London South Bank University

The Ehrenberg Centre for Research in Marketing

The patterns of long-term repeat-buying in Dirichlet markets

Charles Graham, BA, MA

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ABSTRACT

Dirichlet markets are stationary and unsegmented, and characterised by predictable patterns of split-loyal buying. This is because, across the population, individual but different household purchase propensities tend to remain stable. Although Dirichlet theory is among the most robust in marketing science, it has not yet been shown from empirical evidence how or if these purchase propensities evolve in the long run, knowledge crucial to marketers concerned with disrupting category structure. This thesis now describes the patterns of long-term repeat-buying. The research approach adopted was the differentiated replication and extension of empirical generalisations under the new condition of extended time, evaluating observations in a 26-quarter household panel of continuous reporters against steady-state Dirichlet benchmarks.

In successive and non-adjacent quarters, contrary to widely held beliefs, few cases of persistent brand share growth or decline were observed and quarterly category structures retained Dirichlet characteristics even over six years. But analysis of cumulative data aggregations revealed that underlying purchase propensities were not entirely stable, leading to a gradual deterioration in model fit to longer reference periods. The main pattern observed was an unpredicted and substantial increase in brand switching, but since this remained governed by Double Jeopardy, and category purchase incidence was largely steady, no segmentation resulted and cumulative shares remained near-stationary.

Findings contribute to knowledge of the nature of long-run behavioural loyalty. They establish that new uses of the Dirichlet in modelling management periods at wider intervals are possible since the effects of trending propensities are marginal when viewed in medium term data. They reveal the evolution of the DJ relationship over the long-run, and they confirm the behavioural drivers of exceptional brand dynamics.

Findings also account for several well-reported systematic deviations in short term Dirichlet fit, but perhaps most importantly, the discovery of long-run equilibrium coupled with the unpredicted but systematic underlying churn of buyers between brands offers no support for loyalty strategies. Rather, it emphasises the importance for practitioners of maintaining market share transaction by transaction.

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CHAPTER 1. INTRODUCTION

In this chapter a brief overview of the research topic is presented, with an explanation for its relevance and importance to practitioners. The research objectives and methodology are outlined, and research limitations described followed by a summary of the contribution to knowledge that this work will make. The chapter closes with an outline of the dissertation structure, and definitions of terms and abbreviations.

1.1 Introduction

Growth is widely accepted as a business imperative, necessary both to create immediate shareholder value (Day, 2002) and to avoid eventual bankruptcy (Gordon & Rosenthal, 2003). Day argues that strategies to deliver growth are the responsibility of the marketing function, and best addressed by managing consumer loyalty to avoid the uncertainty and risk of innovation or the expense of brand acquisition.

Marketers have long been told that substantial increases in brand sales, profits and market share can be delivered through customer retention (Reichheld & Sasser, 1990), and such strategies are also now considered to deliver *additional* shareholder value through customer equity (Blattberg & Deighton, 1996; Rust, Lemon & Zeithaml, 2004). Customer equity theory proposes that a brand's consumer-base can; (1) be managed to deliver superior loyalty, (2) evolve to become segmented from competitors' buyers on the basis of this behaviour and (3) develop an enhanced market-based asset value (Gupta, Lehmann & Stuart, 2004). Kotler explains the importance of this as follows:

> *"...the more loyal the firm's profitable customers, the higher the firm's customer equity. Customer equity may be a better measure of a firm's performance than current sales or market share. Whereas sales and market share reflect the past, customer equity suggests the future."*
>
> (Kotler, Armstrong, Wong & Saunders, 2008. p.29)

Yet precisely because of observations of the past, Ehrenberg argued consistently against loyalty-based *"anything goes"* marketing strategies (Ehrenberg, Uncles, & Goodhardt, 2004) based on brand-level segmentation (Kennedy &

Ehrenberg 2001), describing differentiation, added value, and brand share growth objectives as "romantic" rather than realistic (Ehrenberg, 2001).

Most brands compete in large and valuable categories (East, Wright & Vanhuele, 2008), characterised by stable, split-loyal buying. Regularities in patterns of consumer behaviour, observed by Ehrenberg and his colleagues in such markets and replicated and extended in over half a century of systematic studies since, led to the development of the best-known laws of marketing science (Scriven & Goodhardt, 2012; Uncles, Ehrenberg and Hammond, 1995). Double Jeopardy for example defines an approximately constant relationship between the penetration and purchase frequency of competing brands, how they vary greatly in the number of buyers they reach in a period, yet differ little in the loyalty they attract. This and other laws, along with the interwoven theories that support them, were then later combined in the NBD-Dirichlet model (Goodhardt, Ehrenberg and Chatfield, 1984) which describes market structure with great accuracy and detail when, across a population, individual households have established different brand repertoires and buy the category at different but steady rates.

Dirichlet markets are surprisingly common given their two defining characteristics. They are stationary, showing no persistent trend in the sales for each brand; and they remain unsegmented, so that different competing brands show no special groupings (Goodhardt *et al*., 1984). Although originally conceived to describe fast moving consumer goods (FMCG) purchasing, the Dirichlet has now been discovered to define the usage and choice of services as well as goods, in categories as widely different as industrial buying, banking and insurance, telecoms, cars, retailing, pharmaceutical prescription, and in TV, radio and social media consumption. Dirichlet markets are found in the established European, US and Australian economies and in emergent nations such as Thailand, Russia and China (Bennett & Graham, 2010; Kennedy and McColl, 2012). The model is so central to a scientific understanding of marketing that it has been said that we inhabit a Dirichlet world (Sharp, Wright, Dawes, Driesener, Meyer-Warden, Stochi and Stern, 2012).

Yet the Dirichlet world-view, although empirically grounded, is clearly at odds with much of the marketing literature, and the assumptions of everyday practice. Where individual buyers are concerned, the Dirichlet modeller sees steady purchase propensities *"for the time being"* in both brand choice and purchase incidence, which may thus be interpreted as fixed probability distributions in the model (Goodhardt *et*

al., 1984). By contrast, the persuasive marketer seeks to disrupt category structure permanently by changing those propensities (Schultz, 2010). Brand share growth objectives are regularly set and marketing investments made, each designed over time to persuade more households to switch to the brand, to dissuade them from switching back, and to influence them to buy more of it more often for more money. Given the widely accepted outcome of failing to achieve growth (Christensen, Kaufman & Shih, 2008; Gordon & Rosenthal, 2003), it seems unlikely that competitive markets could remain in equilibrium or unsegmented much beyond the few quarters so far observed.

This thesis therefore addresses the question of *"the time being"* and it is here that a gap in knowledge may be defined. To date, understanding of Dirichlet markets has been developed from, but is also limited by, short and medium-term panel data, covering initially weeks and months, but then extending to one or two years of continuous buying. Over this period, purchase propensities might well be expected to remain largely steady, supporting the various zero-order assumptions of Dirichlet theory. But in order to observe the long-run development of customer loyalty and the suggested trends in propensities suggested by the brand and customer equity literature, new extended data is required which cannot be based on a population sample but must consist solely of continuous reporters in order to avoid confounding brand and panel defection. Such data is now available.

The purpose of this dissertation is to describe how the short-run regularities and established norms of repeat-purchase in established FMCG categories develop over the long-term. In order to do this it is necessary first to replicate and extend known empirical generalisations through observations in multiple differentiated datasets under a new condition of long-term continuous purchasing. Then, in a second stage, the fit of the Dirichlet must be tested to establish any boundary conditions to its predictive and evaluative uses.

The questions for this research are therefore; for how long do stationarity and non-partitioning normally persist beyond the few quarters so far observed? And what new regularities in behaviour if any are associated with changes to market structure that might be seen over time? To undertake the investigation a new six-year dataset was created (over twice the length of standard panel data at the outset of this study) and the following objectives defined:

1. To describe the nature and extent of market equilibrium and the patterns of repeat buying behaviour in long-term market data.

2. To identify exceptions to stationarity (i.e. sustained growth or decline in market share).

3. To understand changes in buying patterns attaching to those exceptions.

4. To identify any variance in the expected patterns of repeat buying as a result of increasing the period observed beyond the quarterly and annual predictions.

5. To test the predictive fit of the NBD-Dirichlet model over extended periods.

Three areas of the consumer behaviour literature shape the research. First, from the short two-year span of available commercial panel reports, some work has already suggested that while brand growth is rare, where it occurs it is characterised by increasing penetration far more than by loyalty (Anschuetz, 2002; Sharp, 2010). Empirical generalisations here might be usefully extended in longer-term data.

Conversely, the loyalty effects thought to arise from brand or customer equity are usually conceptualised as being cumulative and long-term (Aaker, 2002; Keller, 1993) and so their evolution may not be clear in a few successive quarters of buying, especially in categories where mean purchase frequencies are low. It could perhaps be that a longer view would bring this into focus, either over many more successive quarters, or in extended periods of analysis that would better capture the repeat purchasing behaviour of lighter category buyers. The regular constrictions of monthly or quarterly management reporting periods normally imposed upon stochastic brand choice behaviour might be confounding observations of the true nature of brand loyalty (Romaniuk & Wight, 2010), and the ability to examine very long spreads of behavioural data would add to our knowledge of this.

Finally, there is some evidence for the shifting of individual household purchase propensities that is simply not accounted for in our current understanding of stationarity. The observed phenomenon, known as the leaky bucket (East & Hammond, 1996; Ehrenberg, 1988) is a systematic and cumulative decline in the repeat-purchase loyalty of identified buyers over time, while the aggregate repeat-purchase metric remains stationary from quarter to quarter. This implies that brands are both losing and gaining more buyers than benchmarks and models predict and yet the churn leaves aggregate loyalty in equilibrium for the short term. The variance would have serious implications for any customer equity strategy were acquisition and retention to fall out of balance, but understanding of this mechanism is still limited.

A fundamental polarisation of views thus remains to be resolved. If the Double Jeopardy relationship proves to be relaxed in the long term, along with other empirical generalisations such as the Duplication of Purchase law, then boundaries to scientific knowledge of consumer behaviour will have been established, since increasing customer equity outcomes would violate the two theoretical assumptions of the NBD-Dirichlet. However, if the steady purchasing propensities repeatedly observed over the short term are found to persist, and predictive validity is established, then the applications of the Dirichlet might very usefully be extended to include strategic marketing planning, brand portfolio analysis, brand extension and acquisition policy development, and even brand valuation.

1.2 Main findings

This thesis argues that well-established empirical generalisations of repeat buying normally observed over a few successive quarters generally extend to a strategic timeframe of twenty-six quarters. Crucially, since the two assumptions of the NBD-Dirichlet, stationarity and non-partitioning remain approximately inviolate in widely spaced non-adjacent quarters, the model may now be used to predict and benchmark long-term competitive brand performance. A few exceptions were observed, but these cases of brand growth or decline appeared to remain governed by Double Jeopardy, not by customer equity.

At the same time, ongoing purchase propensities did not remain entirely stable in the population. They were observed to reflect far greater brand switching than was expected, although once again even this was determined by brand size. There was therefore little evidence to support the idea of a differentiated customer base. In observing the data and fitting the model, the following empirical generalisations have been replicated and extended:

Summary of findings from successive periods of quarterly data
1. Near-stationarity in patterns of repeat purchasing behaviour from period to period was replicated over a few quarters and found to be persistent long-term.

2. Trends, defined as an increase or decrease of more than six absolute share points in as many years, occurred for less than 5% of brands but were observed to remain constrained by Double Jeopardy, supporting the assumption of non-partitioning.

3. Persistent brand share dynamics were associated with declining category penetrations and largely with external environmental forces. No evidence of loyalty-based growth was found whatsoever, other than that associated with penetration.

Summary of findings concerning observed variances with time

In successive quarterly periods it was found that:

1. A persistent market share premium existed for 40% of the leading brands in the dataset, but showed little or no trend between equal periods, or any clear relationship with brand growth.

