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System Dynamics and Innovation in Food Networks 2012

Proceedings of the 6th International European Forum on System Dynamics and Innovation in Food Networks, organized by the International Center for Food Chain and Network Research, University of Bonn, Germany
February 13-17, 2012, Innsbruck-Igls, Austria
officially endorsed by

EAAE(European Association of Agricultural Economists)
IAMA (International Food and Agribusiness Management Association)
AIEA2 (Assoc. Intern. di Economia Alimentare e Agro-Industriale)
INFITA (Intern. Network for IT in Agric., Food and the Environment)

edited by

U. Rickert and G. Schiefer

© 2012, Universität Bonn-ILB, Germany,
ISSN 2194-511X

Published by
Universität Bonn-ILB Press, Bonn
(Rheinische Friedrich-Wilhelms-Universität Bonn,
Institut für Lebensmittel- und Ressourcenökonomik)

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Printed by
Universitätsdruckerei der Rheinischen Friedrich-Wilhelms-Universität Bonn

Using Supermarket Loyalty Card Data to Inform Better Promotional Strategies

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Abstract

This paper reports the use of loyalty card data from one of the biggest retailers in the world – Tesco - to analyse the impact of promotions. The aim is to demonstrate how such data can bring significant benefits to retailers and manufacturers when deciding promotional strategies, over and above traditional scanner datasets, which the majority of existing research is based around (E.g. Raju, 1992; Macé and Neslin, 2004; and Martínez-Ruiz et al. 2006). Regression analysis is used to compare the effects of different promotional mechanics upon different cuts and tiers of product across the fresh beef category in Tesco; using both scanner data and loyalty card data. The results show that using loyalty card data, which enables us to control for shopper life-stage and region (something which cannot be achieved using scanner data), produces more statistically significant results and provides a more detailed picture of how promotions influence sales.

Keywords: *loyalty card data, promotion, multiple regression model*

1 Introduction

The use of promotions in retailing has increased rapidly in recent times, yet more often than not promotions are being implemented with an inadequate understanding of which mechanisms are most effective, for which products and for which shopper segments (Felgate et al, 2011). Despite this growth in the use of promotions, particularly in the Fast Moving Consumer Goods (FMCG) sector, consideration of their impact and effectiveness amongst academics has been limited. It has been identified as an important area for future research, as has the greater use of supermarket panel data to provide insights into how different shoppers respond to price changes, including promotions (Grewal and Levy, 2009). Moreau et al (2001) assert that a lack of understanding by retailers about consumer perceptions of promotions can lead to weaknesses in their marketing strategies. Thus, as the use of promotions continues to grow, it is increasingly important to gain a more complete understanding of how consumers actually behave in response to different promotional activities.

This paper reports the use of loyalty card data from one of the biggest retailers in the world – Tesco - to analyse the impact of promotions. The aim of the paper is to demonstrate how such data can bring significant benefits to retailers and manufacturers when deciding promotional strategies, over and above traditional scanner datasets, which the majority of existing research is based around. While the case study is based on data from the UK, it demonstrates how other major retailers with similar loyalty card schemes (e.g. Kroger in the USA, and Casino in France) could make use of this powerful source of behaviour data to gain a better understanding of the effectiveness of promotions in key (destination) categories. The paper also contributes to the existing promotions literature, through presenting a

conceptual framework to test the moderating effect of shopper specific characteristics such as life-stage and region on promotional impacts.

2 Promotions

Promotions can be defined as marketing events limited in duration, implemented to directly influence the purchasing actions of customers with the underlying intention of achieving the objectives set out in the marketing strategy for the retailer and/or manufacturer (Webster 1971; Blattberg and Neslin 1990). These objectives may include improving competitive position, brand extension, category expansion or increasing profitability.

