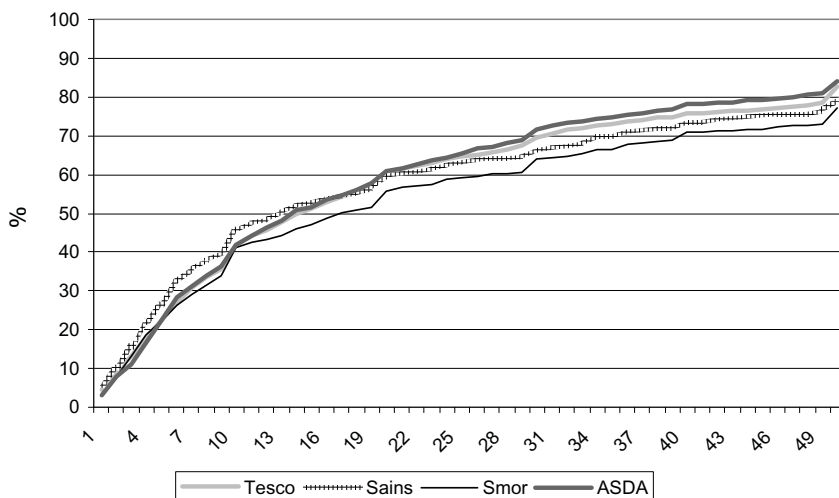


Figure 3b. Cumulative frequency: price rises (1p–50p).

Table 4. Extent of Price Change (Percentage) over Different Sub-Periods

Sub-period	Percent range	Tesco	Sainsbury's	Safeway/ Morrisson	Asda
Price rises (in pence)					
One	0–1	2.4	0.8	0	1.3
	0–10	47.2	50.4	16.6	50.7
Two	0–1	0.6	1.1	1.1	3.5
	0–10	48.9	45.2	45.1	65.2
Three	0–1	2.2	1.7	1.6	1.2
	0–10	41.5	48.2	47.2	42.2
Price falls (in pence)					
One	0–1	13.6	1.5	0.5	11.6
	0–10	71.7	45.3	15.7	86.0
Two	0–1	8.5	7.2	0.2	10.6
	0–10	54.4	66.7	22.1	68.2
Three	0–1	13.5	5.7	4.6	10.6
	0–10	61.2	59.2	53.6	56.5

these become roughly the same as the other three retailers. In contrast, the Tesco and Asda price falls are relatively small, particularly in sub-period one. Sainsbury generally adopted an intermediate position but with high proportion of price falls in period two, most of which were small

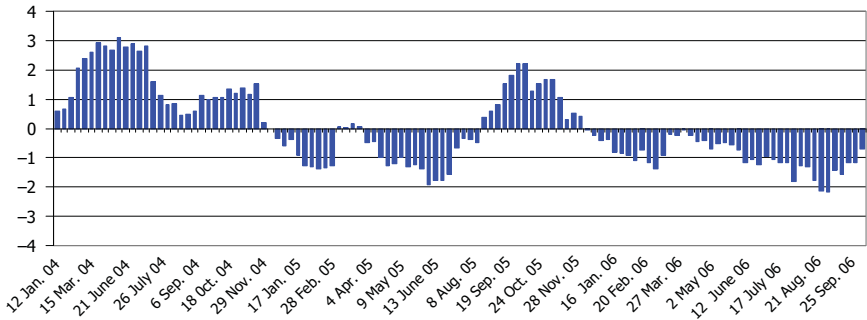


Figure 4a. Net price falls of 10p or more.