2. In contrast, the erosion of repeat purchase loyalty was seen to trend over time reaching an average loss of 35% of repeat buyers, although the leaky bucket continued to be topped up so that aggregate repeat measures remained stable.

3. The erosion of repeat purchase was found to be related to brand growth and decline. Growing brands benefited from a small retention bonus as penetration lifted; declining brands eroded their repeat buyers rather faster than average.

4. As the number of observed purchases increased with time, substantial differences in purchase frequency between bigger and smaller brands emerged, yet these remained largely predictable in the extended DJ slope. Variances between observed and predicted measures became more extreme in longer periods of observation indicating incremental non-stationarity.

Summary of findings from Dirichlet fittings

1. The long-term predictive reliability of the Dirichlet was established. Using nine tests (Driesener, 2005) a continuing stability in goodness of fit to short-term observed data in successive and non-adjacent periods was found in all categories, extending to periods up to six years apart.

2. By contrast, a deteriorating fit was found to cumulative data aggregations. When re-estimated to six-year cumulative observations, results were poor in half the fittings and deemed unacceptable in one third of cases.

3. Category purchase propensities are described in the model's parameters. If steady, the gamma distribution should vary predictably with T, but a comparison of parameter values in acceptable fittings from the first two fitting procedures revealed generalising but unexpected changes. While M maintained a linear increase with time, average values of K increased 40%, while average A rose to only about 75% of its theoretical value. K had previously been thought to remain time-invariant.

4. Brand choice propensities evolved even more dramatically. Parameter S increased its value two and a half times, and average household repertoire doubled between six months and six years. Despite these variances, it was noted once again that market shares in both time periods remained largely stable.

5. Cumulative buying behaviour was benchmarked against projected steady-state Dirichlet norms and new generalisations emerged. Though brand shares remained constant in both observed and theoretical measures, and B & W were closely predicted, long-term buying was characterised by;

    - Dramatic increases in brand switching beyond expectation

    - Far higher penetrations and far lower purchase frequencies than anticipated

    - Close predictions of category buying rates by brand buyers, but substantial over prediction of SCR measures for every brand.

1.3 Research design & methodology

The research approach adopted was inductive, the replication and extension of empirical generalisation through observation of recurring patterns and regularities across many sets of data. Results from such an approach are descriptive, but are expected to build over time into explanatory theories that are strengthened when exceptions to the norms are observed; this study contributes to that process. The required research design is one of methodical, differentiated replication to establish varied conditions in which a law-like relationship does or doesn't hold.

The data used were derived from a recent and continuously reporting panel of nearly 4,000 UK households recording purchasing over 26 quarters and in 18 product categories. A panel of this extent and nature had never been constructed before to the

best of the researcher's knowledge, and the extended and continuous nature of the data allowed observation, comparison and analysis at three different levels.

· 26 successive standard quarterly periods of aggregate brand performance metrics

· 26 successive quarters of household-level repeat purchasing.

· Cumulative aggregate metrics in six month, annual and six-year periods.

1.4 Research limitations

A primary limitation is that the study relates solely to FMCG categories and has not yet been extended to subscription markets. A second is that only the five or six largest competing brands in any category were observed individually, those with market shares in excess of four percentage points in the final quarters of the dataset. Own-brands and smaller competitors were thus excluded, other than in aggregated form (a feature of the NBD-Dirichlet is that this aggregation is possible), while the total share of the leading brands averaged 44% across the categories. Further research here is desirable, especially since own-brand offers are large entities in their own right, occasionally with double-digit shares restricted only by available distribution.

1.5 Organisation of the dissertation

Following this introduction the dissertation is structured in ten further chapters:

Chapter 2: Empirical generalisations in Dirichlet markets

• The development of the empirical generalisations that describe repeat buying is explained and the extent of current knowledge defined. The importance of continuing the work of replication and extension under different and varying conditions is highlighted.

• The existence of an untested condition, extended continuous purchasing, and its relevance to the concept of customer equity are set out and the first research objective thereby contextualised.

Chapter 3: Market share stationarity

• Near-stationarity is an underlying assumption of the Dirichlet, and an established empirical generalisation. The literature in this area is reviewed in order to reach a

definition, arrive at a method of assessment and ascertain the known temporal extent of observed equilibrium and steady buying propensities.

- A gap in the literature is identified, since observations of stationarity have long been reported but are limited by the extent of available data, while many examples of sustained brand growth have been offered but are infrequently supported by evidence. The second research objective is derived to address this gap.

Chapter 4: Loyalty and equity outcomes

- The conflicting concepts of customer equity, brand equity and Double Jeopardy are examined through a critical review of the literature.

- Expected evolution in behavioural response to customer equity strategies is described and compared with the stationary non-partitioned view, leading to the third research objective.

Chapter 5: Variation from behavioural norms over time

- Two apparently systematic variances from stationary behavioural norms have emerged in earlier longitudinal studies of panel data – the leaky bucket & the market share premium – with managerial implications. This work is reviewed.

- Time has important but regular effects on the commonly observed measures of repeat-buying, and on their inter-relationships. These are described, and the fourth research objective defined.

Chapter 6: The NBD-Dirichlet

- In this chapter the development and uses of the NBD-Dirichlet are described, with an explanation of its theoretical assumptions, specification and known deviations.

- The final research objective is given.

Chapter 7: Data description and methodology

- The research approach is outlined, with a brief discussion of ways in which the principles of marketing science have been applied.

- The constitution of the long-term continuous household panel is described, and the sampling method and differentiated character of the categories explained.

- Methods for assessing stationarity and non-partitioning are then described, including the Dirichlet fitting to observed data.

- Potential sources of error are identified and the steps taken to limit or control for these are described.

Chapter 8: Descriptive results

- Results obtained from observing quarterly patterns of continuous repeat-buying behaviour in 18 categories are presented in response to the first three objectives.

- These results are compared with the normative benchmarks described in chapters two and three, and exceptions identified.

- Regularities in the characteristics of stationary and (exceptional) non-stationary brands observed in successive quarterly periods are described.

Chapter 9: Assessing the stability of long-run purchase propensities

- This chapter presents observations of the effects of time on behavioural norms; the first part examines the evolution of two known Dirichlet deviations, the market share premium and the erosion of repeat purchase loyalty (ERPL).

- The second part presents results from observations of cumulative data.

Chapter 10: The predictive fit of the Dirichlet to long-run category structure

- Results from three different fitting approaches are presented. The first to successive and non-adjacent quarters, the second directly to the six year data, and finally a six year projection is assessed against observed measures.

Chapter 11: Contribution to Knowledge

- Findings are discussed and six contributions to knowledge presented.

- Managerial implications are proposed, the limitations of the study are described and recommendations for future research in several areas are then presented.

1.6. Definitions

A   Notation used for the A-parameter of the NBD-Dirichlet model. The model has three parameters, A, K and S. The A parameter controls the scale of the gamma distribution of purchase frequencies across the households in the population.

Brand   The standard unit of analysis used in much Dirichlet research, and the primary focus of consumer choice. A brand is taken to mean all the product variants or stock-keeping units (SKU's) sold under one single name.

B   Notation used to indicate household category penetration for the period. Brand penetration in the reference period is denoted *b*.

Buyers   Households that report at least one purchase in the reference period.

Category   A set of functionally similar competing brand and own-brand products. In Dirichlet theory, it is considered that all brands in a category are regarded as broadly substitutable by consumers, and therefore form no particular segments defined by buying behaviour.

CD   Cumulative Deviation. A fitting statistic used to assess the extent of excess loyalty in brand performance. It is expected that the sum of the deviations (O-T) in the purchase frequencies of the highest share brands in the data should be positive and greater than the cumulative deviations across the smaller brands (Driesener, 2005).

Dirichlet The common abbreviation for the NBD-Dirichlet model of purchase incidence and brand choice.

FMCG   Fast moving consumer goods. Familiar and frequently purchased items sold at relatively low cost including pre-packaged foods, household cleaning products and toiletries.

Household   The elements of the sample on which the research measurements are taken. Households may include more than one member, but in panel data research, individual purchasing is aggregated to, and reported at, the household level.

Gamma distribution   The distribution used to describe heterogeneity in category purchase rates across the population.

K   A parameter of the Dirichlet, derived from the shape of the gamma distribution in the NBD. The K-parameter describes the heterogeneity of category purchase rates across households.

Long-term   Used in this thesis (interchangeably with *long-run*) to mean continuous time periods of over three years, whether sub-divided or not. Long-term time periods exceed the range of standard household panel data, but this time frame is managerially important, for example in calculating brand valuations, and in developing or evaluating strategy.

M   The mean of the distribution of total household purchases of the category in the chosen period of analysis T. This increases with the length of T, given the increase in A (M=AK).

MAD   Mean absolute deviation. A statistic used in the Dirichlet literature to assess the fit of observed (O) measures to theoretical (T) model outputs (Scriven & Bound, 2004; Wright, 1999). Driesener (2005, p.103) gives the following equation for a category with *g* brands:

$$MAD = \frac{\sum_{j=1}^{g} |O_j - T_j|}{g}$$

The mean of the resulting deviations is in the same unit as the observed metric, thus restricting comparison between different performance measures.

MAPE   Mean absolute percentage error. Driesener (2005, p.104) gives the following equation for a category with *g* brands.

$$MAPE = \frac{\sum_{j=1}^{g} \frac{|O_j - T_j|}{T_j}}{g}$$

A fitting statistic of error relative to theoretical model output, and therefore expressed as a percentage regardless of unit of measurement.

Market share   The proportion of choices given to one brand in a category out of the total category choices made by households in the period. Market (or brand) share is a common measure of relative performance, since it is zero-sum. Any gain in a period must be at the expense of a rival.

Medium term   Periods of up to three years, the extent of standard panel data.

NBD   Negative binomial distribution. The gamma distribution of household purchase frequencies mixed across the Poisson distribution of purchase timing. The NBD may be used to model purchase incidence for a single brand but it is also the category purchase incidence component of the full Dirichlet model.

Penetration A comparative measure of brand (or category) use. The proportion of the total population of shoppers that buys the brand (or category) at least once in the period of interest. Both brand and category penetrations increase as reference periods extend in length.

Purchase frequency The average rate at which the category or the brand is bought by its consumers in the period of interest. Average purchase frequency is recorded in this research as purchase occasions and denoted as *w* for the brand and W for the category.

Purchase occasion	A record of household brand choice leading to a purchase, regardless of pack size, product variant or volume purchased. This measure may therefore differ slightly from the sales record, although in practice the variance is unimportant when purchase occasions are aggregated across the sample in the period (Ehrenberg, 1988).
Poisson distribution	A Poisson distribution is commonly used to model random events. In Dirichlet theory, purchase incidence is assumed to be a Poisson process occurring at a fixed mean rate, but unaffected by time since a previous event.
Quarter	For the purpose of the analysis in this research, a quarter is defined as a 12-week period. The research dataset can be divided into periods of any length, but is initially considered in 26 equal and successive 12-week quarters.
Repeat purchase	The proportion of households who purchased a brand (or the category) at least once in a period, and that made at least one purchase of the same brand (or the category) in the next period. In the steady state this proportion (expressed as a percentage) is known to hold approximately constant from period to period, although constituted of different households in different pairs of quarters.
S	A parameter of the Dirichlet, referred to as the switching parameter (*e.g.* Stern & Hammond, 2004). S describes the variance in the distributions of brand choice probabilities across the population – the extent to which individual households differ from each other in their propensities to buy each brand.
SCR	Share of Category Requirement, a common brand loyalty metric. SCR is the mean proportion of purchases given to a named brand in the total category purchasing of the buyers of that brand in the period.

Short term Used in this thesis to mean periods of up to two years, and normally considered in consecutive quarters. Panel datasets at the outset of this research were provided to subscribing firms in rolling quarters as two detailed years with a third year in summary for comparison.

Sole brand loyalty The buying behaviour of households that choose only a single brand from the category in the period of interest, whether they buy that brand once or several times.

Shoppers The population of households that might possibly make a category purchase, no matter how infrequently. The term thus includes buyers (those who have made at least one purchase in the period), as well as those households that have purchased in the past or might do so in the future.