The use of price promotions in the UK has increased significantly over the last decade, particularly in grocery retailing where competition between retailers has intensified. In May 2009 a record 32 percent of all grocery sales in the UK were made up of products on promotion (Nielsen Wire 2009a). In the US the figure was even higher, with a reported 42.8 percent of grocery sales made on promotion in September 2009, up from 40.8 percent in 2008 (Nielsen Wire 2009b).This has resulted in both UK supermarkets and their (branded) suppliers becoming increasingly dependent on promotional activity to drive sales growth. It is our contention that much (if not most) of this activity has occurred with limited analysis (and thus understanding) of the impact of promotional activity beyond the uplift in sales of the promoted products.

Over the last few decades substantial inroads have been made in empirical research into the effects of price promotions and what influences their effectiveness. Previous studies have investigated the potential effects of promotions, including brand switching, category expansion and purchase acceleration (E.g. Chintagunta 1993; Manning and Sprott 2007; Martinez-Ruiz et al 2008). However, the vast majority of these studies have relied upon small scale scanner or panel datasets and small-scale experiments which many would argue cannot be considered representative of supermarket shoppers as a whole due to small sample sizes and high levels of aggregation in the data,

Reviewing the extant literature revealed factors which can influence how effective promotions are, including:

- The type of promotional mechanic used (e.g. Manning and Sprott 2007)
- The length of promotions (e.g. Blattberg and Wisniewski 1987)
- The price/quality tier of the brand – shoppers respond differently to promotions on high priced (premium) brands compared to low price brands (e.g. Martinez-Ruiz et al 2008)
- The frequency of promotions (e.g. Mayhew and Winer 1992)
- Product specific characteristics such as perishability and bulkiness, or whether the product is utilitarian or hedonic (e.g. Wansink and Deshpandé 1994; Bell et al 1999; Delgado-Ballester and Palazon-Vidal 2005)
- Characteristics related specifically to the shopper, including household life-stage and location (e.g. Inman and Winer 1998; Lodish 2007)

Some of the above factors can be taken into account when analysing promotions using scanner data, such as the mechanic used (e.g. temporary price cut or buy-one-get-one-free),

the length and frequency of the promotion and product specific characteristics. However, unlike loyalty card data, scanner data cannot moderate for shopper specific characteristics such as household size or life style. This is because scanner data is aggregated to either store or retail chain level, and the sales cannot be attributed to specific shopper segments.

3 Conceptual Framework

The literature review revealed a significant gap in the existing promotions literature which we contend can only be addressed through the analysis of loyalty card datasets. Current evaluations of promotions are mostly based on point of sale scanner data which, unlike loyalty card data, cannot be moderated for differences between shopper segments. Scanner data can tell us what is being purchased, but only loyalty card data can tell us who is buying it on a large scale. Our proposed conceptual framework for measuring the impact of promotions on sales in this research is described in Figure 1.

The framework theorises that sales per store are a function of promotion, with shopper specific characteristics, namely life-stage, acting as moderator variables. Distribution is also accounted for in our framework since sales per store is used as the dependent variable rather than total sales. This is because if the number of stores change over a time period (as is the case with growing retail chains) this will affect the sales at aggregate level, when measuring sales over time. Moreover, promotional strategies often include increased distribution as part of the promotional mix, securing maximum promotional uplift through increased availability.

