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Has behavioural loyalty to online supermarkets declined?

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ABSTRACT

This paper investigates consumer's behavioural loyalty to online supermarkets over time. We use three measures of behavioural loyalty (share of category requirements, repertoire size, and polarisation index) from four major online supermarkets in the UK across five categories. We find that loyalty to online supermarkets is high in the categories we examined, though it declined somewhat from 2005 to 2009 and subsequently remained stable from 2010 to 2014. We also extensively test the generalisability of the well-known Dirichlet model to the choice of online supermarkets. We find that the model gives better fit from 2010 to 2014 than from 2005 to 2009 and can describe loyalty and competition in this context.

1. Introduction

Online retailing is revolutionizing the retail landscape (Wood, 2011) with over three-quarters of all United Kingdom (UK) citizens have purchased goods online (Office for National Statistics, 2015). After a slow adoption by apparently hesitant consumers (Elliot and Fowell, 2000; Freeman, 2009; Geuens et al., 2003; Pavitt, 1997; Ramus and Nielsen, 2005) online sales grew from $1B in 1995 (Lohse and Spiller, 1998; Schmid et al., 1996) to almost $2T in 2016 (eMarketer, 2016). Today, online retail accounts for just over 8% of all retail sales and is projected to increase to around 14% by 2020 (Business Wire, 2016; eMarketer, 2016). Online retail is continuing to grow both regarding total dollar spend and as a proportion of total retail and supermarket sales. In this context, it is important to understand if consumers' behavioural loyalty to online supermarkets has decreased, remained stable or increased during the previous decade.

Arguably it is harder to retain customers due to increased competition and minimal customer switching costs in the online environment, which is why this is of particular interest to retailers (Srinivasan et al., 2002). There have not been any long-term studies investigating how consumers allocate their purchases for a given category over the available online supermarkets and how this might have evolved. There have, however, been some studies that have captured online retailer loyalty in a short period. For example, Huang (2011), using household panel data from the United States over a one year period (2007), shows that there is excess loyalty to online retailers compared to a theoretical benchmark. Melis et al. (2015) found that shoppers initially tended to purchase from the same supermarket brand online from which they already purchased from offline. Elms et al. (2016) also found that consumers bought from their preferred offline supermarket when they first purchased online. However, Dawes and Nenycz-Thiel (2014) recent research comparing online supermarket purchasing patterns in the UK between 2008 and 2010, found increased cross-supermarket purchasing over the two years. Given the importance of online store loyalty to all online retailers, this early indication of decline is worth exploring further, especially since prior research in the area is insufficient. Both the absolute level and the evolution of loyalty to online supermarkets have important implications for those businesses specifically, but also potentially to other retailers employing similar models. The issue is one of understanding the prevailing competitive dynamic in the market place – is it more akin to subscription or repertoire markets (Sharp et al., 2002) and what are the likely future dynamics?

While these previous studies show some insights, they do not provide any coherent picture of the dynamic of loyalty to online supermarkets, particularly over the long term. Such a study might allow us to gauge the likely path of future loyalty to online supermarkets. We, therefore, conduct analyses across ten years (2005 to 2014) to assess the evolution of the dynamics of online supermarket loyalty.

2. Loyalty measures

As this study investigates behavioural loyalty, we use the three following measures: share of category requirements, repertoire size, and polarisation index. Although SCR is one of the most important measures of brand loyalty (Farris et al., 2006), defining brand loyalty in this way has some problems (Danaher et al., 2003). For example, consumers who repeat purchase the same brand, even

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when it is on price promotion, are being loyal (Allenby and Rossi, 1991), and furthermore, it does not take into account category purchase rate (effectively the 'scale'). Higher levels of category purchasing are likely to be associated with lower SCR for its brands via the mechanism of larger repertoires. We therefore include repertoire size as a second measure as it is said to be a natural measure of loyalty (Colombo and Jiang, 2002). However, using repertoire size as a measure of loyalty is also not without its problems. Again this measure is confounded by category purchase rate; the larger the category purchase rate, the higher the repertoire size (Colombo and Jiang, 2002; Stern and Hammond, 2004). We, therefore, use the third measure of loyalty, namely polarisation index. We now discuss the advantages and disadvantages of each of the measures in more detail.

2.1. Share of category requirements

We first measure share of category requirements (SCR), one of the most common measures of loyalty since the earliest days of household diary reporting (Bhattacharya et al., 1996). SCR has been applied when investigating online brand loyalty (Danaher et al., 2003) and the loyalty to manufacturer and store brands (Romaniuk et al., 2014). SCR is a measure of how much the buyers of each brand satisfy their product needs by purchasing that particular brand (Uncles et al., 1994); therefore, the higher SCR, the greater brand loyalty.