W Notation used to denote average category purchase frequency in the period. Average brand purchase frequency in the reference period is denoted w.

CHAPTER 2. EMPIRICAL GENERALISATIONS IN DIRICHLET MARKETS

In this chapter the development of the empirical generalisations that describe repeat-buying is described and current knowledge defined by outlining the main relationships regularly observed in buying measures. The importance of replication and extension of these norms under different and varying conditions is highlighted. The relevance of extended continuous purchasing to the concept of customer equity is established and the first research objective thereby derived.

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2.1 Introduction

An important aspect of Andrew Ehrenberg's contribution to marketing science was in identifying and describing the regularities in consumer behaviour that he and his colleagues observed across many hundreds of sets of standard panel data. These patterns of repeat buying replicate so widely that they are now considered reliable behavioural norms by managers and academics who are familiar with them and have become benchmarks against which to define and evaluate brand investment decisions (Ehrenberg, 1972; 1988; 2004). Time and many further observations then led to the emergence of an empirically grounded theory to explain the structure of established categories in a given period, and the development of the NBD-Dirichlet model (Goodhardt, Ehrenberg & Chatfield, 1984) which links this theory to the laws of marketing. Extending knowledge and understanding of the way behavioural norms influence long term market structure is the central topic of this thesis. In this chapter the empirical generalisations are therefore described in detail.

The patterns depend upon the approximate steady-state of aggregated household purchasing propensities that have been observed to hold at least over a year or two (Bass & Pilon, 1980; Dekimpe & Hanssens, 1995; Srinivasan & Bass, 2000). It is not yet fully understood how far these norms and regularities might extend beyond this term, and particularly into a five-year strategic planning frame, because observations have been limited by available continuous data. It is important to investigate this, first to establish if boundary conditions apply to current knowledge and second, to ascertain under what circumstances predictions of long-term market structure can be made from zero-order choice probability models such as the Dirichlet if equilibrium is found to persist.

Few detailed investigations of continuous long-term purchasing have been reported (some exceptions are Srinivasan, Leszczye & Bass, 2000; Stern & Hammond, 2004) because reliable large-scale empirical evidence has been hard to obtain therefore the first objective of this research is:

To describe the nature and extent of market equilibrium and the patterns of repeat-buying behaviour seen in long-term market data.

The chapter is structured as follows. First, the empirical generalisations that describe repeat buying will be explained and the extent of current knowledge defined. The importance of replication and extension under different and varying conditions will be highlighted. The relevance of the untested condition of extended continuous purchasing to the concept of customer equity will then be established, and the first research objective contextualised. The chapter concludes with a summary of the empirical generalisations to be used as benchmarks in this research.

2.2 Regularities in repeat-purchase behaviour

We next describe the main patterns of repeat-buying that have been observed in established and near-stationary markets over the past fifty years. It is important to note that the variables observed are the purchase occasion (rather than any measure of volume or of value), and brand (rather than product) choices aggregated to a household (rather than an individual) level. This simplification, justified in the methodology, broadly captures the constructs of interest in any reference period, namely purchase incidence and brand choice, across a heterogeneous consumer base, with very little loss of accuracy, but with very considerable benefits in reducing analytical complexity (Ehrenberg, 1988).

The fundamental pattern observed is that all brand performance measures vary together according to brand size. This is reflected in loyalty measures such as repeat purchase and brand switching that are dependent upon market share rather than any particular brand or customer attribute. Big brands tend to score higher and small brands lower on these metrics. Loyalty is therefore not specific to any particular

brand: rather, brands of similar size in any category normally attract similar loyalty (Ehrenberg, 1988; Uncles Ehrenberg & Hammond, 1995).

In addition loyalty is usually split between brands. Most households buy from a repertoire of regular choices over a series of purchases, favouring one over another, but buying each regularly if infrequently. Sometimes they switch from a particular brand, add a new one, or downgrade a former favourite, but few are 100% loyal and those that are tend to be the lightest category buyers (Ehrenberg & Scriven, 1997).

2.2.1 Double Jeopardy.

The law of Double Jeopardy (DJ) states that small brands are punished twice. Compared with bigger brands they have fewer buyers, and those buyers buy the brand slightly less often. It has been observed in hundreds of categories over fifty years in the relationship in any fixed period such as a month or quarter between three common measures in the category, market share, market penetration (b), and average purchase frequency (w). Market shares and penetrations are very closely correlated, and although they usually vary considerably (there are big brands and tiny brands, based on the number of people who buy them) share and penetration decline together. Purchase frequency on the other hand is normally observed to be similar across all brands in a category, although normally slightly above average for bigger brands, and slightly below average for smaller brands (hence Double Jeopardy; smaller brands suffer twice having fewer buyers **and** lower purchase frequency). The DJ relationship implies that penetration, the number of customers that a brand has, is far more important in determining brand size than how loyal those customers are.

The phenomenon was first identified by the sociologist William McPhee (1963) as a statistical selection effect, but has many useful applications in marketing, since the relationship between penetration and purchase frequency for brands in any near-stationary category can be described (Ehrenberg, Goodhardt & Barwise, 1990) as the approximate constant, $w(1 - b) = w_o$. A marketer with knowledge of the basic brand performance measures should therefore be able to determine whether any particular brand is performing as expected or not and decide appropriate strategies.

The fact that an approximately constant relationship exists between penetration and purchase frequency militates against well-established marketing lore. It runs counter to, among other things, the overriding importance of loyalty as a marketing objective. Related concepts also brought into question include the niche

brand, described by Kahn, Kalwani and Morrison, (1988) as a brand targeted towards a small consumer base, who exhibit an unusually high loyalty towards it and, at the other end of the spectrum, "change of pace" brands that appeal to large numbers of buyers, who buy them only occasionally, usually on deal, as a break from routine. Both ideas violate the assumptions of the *w (1 – b)* model and are almost never seen. Brands are either big or small, have many buyers or few, and all other measures typically follow.

Fader and Schmittlein (1993) and Bhattacharya (1997) both observe a deviation from the law associated with some of the biggest brands, a so-called excess loyalty. Here, a higher than expected purchase frequency is partially explained as the result of a distribution benefit for leading brands (since every retailer, no matter how limited in category space, will stock the category leader). The results have been extended by Jung, Gruca and Lopo (2010) who demonstrate that such excess loyalty is significantly influenced by market share and by purchase frequency, but not by a brand's marketing mix. It nevertheless remains unsatisfactory evidence for the existence of growth through loyalty. From a recent UK dataset covering 300 brands, Pare & Dawes (2011) show that only about a quarter of the leading brands exhibit the characteristic consistently over time. In addition, it was observed in only about a third of own-brand offers, previously thought to have the purchase frequencies of large brands, but with penetrations limited by store brand share (Bound & Ehrenberg, 1997; Ehrenberg et al., 1990).

The DJ relationship has replicated across established categories of consumer goods (Ehrenberg *et al*., 1990) and services (Kau, Uncles, Ehrenberg & Barnard, 1998), B2B markets (McCabe, Stern & Dacko, 2012; Pickford and Goodhardt, 2000), TV viewing (Barwise & Ehrenberg, 1987) pharmaceutical prescription (Stern & Ehrenberg, 1993; Stern, 1995) new car purchase (Bennett & Graham, 2010) and over time and continents (Ehrenberg, Uncles and Goodhardt, 2004). It is therefore a well-established empirical generalisation of aggregated consumer behaviour. It has been shown to constrain brand growth and decline (Anschuetz, 2002; Baldinger, Blair and Echambadi, 2002), period-to-period customer churn in subscription and repertoire markets (Sharp, Riebe, Dawes & Danenberg, 2002; Wright and Riebe, 2010), the erosion of repeat-purchase loyalty (East and Hammond, 1996) as well as brand switching and repeat-purchase (Ehrenberg, 1988).

Describing how the relationship fluctuates in the long-term and how this fluctuation is related to changing purchase propensies may extend knowledge of DJ. For example, Aaker (1996; 2002) and Keller (1993) would argue that over time, and as a result of cumulative investment, evidence of "brand equity" might emerge as some brands break out of the DJ relationship and increase share by attracting exceptional levels of loyalty. If category structure changes significantly in this way, then it is expected that a shift in the DJ constant over a few quarters, or an increase in the excess loyalty characteristic for single brands, or a segmented subset of close competitors will be seen.

2.2.2 Your buyers are the buyers of other brands who occasionally buy you.

The pattern of polygamous loyalty is entirely normal, if unexpected, and has been observed in categories from soup to soap in data from across the world. In frequently purchased categories, consumers are experienced and buy habitually from their different but established portfolios of two or three acceptable brands, often choosing the brand on deal on any single occasion.

Average portfolio size reflects both the competitiveness of the category and the loyalty of the buying. Colombo and Jiang (2002), and Banelis (2008) report that in common with other loyalty measures average portfolios expand with time, as buyers have more chance to experiment and switch. It is a typical pattern that the customers of any one brand buy other brands in total far more often than they buy the brand itself (Uncles *et al*., 1995). The smaller the brand the fewer 100% loyal buyers it has (another Double Jeopardy characteristic), and with increasing time this proportion would be expected to decrease for all brands as their penetrations increase.

In this research we can examine the development of polygamous loyalty over six years, longer than previously seen, to study repertoire expansion in detail.

2.2.3 Duplication of purchase is in line with brand penetration.

Benchmarks for polygamous loyalty were published over forty years ago (Ehrenberg and Goodhardt, 1970) in the Duplication of Purchase Law developed from empirical generalisations discovered in panel data. This model of multibrand buying allows the marketing practitioner to evaluate the strength of competition from particular brands in the category (Graham & Danenberg, 2011) and measure the incidence of cannibalisation (Lomax, Hammond, Clemente and East, 1996) for new

introductions. Generally, which other brands any brand's customers also buy varies little from brand to brand (Uncles et al., 1995) because most consumers see competing offers as largely substitutable.

The Duplication of Purchase Law states that brand switching generally declines in line with brand penetrations - bigger brands attract more switching buyers. The regularity is captured in the expression:

$$b_{y/x} = Db_y$$

where $b_{y/x}$ is the proportion of brand x purchasers who also bought y in the observed period, b_y the penetration of y in the same period and D = a duplication coefficient which is approximately constant across all the brands in the category. The law therefore rather surprisingly implies that the competing brands in a category are undifferentiated and substitutable and that their purchase probabilities relate only to the number of buyers they have rather than to any particular positioning derived from a close segmentation and targeting strategy. In practice, some brands are partitioned together functionally (for example slight partitions of caffeinated and decaffeinated coffees, or pre-sweetened and unsweetened breakfast cereals), indicated by a higher than expected duplication between themselves, but here the patterns hold between the competing brands in the sub-category. Bennett, Ehrenberg & Goodhardt (2000) gives the example of duplications between brands of leaded and unleaded petrol.

Over the 26 quarters available in our data, it might be that clear evidence of segmentation, differentiated buying behaviour for functionally similar brands, will emerge as a result of a particular loyalty strategy.

2.2.4 Hard-core loyalty does exist - mostly among light buyers.

The marketing literature has argued extensively that increasing loyalty brings increased customer lifetime value through higher sales, profitability and recommendation (e.g. Reichheld & Sasser, 1990). Evidence to date simply does not support this (East, Hammond and Gendall, 2006). In any period the number of 100% loyal consumers is relatively low, and they buy infrequently. They may well be loyal simply because they don't buy much, and therefore have fewer opportunities to switch. As the period of observation lengthens, the proportion of hard-core loyal

buying for every brand should fall, because such light buyers have more opportunity to switch in a longer period, and many likely will do so. If however for a single brand in a category, we observe an increase in the proportion of sole brand buyers coupled with rising purchase frequency it would be evidence for the emerging effects of differentiation and "brand equity", and might be associated with brand share growth.