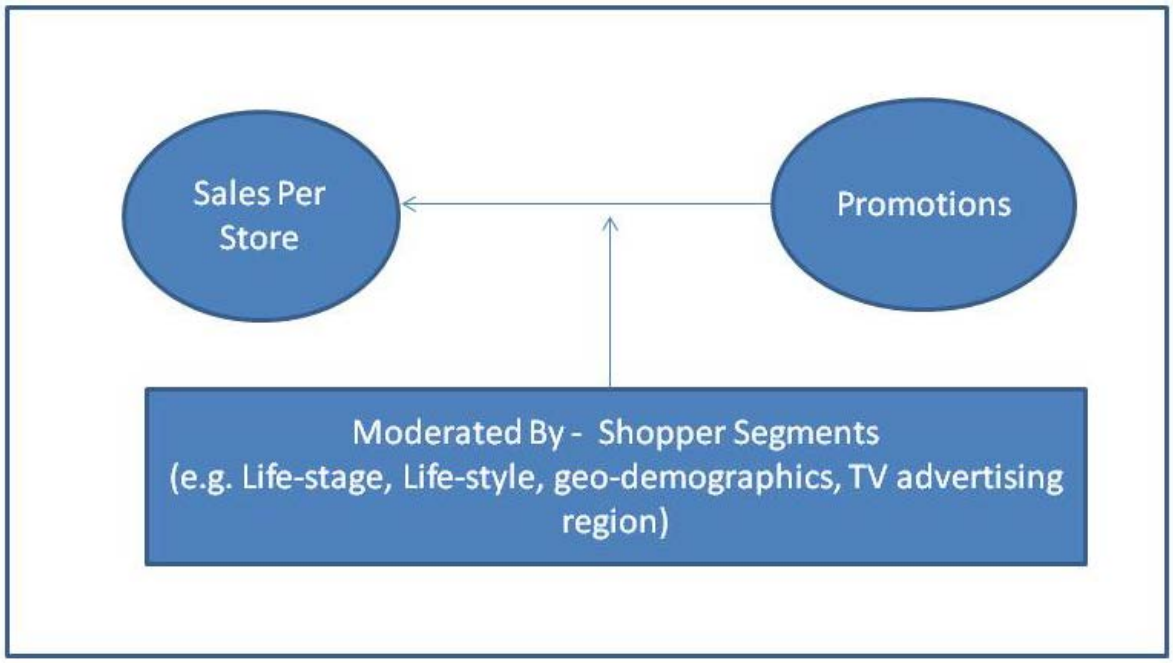

Figure 1. Conceptual Framework for measuring the Impact of Promotions on Sales

Different price promotion mechanics are the independent variables, upon which sales per store are dependent. These include price cuts and multi-buy promotions. Promotional

impacts are moderated by shopper life-stage. Previous studies have indicated that household composition (Urbany et al. 1996, Ainslie and Rossi 1998, Inman and Winer 1998, and Bawa and Gosh 1999) can impact on promotional response.
Based on the conceptual framework, it can be hypothesised that:

> *H1: The relationship between promotional activity and sales growth is moderated by the life-stage profile of the shopper*

This hypothesis can be broken down further into two sub-hypotheses based around how it would be assumed different life-stage segments may respond to promotions:

> *H2: The impact of multi-buy promotions on sales growth is likely to be greater amongst families than single and dual occupancy households*

> *H3: The impact of price cuts on sales growth is likely to be greater amongst single and dual occupancy households than families*

It is hypothesised that families will be more responsive to multi-buy promotions, than single and dual occupancy households, because these households are larger, with more mouths to feed and therefore are more likely to make use of the extra volume of product purchased in a multi-buy offer. It is hypothesised that the impact of price cuts on sales growth will be greater amongst single and dual occupancy households because such offers enable the shopper to save money without having to buy extra volume which smaller households may not be able to consume.

In order to test the above hypotheses, the promotional impact on sales will be measured using both a scanner data set and a loyalty card dataset. The next section will describe in detail the methodology and data used to test these hypotheses.

4 Method

Multiple regression was used to estimate the impact of different promotional mechanics on sales. Multiple regression enables us to evaluate the separate contributions of one or more variables acting jointly on a single dependant variable. Moreover, it is applicable to the analysis of promotions as a given product may use several types of promotion, each of which may have a different effect on sales of both the promoted product and substitute products. Regression analysis techniques have been widely used by other researchers to estimate the effects of promotions (see e.g. Bolton 1989; Sethuraman and Tellis 2002; Macé and Neslin 2004). Regression analysis is well suited to the analysis of large samples of data and for measuring the effects efficiently across different product sub-groups; identifying switching and substitution effects between products and differences across segments of shoppers.