SCR use is widespread in industry and academia (e.g. in Danaher et al., 2003; Fader and Schmittlein, 1993; Bhattacharya et al., 1996; Bhattacharya, 1997; Ehrenberg et al., 2004; Johnson, 1984; Reibstein, 2002; Stern and Hammond, 2004; Tellis, 1988; Dawes, 2013; Romaniuk et al., 2014; Dall'Olmo Riley et al., 2016), making it a most practical measure for behavioural loyalty.

SCR has also been used for bricks and mortar supermarkets. The first studies analysed nine supermarket stores within the US (Uncles and Hammond, 1995; Uncles et al., 1995). On average shoppers allocated 19% of their supermarket requirements to each of the stores that they had purchased from. A further study analysed six categories across eight major Chinese cities. This research found Chinese shoppers allocated on average 27–30% of their shopping needs to a store type (as opposed to store brand, Uncles and Kwok, 2008; Uncles and Kwok, 2009). When looking at store chains as the 'brand' within Shanghai, the average increased to 38% (Uncles and Kwok, 2009). Further analyses by the authors identified a double jeopardy pattern (McPhee, 1963) with the largest supermarkets having a greater number of shoppers who purchased from them more often and spent more money within those stores (Bhat and Fox, 1996; Wright et al., 1998). This is a well-established pattern for consumer goods categories.

However, while these studies describe the relationship between size and loyalty – there is no analysis of the loyalty towards online supermarkets or, importantly, how this loyalty evolves. This paper, therefore, uses SCR in the context of online supermarket loyalty (e.g. loyalty to Tesco, Asda, Sainsbury's and Waitrose) instead of brand loyalty. We, however, look at online supermarket loyalty for category purchasing rather than the entire basket. Our first research question is therefore:

RQ 1: How does the share of requirements for online supermarkets evolve over time?

2.2. Repertoire sizes

Consumers purchase more than one brand within a category. The smaller group of brands typically bought by a consumer from all the available category brands is called a repertoire. Several studies have analysed the size of consumer's repertoires in various circumstances.

Researchers found that the average Australian fuel buyer purchased fuel from 2.6 of the possible six brands within a 12-week period (Sharp et al., 2002). Similarly, the average Australian beer drinker was found to purchase 2.8 beer brands of the possible six analysed (Dawes, 2008). Further empirical evidence was found examining four consumer goods categories, discovering that the average repertoire size was 2.4 brands (Trinh, 2014). The largest empirical study analysed over 122 consumer goods categories. Banelis et al. (2013) found that over the course of 3 months, consumers purchased 1.5 brands (of a possible 20) on average. As the time frame of analysis increased, so did the average repertoire size too. In a 12-month period, the average consumers had purchased 2.4 brands, ranging from 5.8 (sugar and chocolate confectionery) to 1.2 (cold treatment medicines).

There has also been evidence to suggest that non-tangible products have similar repertoire sizes. Sharp et al. (2002) found that the average New Zealand and Australian credit card holder had 1.2 brands within a 10–12 week period. Mundt et al. (2006) analysed the Australian banking consumers and found that they used on average 1.8 financial institutions for their banking needs. The academic literature contains similar results for the insurance industry (average repertoire of 1.5 brands, Mundt et al., 2006) and long-distance telecommunication providers (average repertoire of 1.2 brands, Sharp et al., 2002). Except for Banelis et al. (2013) and Trinh (2014), no studies have documented repertoire size over an extended period. While both studies documented repertories sizes for periods of 12 months or more, we are comparing 12-month periods of time over a decade, and thus are looking at repertoire evolution over the long term for time periods of the same length. Furthermore, to the best of our knowledge, there has not been any study investigating online supermarket repertoire sizes.

In this paper, repertoire size is the number of online supermarkets consumers purchase from in each 12-month period. By comparing 12-month periods, we can identify the dynamics in repertoire size and hence loyalty. So, if a consumer bought a product from multiple online supermarkets last year and only purchased from one online retailer this year, then the consumer can be viewed as being more loyal to online supermarkets this year than last. Our second research question is therefore:

RQ 2: How does the repertoire size for online supermarkets evolve over time?