2.3 The five main Dirichlet patterns: an example.

Ehrenberg argued (1988) that for managers to interpret the data they routinely consider, benchmarks are needed that go far beyond "this time last year". Is it for example "*only* 35%" or "*as many as* 35%" of the brand's customers who repeated in this period? He suggested that most brand performance measures are just about normal most of the time (Ehrenberg, Uncles & Goodhardt, 2004), but it helps to know what patterns to expect. Table 1 shows annual brand performance measures in the UK Laundry Detergent category and demonstrates the five regular patterns that define consumer behaviour in Dirichlet markets. Since these patterns are the benchmarks used to interpret the data in this research they are described in detail next.

Table 1. Annual performance metrics for the eight leading brands in the UK laundry detergent category in 2007.

Brands	Brand Size		Loyalty Related Measures					Switching (annual)		
	Market Share	Percent Buying	Purch/ Buyer	Heavy Buyers (5+)	Cat. Purch/ Buyer	100% Loyal		Percentage of brand buyers who also bought É		
	%	(b)	(w)	%		(b)	(w)	Persil	Ariel	Fairy
Persil	19	38	3.7	24	9	21	5.8	--	34	17
Bold	12	24	3.8	25	10	18	5.5	42	33	11
Ariel	12	25	3.5	21	10	17	5.7	51	--	17
Tesco	10	21	3.6	23	10	15	4.7	39	25	11
Daz	8	17	3.7	23	11	15	5.6	37	29	10
Surf	8	18	3.2	18	11	9	5.8	43	28	10
Fairy	7	13	3.7	26	9	21	6.1	47	32	--
Asda	5	11	3.6	22	11	10	6.3	39	22	11
Average	*10*	*21*	*3.6*	*23*	*10*	*16*	*5.7*	*38**	*24**	*12**

Source: Kantar WorldPanel   ** Average duplications calculated over 20 brands*

Brand share is constrained by the Law of Double Jeopardy. Small brands suffer twice. Compared with bigger brands they have fewer buyers who buy that brand slightly less often. Market shares and penetrations are closely correlated, but vary considerably (Persil is four times the size of ASDA) while it can be seen in the table that purchase frequency is similar across all brands but slightly lower than average for the smaller Ariel and Surf brands. This law implies that penetration accounts for brand size far more than loyalty in a month or a quarter.

Your buyers are the buyers of other brands who occasionally buy you. In the table the average Persil consumer bought nine packs of detergent over the year, but only just over a third of these (3.7 packs) were actually Persil. The pattern is characteristic of all eight brands; average annual purchase frequency is 3.6 while average category purchase frequency is ten. Polygamous loyalty is entirely normal if still unexpected across most of a population of buyers in any period.

Hard-core loyalty exists, but mostly among light buyers. 100% loyalty is no marketing touchstone. Here only 16% of consumers were sole-brand loyal in the year, but they bought at less than two thirds of the average category rate. Such buyers are therefore better considered as light rather than committed consumers.

Duplication is in line with brand penetration. Of the buyers of Bold, four in ten also bought Persil, the largest brand, but only one in ten bought Fairy, the smallest. There are exceptions to the rule here. Persil and Ariel buyers duplicated together far beyond predicted levels, indicating a closer than normal brand substitutability, but both brands over-duplicated with Fairy, indicating it as an *additional* functional purchase. These exceptions however show only slight partitioning, since each brand still duplicated customers, the competitive strategies of Persil, Ariel and Fairy did not succeed in creating any exclusive segmentation.

Natural monopoly. Category purchase frequency increases slightly for buyers of smaller brands compared with larger. In Table 1 it can be seen that Persil buyers bought laundry detergent nine times, ASDA buyers bought detergent 11 times. This effect, like Double Jeopardy, was first described by McPhee (1963). In marketing it says that large brands monopolise light category buyers. In effect, light buyers start with the brand leader before switching, while heavy category buyers manifest more of their repertoire choices in a period. Fairy is again an exception in the table, the lower than expected category purchasing among its buyers being a feature of its partitioning with Persil and Ariel.

2.4 Repeat-buying

These regularities in consumer behaviour identified by Ehrenberg and colleagues in commercial panel data describe aggregated buying and category structure in a single reference period. The patterns were initially found to apply to weeks, then to months, quarters and years, the common management cycles. From this it became clear that not only could the same general patterns be observed in consecutive periods, and then in non-adjacent periods, but also that in periods of equal length the performance measures themselves such as market share, penetration and purchase frequency all tended to remain largely near-stationary (Ehrenberg, 1972; 1988), albeit with occasional pronounced but temporary spikes caused by brand promotional activities or seasonality.

The comparative observation of performance measures from period to period then allowed the introduction of an important additional metric, the proportion of a brand's buyers that repeat a purchase of the same brand in a subsequent period. Although multiple buying of the same brand within a period is a measure of loyalty (24% of Persil's buyers bought once and repeated four more times in the year shown in Table 1), many households are such light buyers of a brand that they may not repeat until the subsequent period, especially between shorter divisions such as months or quarters. The repeat purchase metric describes the proportion of a brand's or category's buyers (both heavy and light) that return from one period to buy in the next, and is of great interest to marketers since it is usually considered to provide a behavioural measure of satisfaction.

To illustrate the typical patterns of repeat purchase observed, Table 2 is adapted from the empirical example given in Chapter 3 of *Repeat Buying* (Ehrenberg, 1988), and shows measures for the top five brands from a particular category in coded form, demonstrating not just the regularities but also some exceptions. Annual market shares and penetrations are closely correlated for the five brands, but quarterly purchase frequencies are similar from brand to brand, and rather higher for Brand A. Once again it is the number of buyers that any brand has that differentiates it, far more than how loyal they are.

Within a quarter, average purchase frequency reflects polygamous loyalty; the average brand buyer bought that brand just under three times, although they bought the category five times. In each quarter roughly two-thirds of buyers from the

previous quarter bought the brand again at least once. The three replications shown here are enough to suggest how regularly the pattern repeats. In addition, it can be seen that the repeat proportion itself has a Double Jeopardy characteristic so that Brand A enjoys above average repeat-purchase but Brand D has both far fewer buyers, and fewer of them repeat from period to period. While a brand manager might worry that only two-thirds of their customers appear to stick with the brand from period to period, the approach shows that this is normal (and further replications have substantiated this). Many of the buyers in the table are either light buyers or switchers or both, and will return to the brand in subsequent periods.

Table 2. Repeat Purchase. The percentage of buyers of a brand in one quarter who bought it again in the next quarter.

Brand	Annual		Quarters				Average
	Market Share	Percent buying	Purch/ Buyer	I/II Repeat	II/III Repeat	III/IV Repeat	Q. Repeat
	%	(b)	(w)	%	%	%	%
Any Brand		79	5.0	87	87	81	85
Brand A	46	62	3.7	84	77	73	73
Brand B	12	32	2.5	61	58	58	58
Brand C	6	17	2.9	49	57	45	45
Brand D	5	14	2.5	55	58	46	46
Brand E	6	12	3.0	65	73	69	69
Average Brand		27	2.9	63	65	58	62

Source: Ehrenberg (1988) p.43 Top five brands account for 75% of annual market purchase occasions

A final point is that repeat purchase is rather lower in the fourth quarter than it is in previous periods. Ehrenberg's analysis suggests that a seasonal fluctuation has depressed overall demand and yet despite this variance Table 2 demonstrates an important characteristic of frequently purchased markets. This is that within a few points, the category is in a near-stationary or equilibrium condition. Individual consumers of any brand may buy at different rates, some buying it every week and others buying it in alternate quarters; they buy other brands too, yet the evidence of a stable repeat rate in the medium term (i.e. here over three quarters) suggested that buyers are not generally being lost, despite the almost limitless variables at play in established FMCG categories from brand size and marketing mix investment to

prevailing weather conditions. Replications in hundreds of categories across the world and over time have established structural equilibrium as an empirical generalization that characterizes established markets in the medium term (Ehrenberg, 1988; Ehrenberg *et al*., 2004).

According to Srinivasan and Bass (2000), the discovery of this phenomenon led directly to the development of the class of zero-order stochastic models that combine probabilities of purchase incidence with brand choice to describe category structure. The best known is still the NBD-Dirichlet published by Goodhardt, Ehrenberg & Chatfield (1984), from which the term Dirichlet markets is derived.

2.5 The equilibrium condition

The underlying assumption of the Dirichlet is that since aggregate consumer buying propensities remain steady, then individual households can be deemed to have fixed but heterogeneous probabilities of purchase incidence and brand choice *for the time being*. The model outputs are the averages of these choice probabilities in a chosen period, interpreted as brand shares, along with a wide variety of other behavioural performance measures that describe market structure.

Of course *"...professional marketers devote their careers to destroying market equilibria"* (Goodhardt *et al*., 1984 p.650) by influencing habitual buying propensities with the expectation of a sustained increase in share. As to how effective this might be, the waters are exceedingly muddy. Equilibrium may be the norm over a year or two, but according to Baldinger & Rubinson (1997);

> *"It is only when the marketer looks at changes in volume and share over an extended period, say 5 to 10 years or more, when it can be seen that Ehrenberg's observation is almost universally inaccurate. It is difficult to bring clarity to the merits of alternate points of view here, due largely to the lack of mutually agreed upon definitions."*

(p.38)

This then is largely the heart of the matter. For how long do ongoing propensities to buy any particular brand, observed to be steady in the medium term, remain resistant to change? This is not just a question of marketing effectiveness,

since changing household circumstances, population demographics and a host of other macro-environmental factors will all come into play over time. But if propensities do change over time, what impact could that have on the stability of buying in Dirichlet markets? Baldinger's second point is also critical and the measurement of equilibrium is addressed in the next chapter.

2.6 Chapter summary and research objective one

In this chapter the main regularities of repeat buying behaviour observed in established markets have been discussed, the principal of which is that buying measures mostly vary together according to brand size. This means that loyalty metrics such as repeat purchase and brand switching depend on the number of buyers a brand has far more than on any brand or customer attribute. Knowledge of the patterns can be applied to most aspects of marketing management, and benchmarks and norms of consumer behaviour, for example that loyalty is constrained by Double Jeopardy, can help practitioners avoid costly mistakes from *"anything goes"* marketing planning (Ehrenberg & Goodhardt, 2002).

On the other hand, these empirical generalisations have been discovered, replicated and tested in markets that are in a steady-state *"for the time being"*. It is not clear for how long markets can stay in this condition given competitive marketing activities, and the limitations of available data. Loyalty-based marketing strategies are designed to break the Double Jeopardy relationship by segmenting those buyers with exceptionally high purchase frequencies. If this creates brand growth it would change category structure over time, and identify a boundary condition to existing theory. Using the new long-term dataset it will be possible to observe the stability of share, penetration and purchase frequency and repeat measures between consecutive periods over time. The first research objective is therefore:

To describe the nature and extent of market equilibrium and the patterns of repeat-buying behaviour seen in long-term market data.

In the next chapter the underlying causes of near-stationarity are discussed, along with a review of the methodologies, variables and time frames reported in the literature to assess equilibrium and the exceptions where propensities have changed.

CHAPTER 3. MARKET SHARE STATIONARITY

Near-stationarity in category structure is both an established empirical generalisation and a fundamental assumption of the Dirichlet. Nevertheless, marketing managers hope to be able to disrupt equilibrium and examples of sustained brand growth are frequently offered in trade press and academic case studies to support the belief. In this chapter the equilibrium literature is reviewed and a gap in knowledge identified since although time-series analysis of scanner data has begun to describe the extent of share stationarity in extended periods it has not been matched to date with equivalent findings from behavioural data. The chapter concludes with a discussion of appropriate variables and methodologies to identify exceptions to stationarity and the second research objective is then given.

3.1 Introduction

In most categories of frequently purchased goods it can be observed that there are great differences between the market shares of the competing brands, with perhaps as many as twenty times the number of purchases between the smallest and largest in any period. It is commonly understood that being leader is advantageous: Doyle & Stern, (2006) argue that leading brands set the pace on price changes, new product launches, depth of distribution and promotional intensity, usually with the twin objective of building the category while defending share.