5 The Model

A multiple regression model was estimated to analyse both the scanner and loyalty card data. The following equation represents the model used for the regression analysis:

$$SALES_PER_STORE_{it} = \beta_0 + \beta_1 PROMO_{it1} + \beta_2 LIFESTAGE_{it2} + e_{it}$$

In the model, $SALES_PER_STORE_{it}$ represents the dependant variable sales value per store for a given product sub-group, *i,* in a given time period, *t*. The parameters of the model are β_0, which represents a fixed constant, β_1 which represents 0-1 dummy variables for the different types of price promotion for product sub-group *i* in the time period *t*, and β_2 which moderates for different shopper life-stage segments. The promotion variable (β_1) captures four different types of promotion used in the fresh beef category: small price reductions of less than fifteen per cent off, medium price reductions of between fifteen to thirty per cent off, large price reductions of more than thirty per cent off the original price and multi-buy promotions. The error term, e, incorporates all the immeasurable factors which may also be influencing sales aside from promotions.

6 Data

There are two main types of data used in the promotions literature to analyse the impact of promotions on purchasing behaviour: panel data and retailer scanner data. Panel data provides information at an individual household (or segment) level; for example by household size or by age. Popular sources of panel data include A. C. Nielsen and TNS Worldpanel. Examples of studies which have utilised panel data include Chintagunta (1993), Bell et al (1999), and Ailawadi et al (2007). All these studies suffer from the same limitation in that the panel data used is relatively small scale and therefore less representative of the whole population when trying to make inferences about the way people respond to promotions. Store-level scanner data pools all sales in a given store, or chain of stores over a period of time but does not contain information on specifically which type of household these sales relate to. Examples of studies which have incorporated store-level scanner data include Raju (1992), Macé and Neslin (2004), and Martínez-Ruiz et al. (2006).

Loyalty card data combines both the advantages of scanner and panel data, in that the data is collected on a relatively large scale (in the case of large retail chains) and can be segmented to show who is buying what. This paper uses both an aggregated scanner data set and a loyalty card data set in order to test the hypothesis that promotional impacts are moderated by demographic characteristics of the shopper. The same model is applied to both data sets to analyse the impact of promotional mechanics on sales. Both datasets cover the same time period (86 weeks from 29th May 2006 to 21st January 2008), product category (fresh beef) and supermarket chain (Tesco). The scanner dataset contains the total aggregate sales for fresh beef products in Tesco, whereas the loyalty card dataset includes purchases made using the Tesco ClubCard (approximately 80% of total transactions), and is segmented by shopper household life-stage.

The dataset comprised of weekly sales over an 86 week period from 29th May 2006 to 21st January 2008. For the purposes of this research the loyalty card data was used to create a cross-sectional panel data set, with sales data sorted by shopper life-stage. The different life-stage segments are young families (all children under 10yrs), older families (at least one

child over 10yrs), young adults (aged 20-39yrs), older adults (aged 40-59yrs) and pensioners. In order to offset the effect caused by increases in distribution (due to the continued growth in Tesco stores) the sales value was divided by the number of stores selling the product each week. This created the dependant variable; sales value per store.

The example used in this paper is fresh meat – a key destination category for most supermarket chains, with a particular emphasis on the fresh beef sector. Fresh meat was chosen because it is a high penetration product category in the UK, with household penetration over 70% for fresh meat, and 65% for beef alone (Source: Dunnhumby, 2011). In the UK, the majority of fresh meat sold through supermarkets is private label with little or no branding, making it unique from most non-commodity product categories. In other grocery categories where branding is more prevalent, consumer attitudes towards private label promotions may differ from the fresh meat sector. While there is no branding, as such, within the fresh meat sector in the UK, products are positioned differently with a range of price/quality tiers, from value products through to premium and organic. These different price/quality tiers of products can be considered in essence to be separate 'brands' and the model enables us to identify switching effects between these different 'brands' of beef. Sharp (2010) asserts that consumers are well aware of this price/quality tier system and respond differently to low-end and premium-end promotions. As well as different tiers there are also different cuts such as roasting joints, ground beef, and steaks.