2.3. Polarisation index

Polarisation index (φ) captures changes in the heterogeneity in consumer choice. φ ranges between zero and one, where zero indicates pure homogeneity in consumer choice (i.e., all buyers have the same propensity to purchase from individual retailers), and one indicates pure heterogeneity (i.e., each consumer purchases only from their favourite store, Fader and Schmittlein, 1993; Sabavala and Morrison, 1977). Many studies use φ when examining consumer loyalty (e.g., Fader and Schmittlein, 1993; Corsi et al., 2011; Dawes et al., 2015; Sabavala and Morrison, 1977) and is the best measure of loyalty (Rungie and Laurent, 2012). φ is estimated using the Dirichlet-multinomial negative binomial model (known as the Dirichlet model in marketing literature). An analysis of 127 repertoire markets found that 98% of them had polarisation figures lower than 0.62 (Driesener, 2017). The result provides us with a useful benchmark when interpreting this data. Our third research question is therefore:

RQ 3: How does the polarisation index for online supermarkets evolve over time?

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3. Dirichlet model

The Dirichlet model was introduced by Goodhardt et al. (1984) to model buyer behaviour of multi-brands in established competitive markets. Subsequently, Keng and Ehrenberg (1984) and Wrigley and Dunn (1984) applied the model to supermarket choice. The model is one of the most well-established empirical generalizations in marketing (Sharp et al., 2012; Uncles et al., 1995), and has successfully characterised loyalty across a wide range of categories and conditions (Bhattacharya, 1997; Danaher et al., 2003; Ehrenberg et al., 2004; Fader and Schmittlein, 1993; Goodhardt et al., 1984; Rossiter and Percy, 1979; Rungie et al., 2013; Trinh and Lam, 2016; Trinh et al., 2015; Uncles and Ellis, 1989; Uncles et al., 1994; Wrigley and Dunn, 1984, 1985). The Dirichlet model is a mixture of the negative binomial distribution (NBD) of category online purchase rate and the Dirichlet-multinomial distribution (DMD) of purchases from individual online retailers, conditional on the category online purchase rate.

The probability density function of the NBD is

$$f(n) = (1+a)^{-k} \frac{\Gamma(n+k)}{n!\Gamma(k)} \left(\frac{a}{1+a}\right)^{n} \quad (1)$$

where n is category online purchase rate, k and a are the shape and scale parameters of the gamma distribution, respectively.

The probability density function of the DMD is

$$f_{\alpha_1,\alpha_2,\ldots,\alpha_m}(x_1, x_2, \ldots x_m | x_1 + x_2 + \ldots + x_m = n) = \frac{\Gamma(s)n!}{\Gamma(s+n)} \prod_{i=1}^{m} \frac{\Gamma(\alpha_i + x_i)}{x_i!\Gamma(\alpha_i)} \quad (2)$$

where m is the number of online retailers, x is online retailer purchase rate, α_i are parameters of the DMD distribution, and s is the sum of α_i

Combining (1) and (2), the probability density function of the Dirichlet model is

$$f_{k,\alpha,\alpha_1,\alpha_2,\ldots,\alpha_m}(x_1, x_2, \ldots x_m) = (1+a)^{-k} \frac{\Gamma(n+k)}{n!\Gamma(k)} \left(\frac{a}{1+a}\right)^{n} \frac{\Gamma(s)n!}{\Gamma(s+n)} \prod_{i=1}^{m} \frac{\Gamma(\alpha_i + x_i)}{x_i!\Gamma(\alpha_i)} \quad (3)$$

The polarisation index is

$$\varphi = \frac{1}{1+s} \quad (4)$$

A notable pattern of competition derived from the Dirichlet theory is the double jeopardy pattern which shows that big brands have more customers who purchase slightly more often. The difference between big and small brands is mainly penetration (number of buyers), rather than loyalty (Bhat and Fox, 1996; Ehrenberg et al., 2004; Wright and Riebe, 2010). As a result, to grow a brand needs to focus more on increasing its customer base rather than the loyalty of its customers.

If competition amongst online supermarkets does fit the Dirichlet model, it would suggest the predictable double jeopardy pattern in this context. We could use this model to benchmark competition metrics and develop marketing activities to promote online supermarkets. Our final research question is therefore:

RQ 4: Do online supermarkets compete in a Dirichlet-like fashion and has this evolved?