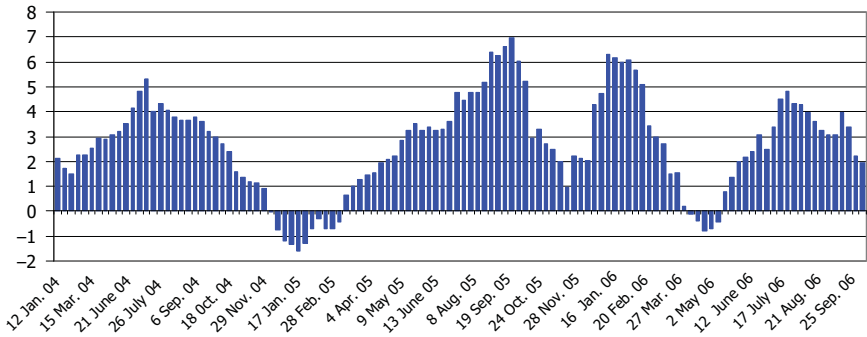


Figure 4b. Net price falls of 9p or less.

Note: Averaged (falls minus rises) over retailer per week for 539 products.

but serving to bring its prices closer into line with Tesco and Asda, as well as Safeway following a wave of cutting prices after the Morrison takeover.

At the market level, it is not uncommon simultaneously to observe net price falls in regard to small price changes but net price rises with larger price changes. This is shown in Figures 4a and 4b, where particularly toward the end of the period, there were many small price falls but these were largely offset by fewer but larger price rises. Indeed, only near the start of the period, when Safeway stores were experiencing price cuts after being acquired by Morrison, do we observe significant net falls in both large and small amounts.

4.4. Price alignment

The price data indicates that the S/M merger in 2004 had a profound effect in terms of the alignment of prices in the market. As discussed in Section 2, where formerly there was a marked difference in the pricing policies employed by each of the leading retailers, ranging from extreme HiLo pricing to pure EDLP, positions considerably narrowed such that all four main players subsequently adopted to a greater or lesser degree a similar hybrid strategy, EDLP-based but combined with limited intense promotional pricing. Consistent with this development, Figure 5 reveals a very significant narrowing in the gap in prices over the period studied. At our starting point, prior to the S/M merger, there was significant price dispersion with almost no products identically priced by all four players and with the spread of prices less than 10p for only around 15% of items. However, subsequent to the merger, prices dramatically converged. By the end of our sample period, a third of the items were identically priced across retailers, over half exhibited a price gap of 3p or less, and 70% a spread of 10p or less. As a measure of the spread of prices and a further indication of the extent of price convergence, we find the average coefficient of variation declined by three-quarters. While product characteristics appear relevant in explaining the extent of price alignment, the merger appears to have

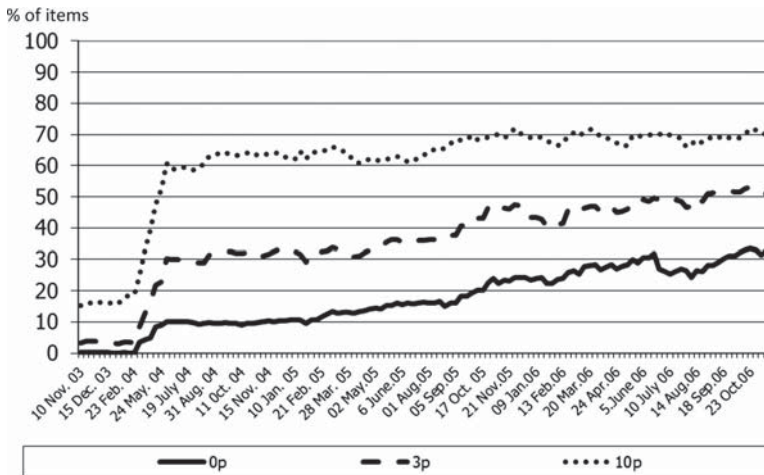


Figure 5. Price gap (in pence) across all four retailers on all items.

played a critical role, leading immediately to lower prices in Safeway (on being acquired by Morrison), and a subsequent response by Sainsbury also lowering prices, drawing both retailers much closer to the prices offered by Tesco and Asda, a trend which continued over time. Accordingly, we find that prices not only drew closer, but generally converged toward a lower level.