Brand size is also considered to influence profitability. Buzzell, Gale & Sultan (1975) suggested from their analysis of the PIMS database that a market-share gain of ten points leads to an average increase in ROI of five points. They argued that this is because higher share brings economies of scale and efficiency, because it bestows enhanced market power so that greater concessions can be extracted from channel partners, and because superior profit and market share performance are linked by a single underlying factor, higher quality management. They concluded that for many businesses there is a minimum acceptable level of share, and only two available strategies as a consequence; either to grow or to divest.

Day (2002) argues that firms now demand sustained brand growth to deliver shareholder value, and that marketing strategists should increase brand share through loyalty. The link between brand size and profitability is also a building block of the Boston Consulting Group's well-known strategic portfolio management matrix.

Here, relative market position partially determines a brand's future investment and growth prospects. An underlying assumption of the BCG matrix is that size matters, so that managers are advised to invest in brand growth to develop a pipeline of future cash cows. Both the PIMS analysis and the BCG matrix have been challenged many times since their publication. Notably, Jacobson and Aaker (1985) found no clear causal link between market share and ROI, arguing that it might be the joint product of a third factor, perhaps management quality or even luck, a view subsequently supported by Czepiel (1992).

Empirical evidence clearly points to the vulnerability of smaller brands. The law of Double Jeopardy explained in Chapter Two describes how such brands have fewer buyers who buy that brand less often. Small brands also share proportionally more of their buyers with bigger brands. As a consequence they are vulnerable to changes in distribution, they certainly have smaller marketing budgets at their disposal, and may be quickly outgunned by larger competitors if any marketing investment looks likely to succeed (Sharp, Riebe, Dawes & Danenberg, 2002).

Improving market share is therefore both a frequent management objective and as O'Regan (2002) argues, an important organisational goal. Ambler (2003) found market share and loyalty to be the most commonly reported measures of marketing effectiveness at board level, and such high-level attention to share is hardly surprising since in many FMCG categories a single point may be worth several million pounds a year in turnover. In addition the concept is easy to understand, responsive to intervention in the short term and quick to report. In a discipline that often deals in intangibles, even a small market share increase can appear to be a solid return on investment, if it can be sustained. But sustained share change implies trending buying choices, while the empirical findings of marketing science suggest that purchase propensities of different households remain largely stable, calling into question this most common marketing objective. This therefore prompts the second research objective:

To identify exceptions to stationarity, sustained growth or decline in brand share.

In this chapter the equilibrium literature is reviewed with respect to this apparent contradiction and four broad conclusions drawn. First, in the medium term there is little question that, largely, categories remain in equilibrium. Frequent reports

of brand share growth may be unreliable since the window of observation is often too narrow to include empirical evidence of the almost inevitable subsequent decline. Second, there is a consensus that structural equilibrium results from a combination of the oligopolistic interdependence of competitors that leads to off-setting interventions, coupled with the switching between familiar brands that experienced consumers are able to undertake. Third, between a strategic time frame (somewhere over three years) and the realms of historic interest (up to 75 years), established category structures do evolve, usually gradually, but this time-scale is of limited practical relevance to the marketing strategist, except in identifying exceptions to stationarity in order to understand them better. Finally, since the causes of such brand growth or decline are of primary concern to managers any exceptions are of great interest, but create some methodological problems for the researcher *a)* in arriving at a suitable definition and measure of equilibrium to adopt and *b)* in finding suitable and available data to test.

3.2 Market share equilibrium is the rule

Table 3 lists 21 studies and meta-analyses conducted over the last 30 years on hundreds of datasets from different continents and of varying duration using at least nine separate methodologies. Although their aims are different, a common conclusion in every one is that in established markets, whilst some category structures evolve, most do not, at least in the medium term. Market share equilibrium is thus confirmed as an empirical generalisation that has been strengthened by a great deal of differentiated replication.

Using consumer panels, Bass, Jeuland & Wright (1976) report equilibrium over 24 purchase occasions, Ehrenberg (1988) finds near-stationarity in periods ranging from week-to-week and from quarter-to-quarter over a year or two, while over ten years Johnson (1984) reports a slight average share decline of 3% using a cross section of panels covering 20 categories and 50 major brands. Similar results have been reported in weekly scanner data in periods ranging from two years to four years (Srinivasan & Bass, 2000; Nijs, Dekimpe, Steenkamp & Hanssens, 2001) whilst Lal et al., aggregated annual share data over nine years and found through a regression against time that 60% of brands remained stationary even in that extended window.

Table 3: Market share stationarity studies

Study	Analysis	Data Source & Extent	Temporal Aggregation	Categories / Brands	Contribution
Bass et al. (1976)	Switching matrix	Purchases/ 24 occasions	-	1 category	"… a great amount of switching, despite stable market shares."
Caves & Porter (1978)	Absolute & relative share change avg.	Self-reported share/ 3 years	Annual	448 brands	Mature markets become more stable over time as oligopolists grow more adept at anticipating response.
Bass et al. (1980)	Time-Series	Panels 6 years	Month	1 category	Competitive price reactions may offset each other, but equilibrium is explained by consumer attitude.
Johnson, Tod (1984)	Relative share change >,<, +/-10%	Panels 6 reports in 10 years	Annual Cross Section	20 categories 50 brands	Average "major brand" share declines from 21% to 18% over 10 years: stationary.
Ehrenberg, (1988)	Absolute Share Change	Panel /Short to medium term	4-weekly & quarterly	Over 100 categories.	"The sales of most established brands or products are in fact approximately stationary most of the time."
Ehrenberg et al (1994)	Before/ After sales levels	3 Panels, 1-3 years	Weekly	25 categories 100 brands	Promotion does not affect subsequent sales or loyalty.
Lal et al. (1995)	Regression	Scanner 9 + 2 years	Annual + monthly	91 categories	Relative promotional expenditure is off-setting: 60% of brands stationary
Dekimpe et al. (1995)	Unit-root test /ARIMA	Various, 2-3 years mostly.	Various	Meta-analysis 419 series	Stationary market shares in 78% of cases, and most *sales* series evolving.
East et al. (1996)	Absolute share change	Panel Data 3 years	Monthly/ quarterly	9 categories	Systematic loss of repeat purchase is balanced by new buyers over 6 Qs.
Golder (2000)	Rank order regression.	Various: 74 Years (1923-1997)	CrossSection Start - Finish	100 categories	Market shares are *not stable* over 74 years, but 23% of top brands hold rank over that period.
Srinivasan & Bass (2000)	Unit root & cointegration tests.	Scanner 2 years	Weekly	8 categories	Stable shares are consistent with evolving sales if brand & category sales are cointegrated.
Srinivasan et al. (2000)	Unit root	Scanner 7 years	Weekly	2 categories	***Structural reduction*** in price may lead to share evolution.
Franses et al. (2001)	Unit root	Scanner 2+2 Years	Weekly	1 category	Ketchup shares are stationary
Nijs et al. (2001)	VARX models	Scanner 4 Years	Weekly	560 categories	Promotion primarily maintains category *status-quo*
Hoch et al. (2002)	Regression of share against time	Scanner 8 years	Annual	5 categories, (3 brands, PL + other).	Private Label share is not stationary, growing 1.1 points per year. Other evidence is inconclusive.
Baldinger et al. (2002)	Relative share change	Panel Data 5 Years	CrossSection Start-Finish	21 categories 353 brands	65% stationarity: 20% grew >50%, 15% lost > 50%.
Pauwels et al. (2002)	Unit root and VARX models	Scanner	Weekly	1 Perishable & 1 storable category	Promotions have almost no permanent effect on category incidence, brand choice or purchase quantity.
van Herde et al. (2004)	Dynamic Linear Model	Store level scanner data	Weekly	1 category, 7 brands	Substantial innovation fuels sales & share growth in a mature category.
Pauwels et al. (2007)	Rolling-Window.	Scanner & causal 3 yrs	Weekly	1 category	Performance stability in time may mask "punctuated equilibrium".

From the table it can be seen that there are two main sources of data for these studies; retail store scanner data that reports category sales in various degrees of aggregation (that is, in weeks, months, years, by brand, by product and by depth of distribution), and household panel data that reveals the aggregated consumer purchase behaviour underlying the sales. Scanner data, increasingly available in longer, more detailed datasets as Dekimpe & Hanssens (2000) point out, is well suited to time-series analysis, but only panel data, derived from a large quota sample of households, can give any insight into the underlying patterns of purchase. Panel data is hard to aggregate, and in cross sectional studies does not represent continuous buying. Although it has not kept pace with the expansion of scanner records, it points in the same direction.

Despite the evidence, why do marketers commonly believe in sustained brand growth? First, it is important to point out that these studies were all conducted in established markets, rather than emerging categories. Although such markets are generally large and valuable and constitute the majority of FMCG sales (East, Wright & Vanhuele, 2008) this is a boundary condition to the generalization.

A second factor may be the time horizon of the practitioner, which is focused on short-term results (Dekimpe et al., 2000). Prolonged stationarity in market share is normally punctuated with substantial sales spikes which are the result of marketing interventions. These are usually temporary, representing a short-term variance from an otherwise long-term stationary mean, but any attention-grabbing news of brand-growth reported in the marketing press is unlikely to reflect a subsequent fall in share. Simms, (2008) revisits a wide range of case histories of past successes, to discover that they had subsequently been reversed (some to oblivion). Simms in common with Dekimpe *et al.*, (2000) attributes the pattern to a short-termism caused by shareholder pressure, and also to an increasingly rapid turnover of marketers. That view is supported by research published in Forbes Magazine (Linton 2009), which finds that average CMO tenure has reached just 28 months, clearly a tactical rather than a strategic timeframe. Linton argues that the CMO must *"deliver today's results while building the brand for the long term"* but the implication may be that the former has now become more important.

A third reason for a prevalent belief in sustainable growth might sit with educators. In their discussion of stationary markets, East *et al.*, (2008) draw attention to the fact that text book and case study evidence in the academic literature may suffer

selection bias in reporting only successes, perhaps drawing too unquestioningly from reports in the marketing trade press. Finally, as Millward Brown point out (Wyner, 2008) it is far easier for CMO's to measure obvious short-term effects such as a substantial promotional sales uplift than it is to find any residual long-term effects from a predecessor's activities.

3.3 The underlying causes of market share stationarity

Much equilibrium research has been designed to address this last point, by describing long-run consumer behaviour and by identifying and separating the temporary from the persistent impacts of interventions in order to establish the extent of long-run marketing effectiveness.

Bass, Jeuland & Wright, (1976), Bass and Pilon, (1980) and Ehrenberg, (1988) assume that in mature categories consumers have mostly already developed a repertoire of brands from which they shop habitually. This means that competitive marketing activities are offsetting because consumers can switch easily between brands they already buy and which they regard as substitutable.

This substitutability has long had a very tangible basis. According to Hotelling (1929) the cause of the likeness between competing brands is attributable to a drive for economies of scale, to fashion and to imitation, but largely to:

> *"... a tendency to make only slight deviations in order to have for the new commodity as many buyers of the old as possible, to get, so to speak, between one's competitors and a mass of customers."*

(p.54)

Hotelling saw this product improvement process as iterative, and as an unspoken arrangement, so that over time marketing advances are quickly matched, and only heterogeneity of demand and consequent segmentation mitigates excessive similarity. Michael Porter describes the competitive interdependence between several rivals, as seen between brands in established categories, as the oligopolistic bargain (Caves *et al*, 1978). Porter argues that established markets become more stable over time because competitors grow better at anticipating and responding to rival moves. The bargain dictates that in established markets for one brand to gain market share at

least one other must lose so any strategic actions to increase share are most likely to draw an aggressive competitive response. Market shares therefore respond to marketing actions only in the short term before reverting to their previous level. Since marketers hope for long-term effects from such actions their effects have been closely studied over the past few decades, and are briefly discussed next.