4. Data

The data used in this study is UK household consumer data from the Kantar (previously TNS) Superpanel database. According to previous studies, UK is one of the most developed online markets in the world (Dawes and Nenycz-Thiel, 2014; Hand et al., 2009). The data consists of approximately 35,000 households that are demographically and geographically representative of the UK (Kantar, 2015). The data cover a ten-year period from 2005 to 2014. Data were collected from panel participants via electronic terminals in the home, with home-scanning technology aiding participants in recording their purchases (Leicester and Oldfield, 2009). Four major supermarkets (Tesco, Asda, Sainsbury's and Waitrose), who operated online during the analysis period, are investigated. Tesco, Sainsbury, and Asda are the top three selling UK supermarkets and combined accounted for £101,264 millions in sales during 2015 (Retail Economics, 2017). Tesco took over three million orders online during the 2013 Christmas period, a rise of 11% on the same period during 2012 (Bartholomeusz, 2014). Following Dawes and Nenycz-Thiel (2014) and Keng and Ehrenberg (1984), we examine online supermarket loyalty within five product categories (toothpaste, soft drinks, fabric washing, nappies and cat food) in the UK market. This study includes purchases of both national and private label brands. These categories were chosen to provide variety covering personal care, beverages, household cleaners and miscellaneous.

5. Results

We analyse the results of three behavioural loyalty measures: SCR, repertoire size and polarisation index over time to see if loyalty to online supermarkets has declined. For each measure, we show both results of individual categories and the average across categories.

First, we address RQ1 by comparing SCR for online supermarkets over time. We see in Fig. 1 that the SCR decreases from 79% to 62% between 2005 and 2009, a decline of more than 20%. This decline does not continue but recovers slightly from 2009 to 2010 and stabilises between 2010 and 2014, across all four categories. On average, SCR decreased by only 1% from 70% in 2010 to 69% in 2014.

We continue our analysis of online supermarket behavioural loyalty, and addressing RQ2, by comparing the average repertoire size over time. Fig. 2 shows that between 2005 and 2009, the average repertoire size increases by more than 12% (i.e. from 1.06 to 1.19). Similarly, the repertoire size remains stable after 2010 amongst all five categories, with the average repertoire size being unchanged from 2010 to 2014 (1.20). The implications for loyalty are consistent with the findings of the SCR analysis above.

Last, we address RQ3 to complete our analysis of online supermarket loyalty over time, and we compare the polarisation indexes. Fig. 3 shows both the average and individual category polarisation index across the five product categories from the four leading online supermarkets. The polarisation index decreased by more than 13% from 0.95 in 2005 to 0.82 in 2009. Once again, we see that the indexes remain stable between 2010 and 2014 increasing by just 3% during the five-year period. It is also worth noting that from 2009 to 2010 both repertoire and polarisation is stable while SCR increases by 12% from 62% to 70%. Again, the implications for loyalty are consistent with those from the SCR and the repertoire size analysis.

In summary, we find that across all three measures, loyalty to online supermarkets declines from 2005 to 2009 and is then quite stable. We observe that between 2005 and 2009, the average SCR declines (79% to 62%), the average repertoire size increases (1.06 to 1.19) and the average polarisation declines (0.95 to 0.82). All three measures of behavioural loyalty then remain stable between 2010 and 2014. The results confirm that after an initial period of instability, the online supermarket market has become more stable and consumers have developed more habitual loyalty in their online supermarket buying behaviour.

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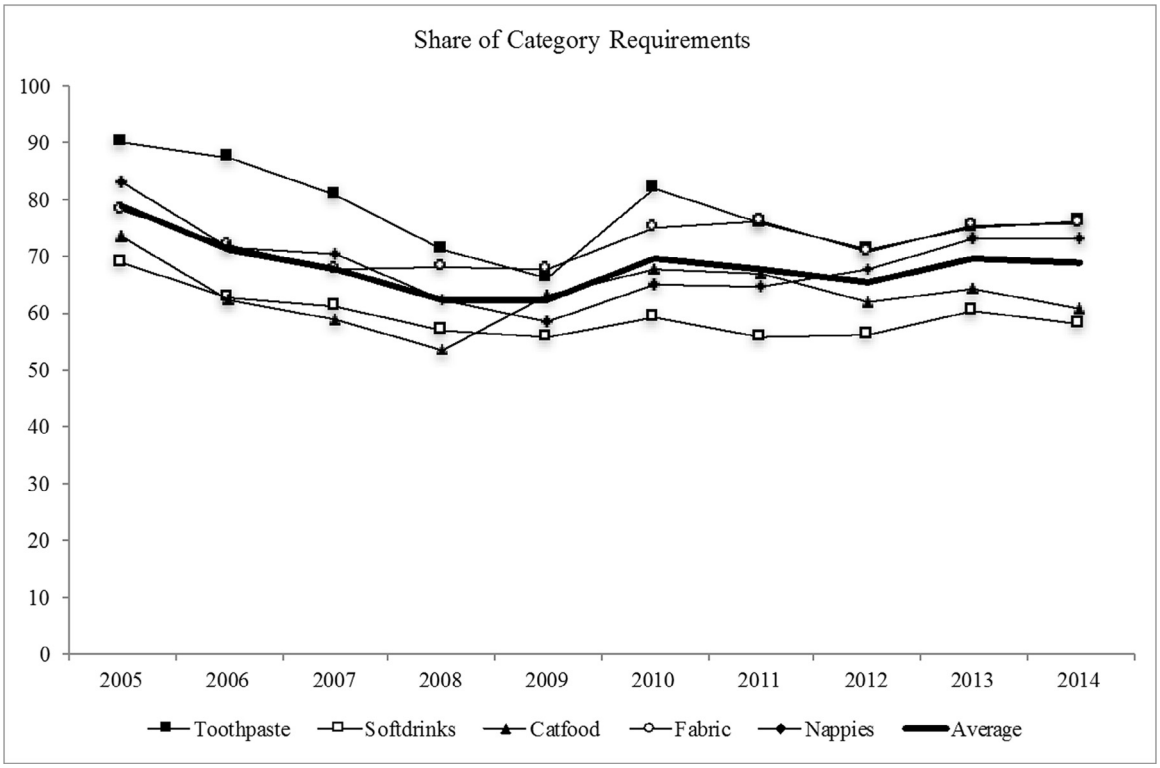