4.5. *Patterns across product types*

Differences in the volatility of prices by aisles are shown in Figure 6. Alcohol items in particular appear subject to more frequent price changes, with a tendency for many of these items to have short-term discounts before reverting back to higher prices (particularly around each Christmas/New Year period).¹⁴ Examining more detailed data, it is evident that there is a greater propensity for leading branded goods, especially in relation to alcohol and beverages, household and pet food goods, to have more volatile prices, characteristic of short-term promotional activity on such

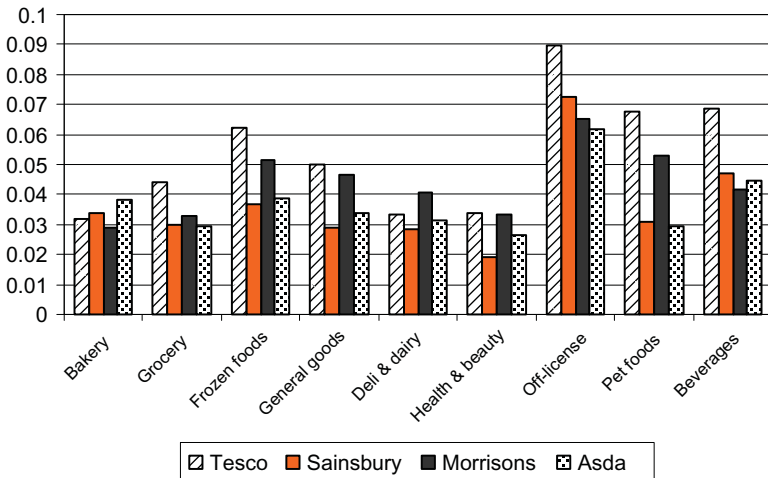


Figure 6. Probability of price change by Aisles.

¹⁴This is consistent with recent empirical work showing that prices can fall on products in periods of high demand — see McDonald (2000), Chevalier *et al.* (2003), and Nevo and Hatzitaskos (2005).

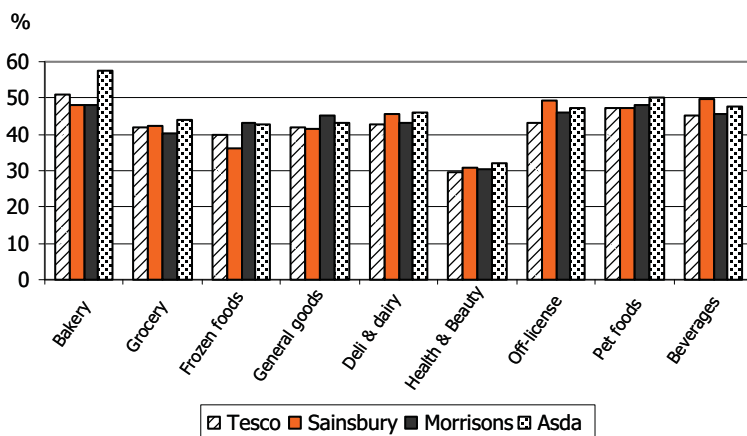


Figure 7. Percentage of price changes that are rises by Aisle.

items (e.g., Hosken and Reiffen, 2004). In addition, though, the extent of changing prices for such products varies from retailer to retailer. Tesco and Sainsbury appear to change prices more frequently on these products (perhaps indicative of their greater use of short-term promotional discount pricing by these two retailers).

As evident from Figure 7, only one category — health and beauty — stands out for having considerably more price falls than price rises. Even so, net price falls over the period characterized almost all categories.

4.6. *Leader–follower behavior*

We next consider the individual price changes made by each retailer to see whether there are any discernible patterns of competitive interaction in terms of the timing of price changes with respect to rivals' behavior.¹⁵ For each price change made by a retailer on a particular item, we consider price changes around this event made by the other retailers on this same item. Specifically, for a $2n + 1$ week window around each retailer's price change, we record whether any other retailer raises or lowers their price

¹⁵A more extensive investigation of price leadership as between Tesco and Asda over an extended period is reported in Seaton and Waterson (2013). Though the methodology differs significantly, and the timeframe is somewhat different, the results are broadly in line with those reported here.

for that product in the same week (w), the preceding n weeks ($w - 1, w - 2, \dots, w - n$) and the following n weeks ($w + 1, w + 2, \dots, w + n$). A high count of price changes before the retailer moves indicates that the retailer is a *price follower*, a clump of high counts following w suggests that the retailer is a *price leader*, while a peak around w indicates that the retailers move together (changing prices in the same week). In order to avoid the problem of missing observations, we calculate our results using the maximal window possible up to $n = 3$.