Price Promotion. The quick-response tool in the marketing mix is the price promotion, but as Ehrenberg, Hammond and Goodhardt (1994) clearly show in a large scale international study, price promotions bring about dramatic sales increases while they are running only by attracting a small proportion of extra, but existing customers of the brand. This is a direct consequence of established consumer propensities, since shopping households can switch to the best deal the category offers at the time. Promotions therefore have little impact on future sales or on loyalty, which remains as polygamous as it already is. These findings confirmed earlier small-scale experiments by Charlton and Ehrenberg (1976), and have been supported since in much econometric testing of stationary data (Lal *et al*., 1995; Pauwels, Hanssens & Sidarth, 2002; Van Heerde, Gupta & Wittink, 2003). Srinivasan, Popkowski Leszczyc and Bass (2000) distinguish between one time promotion, regular price promotion and structural price reduction strategies, analyzing the effects on competitive response and share. They find that different levels of response emerge but that a structural (permanent) price reduction gives an immediate uplift to market share that is sustained for longer because the inevitable response emerges more slowly. Nijs *et al*., (2001) conclude that the value of price promotions lies only in preserving category status quo, while other research has found the effects of price promotion to be damaging, leading to decreased brand differentiation (Mela, Gupta and Lehmann, 1997) and increased price sensitivity (Mela, Gupta & Jedidi, 1998). Ehrenberg *et al*., recommends that the use of price promotions be cut back since they are normally unprofitable, and precisely because they achieve no persistent benefits.

Advertising. This is in fact exactly what Procter and Gamble decided to do during the early nineties, by introducing a value pricing strategy designed to reduce marketing costs and increase loyalty. During the period couponing and price promotions were drastically reduced while advertising expenditure was raised. Ailawadi, Lehmann & Neslin (2001) studied consumer response to this strategy and report that while price

promotions increase brand penetration during the promotion, they have little lasting impact. Advertising, although it also increases penetration is less effective. Competitors were therefore able to fill the vacuum with additional price promotions, although while P&G brands lost market share the authors speculate that they may have made more money.

Advertising is unlikely to disrupt category equilibrium since, as Barnard & Ehrenberg (1997) argue, the effects are weak; that is, advertising reminds rather than persuades, merely nudging experienced buyers back to brands they already know. In this regard it works in the same way as (but less effectively than) price promotion, with the added proviso that, as Jones (1990; 2004) demonstrates, market share and share of voice are closely related. Brands spend what they can afford, and usually in line with relative size. In the face of competitive advertising funded on the same basis, this strategy can therefore do little more than maintain share.

Product Innovation. Brands very frequently attempt to create competitive advantage through product line extensions; revisions and improvements, packaging changes, "new, improved" offers and other continuous innovations. Doole & Lowe (2012, p.274) report that these make up 90% of all new product launches. Van Heerde, Mela & Manchanda (2004) describe the disruptive effect such an innovation has on the established structure of the US frozen pizza category. While an initial launch increased category volume slightly, subsequent competitive responses did not, so that equilibrium in brand choice subsequently returned to the category. This finding confirms Ehrenberg, Barnard and Scriven (1997), who note that any differentiating advance is usually only temporary, and quickly matched. Ehrenberg & Goodhardt (2001) have also shown how successful new product line extensions achieve near-instant loyalty, but take longer to build penetration, while Singh, Ehrenberg & Goodhardt (2008) report that product line variants attract the same regular patterns of behaviour as their parent brands, conforming to the laws of Double Jeopardy and Duplication of Purchase.

Distribution. Market equilibrium may also be influenced by the distribution that competing brands achieve. Bronnenberg, Mahajahan & Vanhonacker (2000) report positive feedback between distribution and market share during the category growth stage with long-term effects. Retailers may favour brands that have established larger

share earlier, and these effects create a baseline structure when the category reaches maturity. They argue that this is central in defining market structure, because late entrants may fail to establish the necessary distribution to compete effectively. This is a barrier to entry protecting category incumbents.

How then should marketers grow their brands? Williams (2007) echoes much corporate and marketing strategy literature in arguing that the best chance lies in actions that are difficult to implement, and which demonstrate strategic commitment. These are the most likely to discourage retaliation. Of course such actions are also the most risky to undertake, especially as a pioneer (Christensen, 1997; Foster & Kaplan, 2001), and the literature questions the assumption of first-mover advantage (Golder & Tellis, 1993). It is not surprising that market shares are normally in equilibrium, fluctuating sometimes dramatically around their mean. Competitive pressure means that incidence of sustained growth is likely to be rare and gradual, and consequently may not appear in any single three-year dataset. In the next section longer-term studies of market structure are examined.

3.4 Long-Term Market Structure Analysis

Strategic marketing decisions are long term, and lead to actions that create and sustain competitive advantage over time (Aaker & McLoughlin, 2007). Brand growth must be considered strategic, and several of the studies in Table 6 examine evidence that stretches into a strategic window, from five years to almost 75 years. From these studies there is evidence that market structure may evolve gradually over longer periods, as some brands grow and others decline or fail.

Golder (2000) challenges the longevity of market share equilibrium and reports useful findings that establish a temporal boundary condition for the empirical generalisation at seventy-four years. The study challenges Kotler's assertion that:

> *"... 19 out of 25 companies that were market leaders in 1923 remained market leaders in 1983, sixty years later."*

(p.162)

Working with market position rather than brand share, Golder shows that between 1923 and 1997 market structures have in fact changed considerably. For example,

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while 23% of the original market leaders had retained their position, 28% of a sample of over 650 brands had not even survived. These findings therefore indicate a possible limit on near-stationarity, although the implications of this for most practitioners are questionable given the macroeconomic environmental changes seen over three-quarters of a century.

Over eight years, Hoch, Montgomery and Park (2002) considered annual own-brand share, and support Johnson, finding average own-label growth of just over 1% a year in five categories. Baldinger et al., (2002) consider share growth comparing 353 brands in two periods of panel data five years apart. The average share remained unchanged at 5.91%. There is however some support for gradual incremental growth in that while Dekimpe and Hanssens (1995) found stationarity in 78% of categories over two or three years, in the nine year data examined by Lal *et al.* (1995), equilibrium was present in only 60% of cases. Ehrenberg, Uncles, Carrie and Scriven (2001) have suggested that share change is gradual rather than sudden, but cross sectional studies cannot adequately confirm this and more research is clearly needed, first to identify and then to describe the dynamic examples found in multiple long-term datasets.

Pauwels and Hanssens (2007) later proposed that rather than gradual change, periods of stability may be punctuated by shorter structural breaks since management will not tolerate declining performance and take action, and market forces will not easily permit sustained periods of growth and bring about mean reversion. The idea of punctuated equilibrium is derived from evolutionary theory (Gould & Eldridge, 1977), and states that evolutionary change is not the gradual process envisaged by Darwin, but instead consists of long periods of stasis interrupted by rare and rapid events. The historic method of Golder and the other long-term cross-sectional studies above indicate that change in category structure is certainly rare at an annual market share, or even ranking level, but give little sense of possible dynamics within a series.

3.5 Methodology and definition

The equilibrium literature reveals very little about underlying long-term consumer behaviour. Extending knowledge of instances of permanent brand growth or decline may indicate more effective strategies for influencing consumer choice in

order to bring about permanent change to category structure. First, permanent brand growth or decline must be identified, but it is clear from Table 6 is that there is no common definition of stationarity and many methodologies available to capture it from sophisticated time-series econometrics to univariate tabulation. Any researcher must first therefore arrive at a suitable definition and measure of equilibrium from the current literature and then find suitable and available data to test.

As to data, the equilibrium literature can be broadly divided into two streams. The first relates to the persistence of the effects of different marketing interventions over a strategic time frame. Researchers here have adopted and developed several time-series and related unit-root tests of scanner data to examine shocks to stationary sales series over periods extending in a few cases as far as six or seven years. (Srinivasan *et al.*, 2000; Hoch, *et al.,* 2002).

While scanner data can now be collected reliably over longer time spans the underlying consumer behaviour cannot be subsequently examined. This has led to a call for further research, since such data:

"... do not provide direct information about the individual-level processes underlying the results. A detailed investigation at the consumer level may uncover the mechanisms underlying the aggregate market behaviour analyzed in our study."

(Nijs *et al.*, 2001 p.17)

A second stream more directly considers consumer choice behaviour, investigating the underlying patterns of loyalty and repeat-purchase that support brand share from consumer panel data. This is designed to capture behaviour but is limited by extent (usually to two or three years) and by attrition. Participating households are recruited as a quota sample and are not usually continuous. Existing panels are unsuitable for the detailed study of long-term repeat-purchase loyalty since attrition can become confounded with defection (East & Hammond, 1996). Near-stationarity is well established in this stream, but there is a substantial gap in knowledge since findings based on empirical evidence of continuous purchasing have been constrained by available data. In order to contribute to knowledge in this area a new form of extended consumer panel is required.

At the same time, there is no common definition of brand share stationarity. As the periods under observation extend, so conflicting interpretations are appearing.

For example, Hoch *et al*., found an average increase of 6.4 market-share points over six years in 86% of US own-label cases and report it as clear evidence of market share evolution; on the other hand, at around one point change a year this could be interpreted to fit Ehrenberg's description (1988) *"approximately stationary"*. As research moves to consider longer time frames, it becomes more pressing to establish the difference between a stable and an evolving brand or category. When looking at an extended time-series, such a definition must encapsulate the fluctuations and trends in share or penetration that may become more evident.

Econometric and time-series researchers work with rigorous tests, and have developed several new ones here (Srinivasan & Bass, 2000; Van Heerde, Mela & Manchanda, 2004; Pauwels & Hanssens, 2007) but these may be opaque to many managers let alone academics, as Dekimpe and Hanssens, 2000 lament. The techniques are also inferential in that they seek to decompose time-series into component parts, and seek causal explanations for variances. An important consideration is that the definition adopted here will be used in assessing the fit of the Dirichlet to extended data, and need only identify a trend in share as evidence of non-stationarity. To make sense of any findings we need to establish what the model output is being assessed against, but a second consideration is that any measure adopted should be broadly usable, and its interpretation clear to practitioners.

In *Repeat Buying* Ehrenberg defines stationarity as:

> *"...the situation where there is no short term change in the aggregate sales or penetration level of the brand or item in question.**"*

adding the footnote:

> *" ** The term stationary is used here in the specific sense defined, and does not carry overtones from its uses in economics, etc."*

<div align="right">(1988, p.12)</div>

In this case then, little more than a descriptive method is needed, one that can demonstrate visible trends (or their absence) and any fluctuations quickly. Here Chatfield (1989) suggests that graphic run-plots are useful, in which case there is no need to elaborate further on the *"few points up or down"* interpretation. The final consideration then becomes the market share variable of interest.

3.6 Absolute, relative or tiered measures of brand share?

A further difficulty in the interpretation of adjustments to market share arises from differences in brand size. Market share is an evaluation of relative performance in a category, and absolute market share points, for which brands are competing, are therefore a common measure. The change in absolute share point metric gives a clear evaluation of market response to any brands' performance relative to its competitors, since competing shares are bounded by zero & one and sum to unity (Franses, Srinivasan & Boswijk, 2001). Any gain must be off-set by competitors' losses. An application of this approach is found in Buzzell *et al*. (1975) where an absolute share point measure is used to report that over two years only around 20% of the 600 businesses observed had gained two points or more in share. Absolute share change is also the unit used by Ehrenberg (1988) *"…a few points up or down"*.

Given the extreme disparity in brand size normally observed (often as much as a twenty-fold variance), it might be expected that smaller brands could less easily add or lose absolute share points. Caves *et al*., (1978) aimed to discover if share instability manifested in brands of different sizes proportionately or absolutely to different exogenous category shocks. In order to establish this, they calculated both the average *absolute* and *relative* market share changes of the top four brands in each category of the PIMS database over three years. They report that the two measures behave differently depending on market concentration, so that while average absolute share change increases, relative share changes decrease with greater brand size.