Fig. 1. Average share of category requirements over time.

To determine if the Dirichlet model can accurately describe the online supermarket buying behaviour and address RQ4, we use eight tests of fit to compare the model estimated metrics and observed metrics for penetration and purchase frequency across the five categories between 2005 and 2014 (four tests for penetration and four tests for purchase frequency). We use penetration and purchase frequency as they are the most common metrics for testing the model fit in the literature (Driesener, 2017). These tests include

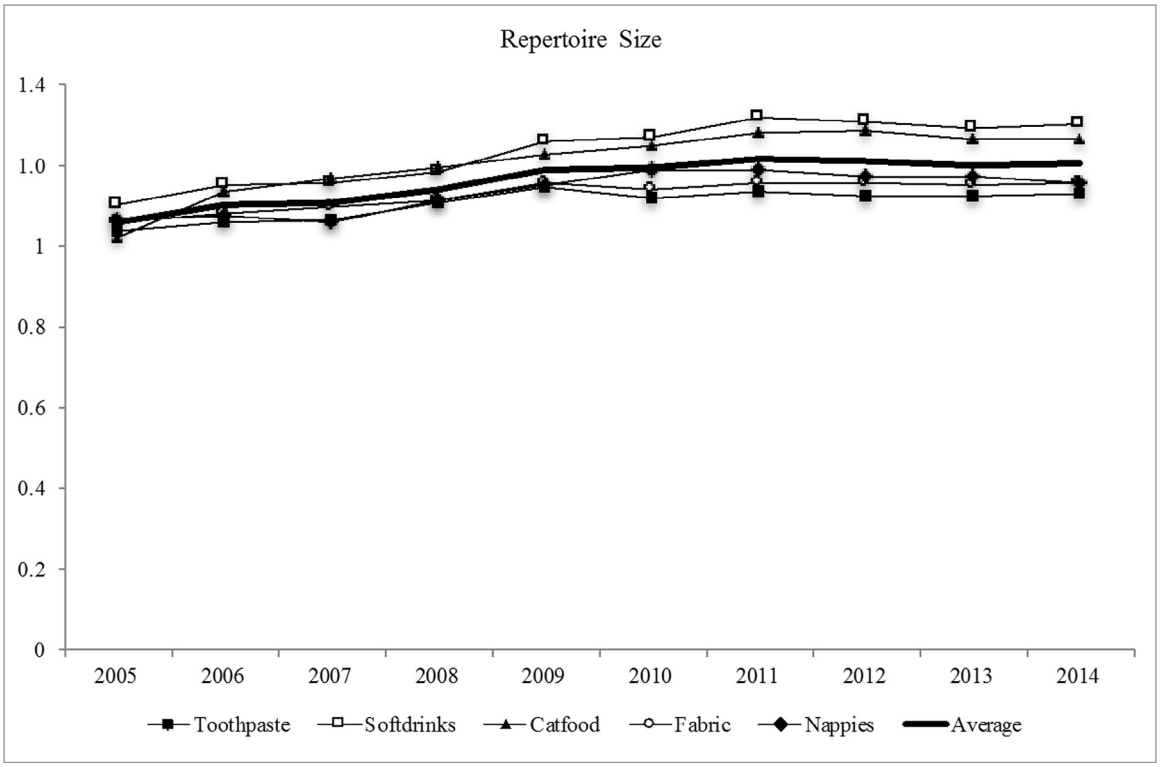

Fig. 2. Average repertoire sizes over time.