7 Results and Discussion

In total 24.4 percent of fresh beef sales occurred while promotions were taking place during the time period analysed. Table 1 shows the percentage of sales within the different beef sub-groups occurring while on promotion.

Table 1.
Percentage of Sales occurring on Promotion by Beef Sub-group over the 86 Week period from 29th May 2006 to 21st January 2008

Sub-group	% Of Sales Occurring On Promotion		
	Roasting Beef	**Ground Beef**	**Fry/Grilling Beef**
Total	39.96%	39.0%	16.7%
Standard	50.31%	54.67%	17.61%
Premium	27.88%	9.88%	23.32%
Organic	31.71%	3.47%	12.44%
Healthy		19.91%	
Value			3.92%

The figures in Table 1 reflect the fact that some categories of fresh beef are more heavily promoted than others. Standard tier promotions occur on an almost weekly basis for all cuts of beef, whereas organic and value promotions are generally much less frequent.

The results of the regression analysis will now be presented for both the scanner and loyalty card datasets, with only those results which are significant at least at the 5 percent significance level being reported.

8 Category Level Results

Table 2a reports the results of the regression analysis at the total (fresh beef) category level for the aggregated scanner dataset, while Table 2b shows the same for the loyalty card dataset. The tables show the percentage uplift in sales resulting from different promotional mechanics for the total beef category, and subdivided for the roasting, ground and fry/grilling beef subgroups.

Table 2a.
Regression results, using Scanner Data, for the fresh beef category with respect to different Promotional Mechanisms

Promotion	Uplift in Sales (%)			
	Total Beef Category	Roasting Beef	Ground Beef	Fry/Grilling Beef
Small Price Cut (<15%)				
Medium Price Cut (15-30%)	-8.12**			12.71**
Large Price Cut (>30%)				
Multi-Buy				
R-Sq	0.1302	0.0323	0.0064	0.18
**p<0.01 *p<0.05				

Table 2b.
Regression results, using Loyalty Card data, for the fresh beef category with respect to different Promotional Mechanisms

Promotion	Uplift in Sales (%)			
	Total Beef Category	Roasting Beef	Ground Beef	Fry/Grilling Beef
Small Price Cut (<15%)				
Medium Price Cut (15-30%)	-7.18**			0.09**
Large Price Cut (>30%)		0.22**		
Multi-buy	8.82**	0.01**	0.03**	
R-Sq	0.1437	0.132	0.106	0.380

**p<0.01 *p<0.05

It can be seen that the analysis using the scanner dataset produces fewer statistically significant results, compared to the loyalty card dataset. If scanner data alone had been used for this analysis, at the category level it would be assumed that only medium price cuts had a statistically significant effect on sales at the total category level. It would appear, when drilling down to cut level, that promotions only had an effect on sales of fry/grilling beef; with medium price cuts creating a sales uplift of 12.7%. However, looking at the results from the loyalty card data analysis, more relationships between sales and promotions are observed.

From the loyalty card data analysis, it can be seen that promotions have the biggest influence on sales within the fry/grilling beef category, since the R-Squared value tells us 38 percent of the variance in sales is attributable to promotions. Within the roasting category, large price cuts were found to have the greatest significant positive impact on sales value, indicating that sales value (per store) will increase by 0.2% during the promotion. Within the ground beef category multi-buys were the only promotion to have a significant impact overall, while medium price cuts were the only promotion to have a significant impact on fry/grilling beef sales. Small price cuts did not have a significant impact on sales across any of the beef cuts. The results indicate that the promotional impacts are affected by the mechanic used; whether it is a small price cut or a multi-buy promotion, the effect will not always be an uplift in sales value.

8.1 Disaggregated Results (by Price/Quality Tier)

Table 3a and Table 3b report the regression results for the ground beef price/quality tier sub-groups with respect to different price promotions for scanner data and loyalty card data respectively. The purpose of this is to provide an example as to how promotional impact can vary between different 'tiers' (or 'brands') of the same product. Again there are significant differences between the analysis using the scanner data and that using the loyalty card data.