This is no surprise. The relative share change approach evaluates variance relative to a base of individual brand share. Some managers (especially of smaller brands) may favour metrics based on brand rather than category size since for example, a four percent share brand can claim an impressive 25% growth with just a single share point increase. The major disadvantage of this system is that the category comparator is lost. Since all competing brands are rivals for the same share points, it may make little sense in comparing relative share growth when assessing category equilibrium, even though smaller brands are less likely to add or lose as many absolute share points as larger ones.

A third technique occasionally adopted in the literature to overcome this difficulty has been to consider share instability in tiers defined by scale of change. Johnson (1984) and Baldinger (2002) both adopt such a strategy, but the technique is

limited in the same way as the analysis of relative share (but see Appendix B for a further discussion).

In this research it has been decided to adopt an absolute measure of brand share, the proportion of total category sales in the period accounted for by the brand of interest. Although managers may prefer to evaluate the relative performance of a single brand, the focus of this study is on long-term category structure. It therefore makes sense to adopt a category-based measure. Second, precedent in the literature favours an absolute share point approach across techniques and over time. Third, this decision does not ignore the fact that a single point increase might represent very substantial and possibly problematic growth or decline for a small company, but rather, it puts it in context. The fact that small brands cannot compete easily from a low base may well in itself be one contributor to extended category equilibrium.

3.7 Chapter summary and research objective two

Brand growth is of overriding concern for managers and investors and yet although there is evidence of frequent but temporary fluctuations in share and established explanations for its cause, evidence of trending share and dynamic category structure occurs rarely. What is currently missing is a much larger scale and longer term assessment of stationarity from panel rather than scanner data. Such a replication and extension would, as a first step, need to confirm the incidence of non-stationary brands in a strategic time-frame, and could then from further investigation describe the evolution in previously stable buying propensities. Given the new continuous long-term panel data available, this is now possible and any sustained trends in brand share can be identified in multiple categories using a measure accessible to practitioners. A simple description of obvious trends in share and other metrics is adequate. The second objective is therefore:

To identify exceptions to stationarity, sustained growth or decline in brand share.

In the next chapter the possible underlying causes of sustained change in brand share are discussed n a review of the bran and consumer equity literature.

CHAPTER 4: LOYALTY AND EQUITY OUTCOMES

In this chapter the conflict between the proposed outcomes of brand and customer equity and Double Jeopardy are introduced through an examination of the literature. The expected evolution in individual and aggregate behavioural response to equity strategies is described and compared with the stationary, non-partitioned outcomes normally seen, thus leading to the third research objective.

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4.1 Introduction

What changes to the established buying propensies in the population will deliver persistent market-share growth? Managers expect to influence consumer behaviour towards their brands, and the loyalty, customer & brand equity literatures tell them that through tangible and intangible differentiation of products and services they can persuade their loyal, heavy users to buy more often, encourage lighter buyers to become heavier buyers, and prevent any buyer from switching to a competitor (Aaker and McLoughlin, 2007; Blattberg & Deighton, 1996; Reichheld, 2001). It is suggested that this can be achieved by influencing consumers' brand knowledge and brand evaluations over time and through use (Ambler, 2003; Keller 2008; Keller & Lehmann, 2006; Reichheld, 2003). For any growing FMCG brand, the behavioural outcomes of loyalty would thus manifest over consecutive periods of panel data as observable trends in performance metrics such as customer retention (repeat-purchase rate), average purchase frequency, share of category requirement and proportion of sole-brand buyers. These effects would not of course be enjoyed to the same extent by less successful competitors and so as brand shares shifted, market structure would become segmented by very substantial variation in behavioural response to the competing offers in the category.

The empirical evidence casts doubt on the proposition that a customer base differentiated by behavioural loyalty can exist at all. Bennett (2010) has argued, following an extensive review of loyalty studies published over fifty years, that managers should not even "try to manage loyalty". Limited observations suggest instead that if a brand becomes more popular, its growth is related to increases in penetration, while higher retention and purchase frequency remain constrained by Double Jeopardy (Anschuetz, 2002; Sharp, 2010).

If as suggested differential brand-equity effects are cumulative and lead to gradual changes in aggregate consumer behaviour, then any emerging segmentation may not be observed in the medium term. A long-term view might reveal a different story. In this chapter, literature is reviewed in order to establish what behavioural evidence might be expected to emerge over the longer term if loyalty, brand or customer equity strategies were successful. The point is that up until now the cumulative effects of brand equity may have been obscured or confounded by the sampling processes used in the collection of panel data, by respondent defection, and by the short-term nature of previous observations. Since this research considers a twenty-six quarter dataset of continuously reporting households, and may now identify exceptional, dynamic brands in otherwise stationary markets, the behavioural drivers of market-share change will become apparent. If they are systematic, the knowledge will be of importance to practitioners, and this consequently defines the third research objective:

To understand changes to buying patterns attaching to any dynamic brands.

The remainder of the chapter is structured as follows. First, a brief overview of the consumer & brand loyalty literature identifies four main categories of loyalty measure. Brand & customer equity research is then reviewed in order to describe the expected behavioural outcomes proposed by equity strategies with an example from recent panel data. This is followed by a discussion of conflicting but limited empirical evidence, contextualising a gap in knowledge and the third research objective.

4.2 Brand loyalty

Conceptualisation

Brand loyalty is the mechanism by which firms capture superior value over time from their customers (Kotler *et al*., 2008) through repeat purchase and increasing share of wallet. The literature has for decades described the process of segmenting markets, and creating satisfaction through tangible (Haley, 1968; Levitt, 1960; McDonald and Dunbar, 2004; Smith, 1956; Webster, 1986), or intangible (Ries and Trout, 2001) differentiation of brand attributes. Heavy users can thus be persuaded to buy more

often, lighter buyers will become heavier buyers, and any buyer can be dissuaded from switching to a competitor maintaining the competitive advantage through loyalty (Schultz, 2010). Uncles, Dowling and Hammond (2003), suggest that many firms have invested in formal customer relationship management programmes and loyalty schemes with two aims; first to increase sales by raising purchase/usage levels and the range of products bought, and second to retain buyers in order to maintain the customer base.

Mellens, Dekimpe and Steenkamp (1996) list the benefits of a loyal customer base to firms as being: higher profitability, lower marketing costs, a reduction in consumer price sensitivity, greater trade leverage, valuable time to respond to competitor activity, and a better price when the brand is sold. From their earlier review of the literature Jacoby and Chestnut (1978) define brand loyalty as;

> *"The (a) biased, (b) behavioral response, (c) expressed over time, (d) by some decision-making unit, (e) with respect to one or more alternative brands out of a set of such brands, and (f) is a function of psychological (decision-making, evaluative) processes."*
>
> *(1978, p.80).*

They expand on this as follows. A biased behavioural response implies that marketers *should* be able to influence repeat purchase behaviour and improve it in favour of the focal brandand that any achieved effect should be persistent (although as Brown (1953) first showed, not necessarily constant over a purchase sequence). The decision making unit can be interpreted as an individual, household or firm therefore marketers must be clear about who is the influencer and who is the purchaser. For example, in FMCG categories there may well be switching at the household level, but this is partly allowed for with the implication that loyalty may be expressed towards several competing brands, and be polygamous (Ehrenberg, 1988) as is seen for example in household panel data. Finally, loyalty is the result of a psychological process involving evaluation of alternatives, and resulting from a commitment towards the brand. This attitudinal component is a requirement for brand loyalty that distinguishes it from repeat-purchase.

It has been argued that such commitment might develop over time through usage and satisfaction (Oliver, 1997; 1999), trust (Morgan and Hunt, 1994), or through the growing positive affect described in many tri-component models of

attitude development (Schiffman & Kanuk, 2009). Mellens *et al*., (1996) thus see brand loyalty as an explanation for repeat purchase behaviour over time.

On the other hand, some have considered that much repeat buying behaviour might be simply inertial (Jeuland, 1979), or at least constrained by heuristics (Hoyland, 1984) or by bounded rationality (Gigerenzer, 2004), thus limiting the possible influence that marketers may be able to exert (Graham, 2009). In addition, the correlation between stated attitude and subsequent behaviour has long been known to be weak at best. East, Gendall, Hammond & Lomax (2005) argue that loyalty is a useful concept if it can be used to predict and therefore manage behaviour, but while individual components of loyalty can predict some individual outcomes well (for example, they show that repeat patronage predicts retention and search behaviour), combination concepts perform poorly. Jacoby and Chestnut made the point that there are so many variables at play predicting performance from attitude that consumer brand choice appears to be *as-if* random. The benefit of behavioural as opposed to attitudinal or composite measures is therefore that they describe actual performance based on behaviour over a period of time (Mellens *et al*., 1996). Many successful aggregate-level stochastic models of multi-brand buying (e.g. Bass, Jeuland & Wright, 1976; Goodhardt, *et al*. 1984; Kalwani & Morrison, 1977) assume a zero-order choice process and stationarity in modelling market outcomes.

Behavioural measures of loyalty can be taken at the individual or brand level (East, Gendall, Hammond & Lomax, 2005). The distinction may be important since many individual switching sequences over time aggregate into stationarity from period to period, as conditional trend analysis demonstrates (Bass, Pessemier & Lehmann, 1972; Goodhardt & Ehrenberg, 1967), therefore any variance from stationarity may need to be examined at an individual level. Loyalty measures aggregated to the brand level include those already discussed, including brand switching and repeat proportions, and market share. Individual measures have also been taken over a succession of purchases and aggregated in discrete choice models (Guadagni and Little, 1983).

At the individual level, measures include proportion of purchase (e.g. SCR), first-brand loyalty (East, Harris, Hammond and Lomax, 2000), average purchase frequency, and sequence of purchase measures. The important point to be drawn here is that while marketers may often think deterministically in deciding which individual

consumers to influence most cost-effectively, the outcome of that investment will always be seen in aggregated market data and in comparative brand performance.

4.3 Brand equity

Loyalty is considered to be one component of brand equity, for example Aaker (1991) describes *"The willingness of customers to repurchase the same brand"* as one of the four assets of brand equity, while Keller (2003) sees *brand resonance* as the apex of the consumer based brand equity pyramid. According to Christodoulides and deChernatony (2010), the brand equity construct is an attempt to reconcile the short and long-term returns on investment in the market-based asset. It links marketing and shareholder value, since it represents both the financial value of the brand, and its ability to deliver a future revenue stream at enhanced margins (Ailawadi, Neslin & Lehmann, 2003; Ambler, 2002; Gupta, Lehmann & Stuart, 2004; Simon & Sullivan, 1993). Brand performance is driven by an attitudinal loyalty component, whose strength gives a protective buffer against competitor actions (Hollis, 2008; Keller, 2008).

Management performance on these cognitive measures is categorised as a direct outcome by Christodoulides *et al*., (2010), leading to the indirect outcome of brand performance. Park and Srinivasan (1994) suggest that brand equity outcomes are driven by two generic strategies; achieving a price premium and building market share, and ever since the earliest contributions to the field, from Srinivasan (1979) and Farquhar (1990), most researchers have found increased market share to be an indicator of greater brand equity. Table 4 summarises some of these findings, and demonstrates how greater consumer loyalty has been integrated into the definitions through attitudinal measures of preference, purchase intention, perceptions, beliefs and relationship strength and the expectation that this leads to greater purchase frequency and retention.

4.4 Outcome variables of brand equity

Besides the impact on marketing promotions and product introductions (Aaker & Keller, 1990; Slotegraaf and Pauwels, 2008) and strengthening price premiums (Ailawadi, Neslin & Lehmann, 2003), strong brand equity is also credited with

reducing firm risk (Rego, Billett and Morgan, 2009), protecting the brand in product-harm crises (Van Heerde, Hellsen & Dekimpe, 2007), and creating a focus for integrating organisation-wide brand management (Ind & Bjerke, 2007) including corporate societal marketing (Hoeffler & Keller, 2002). Moore, Wilkie and Lutz (2002) have demonstrated its selective impact on the intergenerational influence on brand choice, while Park, MacInnis, Priester, Eisengerich and Iacobucci (2010) isolate a brand attachment driver of brand equity as a predictor of improved competitor cross-sensitivity.