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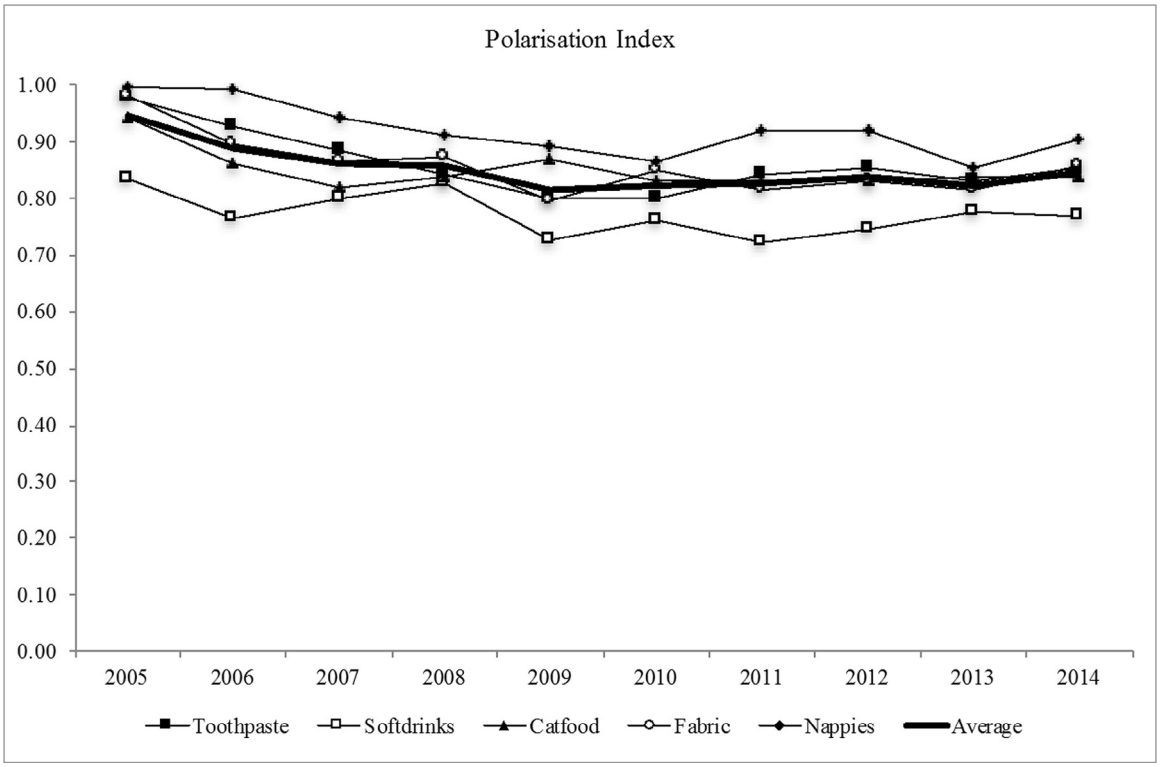

Fig. 3. Average polarisation indexes over time.

comparisons of the average of the estimated and the observed metrics (O-T), Correlations (Correl), Mean Absolute Deviations (MAD), and Mean Absolute Percentage Errors (MAPE) (see Driesener, 2017 for the benchmarks of the tests). Based on an extensive literature review and a comprehensive study of 54 consumer packaged goods categories, Driesener (2017) suggests that an acceptable fit level of a minimum of four out of eight tests passed.

We provide an example of Dirichlet test of fit statistics in Table 1. We see that the 'goodness of fit' scores increase as the time continues. The notion that consumers are becoming more familiar with online supermarket shopping and thus the market is behaving in a more 'Dirichlet' fashion is consistent with the previous findings.

Table 2 shows the evaluation of the fit of the Dirichlet model to online supermarkets' data across five product categories over a period of ten-years. On average, over five out of eight tests passed with most categories having five or more tests pass. The results show that the Dirichlet model can describe completion and loyalty in the online supermarket context.

6. Discussion, limitations and future research

We tested loyalty to online supermarkets using three measures of loyalty. The share of category requirements and repertoire size are common measures of loyalty, but both suffer from a confounding effect with category purchase rate. Our final measure of loyalty, polarisation, is not so affected and so is an excellent measure of loyalty. The first two measures, however, are more intuitively understandable, whereas the third is a measure of the variation in purchase probabilities between brands for the category. Nonetheless, all three measures provide value when understanding loyalty. We are interested in the dynamics of loyalty over time in this is particularly the case. All three of our measures identified two distinct phases in the evolution of loyalty to online supermarkets.