To simplify exposition, we compute a statistic to examine the symmetry of competitor price change, in the same direction, around the firm's price change event at w ,

$$LF(n)\% = 100 \times \left\{ \frac{[\text{Sum of counts } (w + 1, \dots, w + n) - \text{Sum of counts } (w - 1, \dots, w - n)]}{[\text{Total counts at } (w - n, \dots, w - 1, w + 1, \dots, w + n)]} \right\}.$$

This statistic compares the symmetry of price changes on each side of the one firm's price changes at time w . A value of plus one (100%) indicates every other firm that has reacted, did so after this leader firm (f) — whereas minus one (−100%) means all react before, and this firm is a follower. A value close to zero implies price changes were mostly in the same week, or that the distribution is uniform. The results of our analysis are presented in Table 5, where we disaggregate the data, by price type (rise or fall) and sample period (all weeks, pre-merger, S/M merger, post-merger Morrison). We use a chi-squared test to assess the whether the distribution is significantly different from a symmetric one at the 5% level (indicated by *).

Taking first the whole sample period, there is evidence that in terms of price leadership both Tesco and Asda play a strong role. However, their roles appear asymmetric. Asda often leads on price reductions while Tesco often leads price increases. Furthermore, follower behavior appears to be strongly associated with Asda in regard to following the price rises made by others. In contrast, it is Sainsbury and Morrison that both appear to be followers in response to price changes; Sainsbury's having by far the stronger reaction.

The dynamics become particularly interesting when the sample is split into the three sub-periods discussed above in relation to the S/M merger.

Table 5. Price Change Event Window (± 3 Weeks)

	Period	Falls chi sq	Falls LF%	Falls indicate	Chi sq	Rises LF%	Rises indicate
Tesco	All	0.82	2.34	Leader	302.76*	50.21	Leader
Sainsbury	All	34.37*	-20.13	Follower	20.40*	-15.34	Follower
Morrison	All	1.75	-5.15	Follower	1.38	-4.17	Follower
Asda	All	33.78*	17.41	Leader	153.28*	-39.92	Follower
Tesco	1	2.17	-21.74	Follower	3.77	53.85	Leader
Sainsbury	1	0.29	-14.29	Follower	2.00	-50.00	Follower
Morrison	1	1.00	-20.00	Follower	0.89	-22.22	Follower
Asda	1	0.33	16.67	Leader	7.36*	-81.82	Follower
Tesco	2	0.86	-17.24	Follower	0.39	13.04	Leader
Sainsbury	2	0.00	0.00	/	0.14	14.29	Leader
Morrison	2	1.92	38.46	Leader	1.29	42.86	Leader
Asda	2	30.77*	76.92	Leader	2.57	-42.86	Follower
Tesco	3	1.76	3.52	Leader	301.84*	50.90	Leader
Sainsbury	3	36.81*	-20.80	Follower	19.81*	-15.26	Follower
Morrison	3	1.86	-5.47	Follower	1.34	-4.18	Follower
Asda	3	22.00*	14.48	Leader	145.32*	-39.38	Follower

*Significantly different from symmetric at the 5% level.

Again from Table 5, in sub-period 1 (i.e., prior to S/M merger), Tesco and Asda appear to set the price change agenda but with largely asymmetric positions — Tesco leading price rises, Asda leading price falls. Meanwhile, Sainsbury and Safeway generally act as price followers: the former consistently in regard to price rises, the latter in regard to price falls. As sample sizes diminish though, so does the statistical power of our tests, and only one relationship is found significant here (Asda as price follower for rises).