Table 3a.
Regression Results, using Scanner Data, for the Ground Beef sub-groups with respect to different Price Promotions within the Ground beef category

Promotion	Uplift in Sales (%)			
	Standard Ground Beef	Premium Ground Beef	Organic Ground Beef	Healthy Ground Beef
Premium - Medium Price Cut		0.89**	-1.97*	
Healthy - Multi-buy		0.60*		3.97**
Organic - Multi-buy				-1.50*
Standard - Multi-buy				
R-Sq	0.0684	0.3661	0.1148	0.4066
**p<0.01 *p<0.05				

The analysis using scanner data produces fewer statistically significant results, however the results it does produce show there to be larger uplifts (or decreases) in sales than the loyalty card data. For example, the scanner dataset shows a multi-buy on healthy ground beef to generate a sales uplift of almost 4%, whereas the loyalty card data shows a smaller sales uplift of just 0.03%. The scanner dataset does not produce any statistically significant results for the most heavily promoted product category, standard ground beef. However, with the loyalty card dataset promotions account for 16% of the variance in sales of standard ground beef and several promotions were found to have an impact on sales.

Table 3b.
Regression Results, using Loyalty Card Data, for the Ground Beef sub-groups with respect to different Price Promotions within the Ground beef category

	Uplift in Sales (%)			
Promotion	Standard Ground Beef	Premium Ground Beef	Organic Ground Beef	Healthy Ground Beef
Premium - Medium Price Cut	-0.06*	0.019*	-0.077*	
Healthy - Multi-buy	0.032*	0.0197*	0.05*	0.0349**
Organic - Multi-buy			0.09**	-0.09**
Standard - Multi-buy	0.07**	0.017**	-0.05*	
R-Sq	0.164	0.26	0.113	0.544

**p<0.01 *p<0.05

The analysis using the loyalty card data enables us to observe more interactions between promotions and sales than using the scanner data. As a result there are several findings that can be noted. For example, within the ground beef sub-group promotions have the biggest impact in the healthy subgroup, where promotions account for 54 percent of the variance in sales. Multi-buy promotions on healthy ground beef have a significant positive effect on sales of healthy ground beef, but consumers will switch to organic when on promotion. Within the standard subgroup, multi-buy offers have a large positive impact on sales, but consumers will switch from standard to premium when premium ground beef is on offer.

Sales of organic ground beef are negatively affected by promotions on standard and premium products. Harder to explain is the positive impact on premium ground beef of multi-buy promotions on healthy and standard ground beef. However it may be that consumers, who only want one unit of the product, switch to premium because they do not want to partake in the multi-buy promotions on healthy or standard ground beef that they otherwise would buy. This would therefore suggest that multi-buy offers have a negative impact on some shoppers, who will actively switch to a substitute product as a result. Similar affects are observed elsewhere in the sub-group, for example standard multi-buy promotions apparently increase sales of premium ground beef. The results indicate that promotional impacts do vary depending on the product being promoted, as well as the type of mechanic used, and that these are differences are more notable when analysing loyalty card data as opposed to scanner data.

8.2 Disaggregated Results by Shopper Type

The biggest advantage of using loyalty card data is that it enables us to identify how different segments of shoppers respond to promotions. Traditionally promotions have been limited to a 'one size' fits all approach, but understanding how the short-term response to price reductions and promotions varies across segments should be seen as important in the designing and targeting of effective promotions (Lim et al. 2005). This is something which cannot be achieved through using scanner data alone since the data is highly aggregated. Loyalty card data can be segmented in several ways, including by life-stage.

Table 4 reports the results of the regression analysis using loyalty card data, again just for ground beef as an example, by life-stage segment with respect to the various promotions.