1. Firstly, over the years 2005–2009 all three measures showed a decline in loyalty. Our first measure of loyalty, average SCR, declined between the years 2005 and 2009. This metric decreased

Table 1
Dirichlet fit statistics for Fabric Washing.

	Penetration				Average Purchase Frequency				
Year	Correl	O-T (%)	MAD (%)	MAPE (%)	Correl	O-T	MAD	MAPE (%)	Fit Score
2005	1.00	1.0	9.0	19.2	0.77	**19.2**	**22.9**	**31.5**	5
2006	1.00	0.7	12.5	**23.4**	0.83	**22.8**	**28.4**	**40.0**	4
2007	1.00	2.4	9.8	**20.3**	0.81	**20.3**	**23.9**	**33.5**	4
2008	1.00	3.8	7.7	17.9	0.73	**17.1**	**29.5**	**27.5**	5
2009	1.00	2.4	4.6	13.3	0.71	10.0	14.0	17.8	8
2010	1.00	3.4	5.8	8.4	0.86	7.7	8.9	9.6	8
2011	1.00	2.8	2.8	7.0	0.89	7.3	7.3	8.3	8
2012	1.00	3.0	5.1	9.4	0.99	8.8	10.0	11.0	8
2013	1.00	3.1	7.5	9.3	0.93	7.3	9.8	10.3	8
2014	1.00	3.1	8.6	13.8	0.97	**11.9**	15.2	17.4	7

O = Observed; T = Theoretical.
Tests that do not fit are **bolded.**

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Table 2
Summary of Dirichlet fit.

Number of tests passed out of 8	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
Fabric Washing	5	4	4	5	8	8	8	8	8	7	6.5
Toothpaste	7	7	5	5	6	7	7	6	5	7	6.2
Cat food	4	3	3	4	3	7	7	7	7	6	5.1
Nappies	6	4	4	3	3	8	6	6	6	5	5.1
Soft drinks	3	3	3	4	4	7	8	6	3	3	4.4
Average	5.0	4.2	3.8	4.2	4.8	7.4	7.2	6.6	5.8	5.6	5.5

from 79% to 62%, a decline of more than 20%. In effect, this measure shows that the volume of sales allocated to each online supermarket for each category declined by 20%. Similarly, over the same span, the average repertoire size increased by more than 12% (from 1.06 to 1.19), showing that the number of online supermarkets used to make category purchases increased. Finally, the polarisation index decreased from 0.95 to 0.82; again, consistent with a decline in loyalty.

2. This decline in loyalty did not continue; between 2010 and 2014 all three loyalty measures stabilised. On average, SCR decreased by only 1% from 70% in 2010 to 69% in 2014. Similarly, repertoire size remained stable after 2010 amongst all five categories, with the average repertoire size remaining unchanged (1.20). And finally, the polarisation index remained stable between 2010 and 2014 increasing by just 3% during the five-year period. Between 2009 and 2010 both repertoire and polarisation were stable while SCR increased by 12% from 62% to 70%.

All three measures provide a consistent picture of the change in loyalty in the UK online supermarket category, at least as far as the five categories tested here are concerned.

So, we do find evidence of a decline in loyalty to online supermarkets in the UK, but this is limited to the period of 2005 to 2009. The ongoing stability in loyalty from 2010 to 2014 suggests that online grocery buying in the UK has matured and that the propensity to buy from an online supermarket for a given category has become more established. Perhaps as the number of alternatives grows, consumers have some room to experiment and try out new options (which leads to lower loyalty), but over time habits and mental lock-in are established, and loyalty stabilised.

While all three measures show the first phase loyalty decline, the findings in repertoire size are particularly interesting. Initially, about one person in ten used two or more online supermarkets to fulfil their category needs. By 2009 this had risen to one person in five. Online supermarkets make it very easy to use their online stores through features like 'shopping lists,' 'what you purchased last time' and saving individual user display preferences, all of which make it easier for the shopper to buy. Furthermore, it is extraordinarily easy for consumers to be loyal to one online supermarket given the prevalence of bookmarks, URL auto-completion and other methods browsers provide to access commonly used websites. In the offline world, it is harder to shop at the same supermarket if only because of the requirement of being physically proximate. These factors should all encourage sole loyalty to an online supermarket, and yet this is not observed; indeed, repertoire size has increased! The continued split loyalty in this market and that found by Dawes and Nenycz-Thiel (2014) within a category does support the concept of polygamous consumers when shopping (Ehrenberg et al., 2004). The observed decline in polarization in particular could be reflective of increased polygamous behaviour in an environment where consumers are less risk adverse with increasing familiarity or it could be more prosaically due to the increase in the number of retailers and a general increase in category maturity.