In sub-period 2, similarly we only have one significant result — this time for Asda as a leader in price falls. Safeway (after its takeover by Morrison) is largely lowering prices on its own, and while Sainsbury leads on some price increases, it is predominantly Asda that leads on both reductions and Tesco on increases. However, in sub-period 3, Tesco is again a price leader in raising prices, while Asda is a leader in lowering prices (if not to the same degree as in the previous two periods) and also a follower in raising prices. Both Sainsbury and Morrison appear as followers in both price rises and price falls.

In terms of net positions, for the pre-merger sub-period, Tesco and Asda appear to balance each other with asymmetric leadership positions, respectively in price increases and price reductions. Post-merger, Tesco appears to have a greater impact on price increases, with the other three players and especially Asda following Tesco, while Asda's role as setting lower prices for others to follow seems somewhat reduced in the final sub-period.

Accordingly, we find evidence of leader–follower behavior but that the patterns have changed somewhat over time, partly in the aftermath of the S/M merger where just one retailer — the market leader, Tesco — increasingly tended to act as price leader in price rises, perhaps reflecting its growing domination of the sector (possessing double the market share of its nearest rivals) and the reduced influence of the other players to lead price changes.

5. Conclusion

As a tight oligopoly, with four retailers controlling 90% of the national market, the UK's "one-stop-shopping" retail grocery market has witnessed considerable consolidation in recent years, driven by organic growth of the leading players and a major merger (S/M) in 2004.

Given this context, this chapter has sought to draw on a novel data source to examine the nature and extent of price competition in this market, examining the character of price changes and competitor responses amongst the four leading UK supermarket chains over a three-year period. We provide summary data analysis on three specific aspects: (i) the nature and pattern of price changes and whether changes in market structure have altered price change behavior, (ii) the extent of price dispersion and whether price gaps are widening or narrowing; and (iii) any evidence of price leadership behavior.

Despite increased concentration in an already concentrated market, price competition appears to have remained intense, with each major retailer competing to increase its level of sales and improve its market share. We find that Safeway/Morrison prices fell post-merger (as promised), offering consumers an immediate windfall benefit. This is consistent with the view that Safeway was a high-cost firm with the merger achieving lower costs across the merged group; a straightforward Bertrand–Nash model would

predict this outcome, provided the cost falls are large enough relative to the impact of concentration on margins. Associated with this, we find that price differences across the Big 4 narrowed considerably over time, as prices set by Morrison and indeed Sainsbury moved closer to those of Tesco and Asda. Much less easily explained by such oligopoly models are various other phenomena. Whilst the number of price falls exceeded price rises by around a third, most falls tended to be small, with the net result that average prices were almost exactly the same at the end of the three-year period as they were at the start (suggesting significant real price deflation over the period). Yet, we observed changed pricing behavior of all four players over different sub-periods relating to the S/M merger. There is also some indication of asymmetric leadership roles — Tesco leading price increases, Asda leading price falls. Of course, there are likely to have been other drivers of these phenomena, apart from the merger.

This case study shows how the nature of competition can change quite markedly and yet subtly in the wake of market consolidation. Such a prospect makes predicting the outcomes from proposed mergers and other concentrations difficult for competition authorities, given the limited concordance with oligopoly theory. The usual assumption in merger analysis is that in the absence of significant cost savings being generated and (at least partly) passed on to consumers then concentration-increasing mergers may well be anticompetitive based on the assumption that competitive interaction will continue in a predictable manner from past behavior. The analysis here demonstrates that the whole nature of competitive interaction can change if price strategies change. For the UK authorities simultaneously investigating four different contemplated mergers between Safeway and other leading industry players all having a concentrating effect on the market, they appear to have made the right decision in allowing the acquisition by Morrison given the subsequent evolution of market prices, at least in the time period considered here. At the time of the investigation, Morrison promised to make immediate and significant price cuts in Safeway stores and they duly delivered these, but it was the subsequent scramble for market share that appears to have led to the other pricing changes identified in this study emerging, with the apparent change in the whole dynamic of competitive interaction in this industry. Such consequences need very detailed and careful consideration.