Table 4.
Regression Results, using Loyalty Card Data, by Consumer Life-stage for the Standard Ground Beef sub-group

	Uplift in Sales (%)				
Promotion	Older Adults	Young Adults	Older Families	Young Families	Pensioners
Premium - Medium Price Cut	-0.2**		-0.41**	-0.62**	-0.09**
Healthy - Multi-buy	0.023**				0.113**
Standard - Multi-buy	0.231**	0.34**	0.51**	0.616**	
R-Sq	0.1419	0.1282	0.1263	0.1332	0.1021

* * p< .01 * p< .05

It can be seen that standard multi-buy promotions had a large and positive effect on sales of standard ground beef within all segments except Pensioners. The segment for which sales value increased the most in response to the standard ground beef multi-buy promotion was young families. Similarly the young families were the segment for which sales of standard ground beef fell the furthest in response to the price cuts on premium ground beef. Sales value of standard ground beef amongst both older adults and pensioners actually increased in response to multi-buy promotions on healthy ground beef. This indicates that shoppers within these segments were put off by the multi-buy offer on healthy ground beef, which perhaps they normally purchase, and instead switched to buying standard ground beef. Older adults and pensioners perhaps do not want to purchase multiple packs of ground beef since they do not have families to feed, so switch their spend to a product not on offer. It can be seen that there are differences in the response amongst different households, which again may vary between products and commodities or due to the mechanic used.

The results overall show some significant differences between the scanner and loyalty card data. Analysing promotional impacts using loyalty card data, moderating for shopper life-stage, produced more statistically significant results and therefore enabled a stronger picture of the relationship between promotional activity and sales growth to be revealed. Therefore we accept H_1 that the relationship between promotional activity and sales growth is moderated by the life-stage profile of the shopper. In addition, it was further hypothesised in H_2 that the impact of multi-buy promotions on sales growth is likely to be greater amongst families than single and dual occupancy households. There is evidence that this is true since the sales uplift from a multi-buy promotion on standard ground beef was shown to be greater amongst young and older families, than single and dual occupancy households (young adults, older adults, and pensioners). It was also hypothesised in H_3 that the impact of price cuts on sales growth is likely to be greater amongst single and dual occupancy households than families, however we cannot accept this hypotheses as the results presented here for standard ground beef did not show price cuts on standard ground beef to have a statistically significant impact on sales growth for any of the life-stage segments.

9 Conclusions

This paper contributes to our understanding of promotions in two ways. First, it highlights the heterogeneity of promotional impacts and the need to evaluate promotional effectiveness beyond the level of short term sales uplifts of promoted products. Second, it illustrates the value of supermarket loyalty card data in permitting the analysis of

promotional impacts in far greater detail than is possible with small and more highly aggregated purchasing datasets. Whilst the results presented here cannot be generalised, as they relate to a specific category (fresh meat) and a specific retailer (Tesco), the principles are transferable, the model is generic and loyalty card data is becoming increasingly available as more supermarkets turn to loyalty cards as a more effective way of targeting shoppers with products and promotions that are more relevant to the needs and wants of distinct shopper segments.

The main academic contribution of this paper is methodological rather than theoretical. The findings contribute to and enhance our existing knowledge of promotions through analysing the impacts using a data set unique in both its size and scope, and which has not previously been used for such a purpose. Loyalty card panel data is now more accessible than ever to many of the major retailers, but so far it is not being used to the best of its potential to inform decision making as to which promotions will be most effective. As can be seen from the results, some promotions have a greater impact than others, but retailers need to understand these differences in order to implement promotions effectively.

As supermarkets come under increasing scrutiny over the sustainability of their strategies, tactics and operations, the role of promotions is likely to be increasingly questioned – who do they really benefit, how, for how long and at what cost? Answers to these questions are essential if supermarkets are to break out from the 'race to the bottom' that has prompted and been prompted by the indiscriminate use of promotions in many (if not most) categories. This paper presents a simple methodological approach that exploits the depth of insight provided by the richest source of shopper data – a source that is becoming more wildly available, is universally relevant and which academics should make more use of in their quest for a more profound understanding of shopper behaviour and the implications thereof for retailing, marketing and the use of promotions therein.

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