We observed a clear evolution in loyalty to online supermarkets in our data. Based on the last five years of data, however, it seems that the decline in loyalty to online supermarkets has ceased. Making predictions is always fraught, especially as we have examined a limited number of factors that may have a relationship with loyalty. Thus, any predictions we make must be conservative. We consequently anticipate no further change in loyalty. We do not, however, think that loyalty will increase, let alone return to the level previously enjoyed by the incumbents, though further decline seems unlikely given the stability of the last years. We, therefore, think that online supermarket shopping (at least within categories) will continue to show subscription-like patterns (very high behavioural loyalty) (Sharp et al., 2002) for probably at least the medium term.

While loyalty has declined, it is still quite high, higher in fact than that commonly observed for brands in a category. Even with the loyalty decline, the supermarket category is still a subscription market. It, therefore, remains that in these markets, growing the size of the customer base is important. The difference with repertoire markets is that a greater allocation of spend (i.e. loyalty) is made to one brand. The competition between online grocery supermarkets is still largely dependent on how many customers they attract, not how loyal they are (Sharp, 2010). As such, marketing efforts to increase penetration, or the number of shoppers, is crucial for success in this environment.

The overall acceptable fit of the NBD-Dirichlet model implies that this category displays the typical patterns of consumer behaviour. In general, though, the model fit is better in the second phase (6.5) than the first (4.4) – the worst fit was in 2007, the best in 2010 and 2011. Two factors may be at play here. The first is that the model is a 'steady-state' model and arguably given the change in loyalty in the first phase, it was not a steady-state (though we did not look at other indicators such as market share, category evolution and so on). The model has been shown to fit in other situations that were not steady state, so this is not a convincing view (Rungie et al., 2002). The second reason could be more relevant and concerns the maturity of the market itself. It is possible that the consumer behaviour in the early stages of the online market did not reflect the observed norms: zero order, independence between category purchase rate and brand choice, disinterested, distracted consumers and so on. During the development of this market, consumers are possibly more interested, the situation is more novel, choices are fewer and attention is more directed. Consequently, as the market matured, competitors entered, and consumers became more experienced, consumer behaviour becomes more habitual, as demonstrated by the improved fit of the model. Our study supports extant literature which shows that once the market is mature, there is little or no real change in the market at the aggregate level, despite each individual consumer purchasing propensity might still be wobbling around his/her long run steady purchasing rate (e.g. (Graham, 2009; Trinh and Anesbury, 2015)).

From the perspective of brand managers in a category (i.e. a manufacturer), the implications are very much those of the offline world. In a high loyalty environment, consumers tend to concentrate their shopping for a category within a given supermarket's online offering. The key is to ensure distribution (and prominence) in as many online supermarkets as possible to achieve broad access to the market. As loyalty to online supermarkets has declined, this

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imperative is not quite as dominant as it once was, but the ongoing, and recently stable, high loyalty exhibited in this study means that it continues to be a critical competitive requirement. It reinforces the importance of being stocked in multiple online supermarket websites.

The authors understand that the study is limited in the generalisability of the results. To build empirical knowledge, we advocate a Multiple Sets of Data approach, where future research aims to replicate the study in various other circumstances to find similarities or differences in consumer behaviour patterns (Bound and Ehrenberg, 1989; Ehrenberg, 1966, 1990). We believe research within China, the United States, Japan and Germany (the other top 5 global e-commerce markets (Bollinger, 2015)), would provide a comparison of developed and developing economies, population sizes and cultures.

In terms of behavioural loyalty measures, we have used three important measures which have been commonly used in extant literature at the product category level. However, there are other measures of behavioural loyalty which have been used to measure store loyalty at the overall store level such as first store loyalty and patronage rate (East et al., 1997; Knox and Denison, 2000). Future research could therefore analyse these loyalty measures at the overall store level to see if the patterns we found here also hold.

We also acknowledge that we have not accounted for the loyalty to traditional supermarkets over the same period, this is an avenue for future research. Another important avenue for future research is examining the effects of early adopters of online selling. For example, whether the supermarkets who expand to online earlier will have higher customer loyalty in the long run than those who expand later. Finally, it is also worthwhile to examine the interaction effect between online and offline; for example, whether those supermarkets who offer both online and traditional modes have more or less overall customer loyalty than those who only offer online or traditional mode.

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