Appendix

Table A1. Observation Dates

Week no. (w)	Obs (t)	Day	Month	Year	Week no. (w)	Obs (t)	Day	Month	Year
1	1	10	November	2003	91	66	1	August	2005
2	2	17	November	2003	92	67	8	August	2005
3	3	24	November	2003	93	68	15	August	2005
4	4	1	December	2003	94	69	22	August	2005
5	5	8	December	2003	95	70	29	August	2005
6	6	15	December	2003	96	71	5	September	2005
10	7	12	January	2004	98	72	19	September	2005
12	8	26	January	2004	99	73	26	September	2005
14	9	9	February	2004	100	74	3	October	2005
15	10	16	February	2004	101	75	10	October	2005
16	11	23	February	2004	102	76	17	October	2005
19	12	15	March	2004	103	77	24	October	2005
22	13	5	April	2004	104	78	1	November	2005
25	14	26	April	2004	105	79	7	November	2005
27	15	10	May	2004	106	80	14	November	2005
29	16	24	May	2004	107	81	21	November	2005
33	17	21	June	2004	108	82	28	November	2005
34	18	28	June	2004	109	83	5	December	2005
35	19	5	July	2004	110	84	12	December	2005
36	20	12	July	2004	113	85	3	January	2006
37	21	19	July	2004	114	86	9	January	2006
38	22	26	July	2004	115	87	16	January	2006
39	23	2	August	2004	116	88	23	January	2006
41	24	16	August	2004	117	89	30	January	2006
42	25	23	August	2004	118	90	6	February	2006
43	26	31	August	2004	119	91	13	February	2006
44	27	6	September	2004	120	92	20	February	2006
46	28	20	September	2004	121	93	27	February	2006
47	29	27	September	2004	122	94	6	March	2006
48	30	4	October	2004	123	95	13	March	2006
49	31	11	October	2004	124	96	20	March	2006
50	32	18	October	2004	125	97	27	March	2006
51	33	25	October	2004	126	98	3	April	2006
52	34	1	November	2004	127	99	10	April	2006
53	35	8	November	2004	128	100	18	April	2006
54	36	15	November	2004	129	101	24	April	2006
56	37	29	November	2004	130	102	2	May	2006
57	38	6	December	2004	131	103	8	May	2006
58	39	13	December	2004	133	104	22	May	2006

(Continued)

Table A1. (Continued)

Week no. (<i>w</i>)	Obs (<i>t</i>)	Day	Month	Year	Week no. (<i>w</i>)	Obs (<i>t</i>)	Day	Month	Year
61	40	3	January	2005	134	105	30	May	2006
62	41	10	January	2005	135	106	5	June	2006
63	42	17	January	2005	136	107	12	June	2006
64	43	24	January	2005	137	108	19	June	2006
66	44	7	February	2005	138	109	26	June	2006
67	45	14	February	2005	139	110	3	July	2006
68	46	21	February	2005	140	111	10	July	2006
69	47	28	February	2005	141	112	17	July	2006
70	48	7	March	2005	142	113	24	July	2006
71	49	14	March	2005	143	114	1	August	2006
72	50	21	March	2005	144	115	7	August	2006
73	51	28	March	2005	145	116	14	August	2006
74	52	4	April	2005	146	117	21	August	2006
75	53	11	April	2005	147	118	29	August	2006
76	54	18	April	2005	148	119	4	September	2006
77	55	25	April	2005	149	120	11	September	2006
78	56	2	May	2005	150	121	18	September	2006
79	57	9	May	2005	151	122	25	September	2006
80	58	16	May	2005	152	123	2	October	2006
81	59	23	May	2005	153	124	9	October	2006
82	60	30	May	2005	154	125	16	October	2006
83	61	6	June	2005	155	126	23	October	2006
84	62	13	June	2005	156	127	30	October	2006
85	63	20	June	2005	157	128	6	November	2006
89	64	18	July	2005	158	129	13	November	2006
90	65	25	July	2005	/	/	/	/	/

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