The behavioural outcomes of brand equity are thus largely those expected of brand loyalty – that a brand with stronger equity has more loyal customers than its competitors, who will buy more and switch less over time. In addition, attitude-driven behaviour towards higher-equity brands should respond more positively to marketing intervention, and thus over time lead to market share gains.

Table 4. Indicators of Cognitive and Behavioural Brand Equity

Study	Definition		Proposed Indicator
Srinivasan (1979)	"the component of a brand's overall preference that is not explained by the multi-attribute model." (p.12)	*Direct:* changes in individual preference	*Indirect:* market share changes through penetration
Farquhar (1990)	"the added value with which a given brand endows a product." (p.7)	*Direct:* attitude strength, awareness, continued preference	*Indirect:* market share, market dominance, loyalty.
Keller (1993)	"The differential effect of brand knowledge on consumer response to the marketing of the brand." (p.8)	*Direct:* "Consumer perception, preference & behavior."	*Indirect:* "probability of brand choice… greater consumer (and retailer) loyalty [and decreased] vulnerability to competitive marketing actions."
Cobb-Walgren, Ruble & Donthu (1995)	"..the added value that a brand name gives to a product…" (p.26)	*Direct:* attitude, perception, salience, preference, purchase intention.	*Indirect:* Increased volume/market share.
Ambler (1995)	"… the sum of the habitual behaviours of those in the marketing channel." (p.338)	*Direct:* brand relationship strength (conation)	*Indirect:* market share via distribution & SCR
Agarwal & Rao (1996)	" …. The added value of the brand."	*Direct:* perception-preference-intention-choice.	*Indirect:* market share through penetration.

Aaker (1991)	"A set of assets and liabilities linked to a brand, its name and symbol that add to or subtract from the value provided by a product or service to a firm and/or that firm's customers." (1991, p15).	*Direct:* loyalty, perceived quality, associations & awareness.	*Indirect:* market share, loyalty, distribution.
Dyson, Farr & Hollis (1996)	The strength and resilience of intangible mental brand associations.	*Direct:* Rational, emotional & salience-based drivers	*Indirect:* Value share of requirements & purchase frequency loyalty measures.
Keller & Lehmann (2003)	"The brand value chain offers a holistic, integrated approach to understanding the value created by brands." (p.28)	*Direct:* "...prevailing customer mindset" (p.29)	*Indirect:* market share, retention, purchase frequency, WOM.
Reynolds & Phillips (2005)	"The value of a brand's loyal customers relative to other brands in the category in financial terms" (p.183)	*Direct:* beliefs, behaviour and the likelihood of these remaining constant in the future.	*Indirect:* The contribution to market share from the size and vitality of the core of loyal brand buyers relative to competing brands.
Oliveira-Castro, Foxall, James, Pohl, Dias & Chang (2008)	"...the marketing effects uniquely attributable to the brand.."	*Direct:* perception, attitude, intention.	*Indirect:* Market share increases (but observed within a buying context), preference.
Park, MacInnis, Priester, Eisingerich & Iacobucci (2010)	A willingness ... "to express an intent to engage in difficult behaviors—those that require investments of time, money, energy, and reputation—to maintain (or deepen) a brand relationship." (p.14)	*Direct;* Brand attitude, attachment & prominence	*Indirect:* SCR and need-share

4.5 Behavioural measures of customer equity

A separate stream of the literature proposes targeted investment in the firm's customer base in order to build customer equity (Blattberg and Deighton, 1996). This idea was largely based upon Reichheld's work on retention, and his attribution to loyalty of increasing profitability from price premiums, added referrals, cost savings and revenue growth. Customer equity is achieved through an optimal balance of

spending between acquisition and retention designed to enhance the returns from loyalty and grow overall customer lifetime value. Gupta, Lehmann and Stuart (2004) define CLV as:

> *"the discounted future income stream from acquisition, retention and expansion projections and their associated costs. (p.7)*

The interest in customer-centric marketing initiatives has been driven by ever increasing volumes of purchase data, and the relationship opportunities offered by web-based interactions (Jain and Singh, 2002), as well as by a desire to analyse the profitability of different customer segments. Research has included both repertoire and subscription markets, but findings have been contradictory in FMCG markets. Zhang, Dixit and Friedmann (2010) find that loyalty is positively associated with customer revenue and customer retention, yet Reinartz and Kumar (2000; 2002), and later Gupta and Lehmann (2005) found the evidence less convincing. These studies have drawn attention to the limitation of short-term panel data in assessing lifetime value, the split-loyal nature of frequently purchased categories, and heterogeneity in consumer purchasing. Nevertheless, others (e.g. Blattberg, Getz and Thomas, 2001; Zeithaml, Rust, and Lemon, 2001; Venkatesan and Kumar, 2004) have proposed further models of increasing long-run customer spend, firm profits and shareholder value.

Customer equity theory proposes that the customer base of any successful brand becomes segmented by its behaviour over time, purchasing more frequently and switching less often than the buyers of other brands. The expected behavioural outcomes of loyalty, brand and customer equity strategies are described next.

4.6 Expected behavioural outcomes from equity strategies

Behavioural outcomes are cumulative. Keller, (1993; 2008) argues that consumers' associative mental structures are built over time and through different exposures to the brand, and develop slowly into consumer based brand equity. Reichheld's well-known chart of the sources of rapidly increasing profit (2001, p.39) shows growth evolving over seven years from acquisition. Both are congruent with a hierarchy of effects view of loyalty, that with tenure consumers may become more

valuable as they are shepherded up a loyalty ladder or pyramid (Dyson, Farr and Hollis, 1996) or taken on a brand journey (Hollis, 2008). For any successful brand, the effects of increasing equity or loyalty in the customer base should therefore manifest in behavioural trends in consecutive equal periods of panel data and show:

- *An improvement in market share* at the expense of brands with lower equity (e.g. Keller & Lehmann, 2003; Oliveira-Castro *et al*., 2008; Srinivasan, 1979)

- *A steady growth in all loyalty measures,* as the brand's existing buyers begin to switch less and buy the brand more often. This would be expected to lead to rising purchase frequency, repeat purchase and share of category requirement metrics (e.g. Baldinger & Rubinson, 1996; Reichheld, 1993; 2001; Dyson *et al.,* 1996; Park *et al.,* 2010).

- *An increasing number of 100% loyal buyers* in each consecutive period, as retention measures gradually take effect. (e.g. Blattberg *et al*., 1996; Rust *et al.,* 2004)

- *Stable or perhaps falling penetration,* since marketing efforts are directed at retaining existing but valuable heavy buyers and trading up potential loyalists. The many light buyers who do not engage with the brand can thus be allowed to defect or may even "be resigned".

- *Extreme decline in duplication of purchase metrics,* as a "strong" brand becomes completely partitioned from former competitors with whom it no longer shares its own consumers. There may also be a slight *increase* in switching between the remaining competitors (Schultz, 2010).

A further trend not described in the literature, but implicit from these changes in any stationary market, is the emerging differential customer equity – brands with more or less valuable consumer bases - that would continue to drive trending market share.

- *Declining loyalty metrics for one or more competitors*. As more valuable consumers migrate to the brand with the highest equity, the less valuable but more numerous light category buyers remain with, or switch between less successful and declining brands.

Table 5 is an example from recent panel data of what such a category might eventually look like. Of course it is only a cross section and therefore gives no indication of the evolution in the behavioural metrics.

Table 5. An Exception to Double Jeopardy. Annual performance metrics for six leading UK ground coffee brands.

Brands	Brand Size		Loyalty Related Measures					Switching (annual)					
	Mkt.	Pen.	Purch	% Buying...		SCR	100%	% of the brand's buyers who also bought...					
	Share	%	Freq.	Once	5+		Loyals						
	%	(b)	(w)	%	%	%	%	D/E.	T/co	Sa/y	Tas.	Tay/s	L/za
Category		24	5.6										
Douwe Egbert	18	7	3.4	58	16	44	41	-	16	10	2	10	7
Tesco	11	4	3.7	57	19	41	30	29	-	16	2	14	10
Sainsbury	9	4	3.2	62	16	39	35	19	16	-	2	12	9
Tassimo	8	2	6.8	33	33	81	67	8	4	5	-	2	3
Taylors	7	3	3.4	58	15	34	27	27	20	17	1	-	11
Lavazza	4	2	2.6	63	11	28	32	25	20	19	2	16	-
Average			3.3	60	15	35	32	25	18	17	2	14	8

Source: Kantar WorldPanel 52 weeks ending July 15th 2007

From the table, which shows annual performance in the UK ground coffee category, it is clear that *Tassimo* is violating the Double Jeopardy law, demonstrating all the desired outcomes of customer equity. Reading the columns from left to right, it has half the penetration and twice the purchase frequency of the similar sized competitors that bracket it (both of which conform to the expected Double Jeopardy regularity), and is therefore displaying the exceptional loyalty outcome associated with the idea of "brand resonance". Reading across its remaining loyalty metrics, it can be seen that it has a completely different buying distribution from its competitors; half the category proportion of light buyers, and twice the average proportion of heavy buyers. Two thirds of *Tassimo* buyers are 100% loyal (as opposed to only a third in the rest of the category), the brand makes up over 80% of its buyers' ground coffee requirements and its own average purchase frequency (6.8) is higher than the category average (5.6) by over a pack a year. In short, the brand has a differentiated consumer base compared to rivals. *Tassimo* has effectively lifted itself clear of its competitors; its buyers just don't drink much coffee from any other brand.

The interpretation depends upon the definition of the competitive set; to use *Tassimo* branded products, consumers must have previously purchased a *Tassimo* coffee maker, which only brews coffee using *Tassimo* cartridges. It is not attitudinal loyalty and brand segmentation, but a functional partition in consumer buying-behaviour, which will remain until competitors emerge (as they have done in subsequent years). At first glance this may seem to be a powerful growth strategy, but an important implication is that the brand has limited its opportunity to increase sales by targeting only a tiny segment of an already small market. This is the outcome of any segmentation strategy, for example benefit segmentation (Haley, 1968), which by extension chooses to ignore very large numbers of category buyers who are potential customers. There is substantial further empirical evidence suggesting that loyalty strategies might not be generally as effective as the literature suggests. In the next section, this evidence is reviewed.

4.7 Conflicting evidence

Contrary to some opinion, brand loyalty does exist in Dirichlet markets (Sharp *et al.,* 2012), but it is both polygamous and undifferentiated, at least in the medium term, between competing brands. Consumers largely view each brand in the market as substitutable, but each household buys regularly from within its repertoire. For a segmentation strategy to be successful, marketing interventions must create or influence such a clear divergence in brand-attitude and preference between distinct groupings of category buyers that it is powerful enough to drive a persistent, differential (and eventually sole-loyal) brand response. The evidence for this mechanism is weak or conflicting at best.

Kennedy & Ehrenberg (2001) examined the variances between rival brand users' profiles using the TGI survey database, and found that there was no brand level segmentation. Their data included 200 different demographic, attitudinal and media usage variables for 25,000 adults buying 42 different categories of goods and services. Rather than discovering that different brands appeal to different people as the segmentation literature suggests, they found that similar brands appealed to similar people. Competing brands were shown to have such similar consumer profiles that the variances, where found, were considered to be unactionable. This work is

important because it links the direct and indirect measures of equity outcomes. The findings support the propositions that consumer attitude is a consequence of experience, that customers use a portfolio of acceptable brands and that they hold similar attitudes towards each. Although category buying sometimes exhibits partitioning around a functional benefit (diet or decaffeinated cola variants for example), this only reveals the existence of a sub-market within which the Duplication of Purchase law still applies, and usually with only a slightly reduced level of competition within the wider category. Segmentation may not emerge even within a wider generic context, as Graham & Danenberg, (2011) show in a whole-of-consumer seafood purchasing study. The absence of differentiating consumer characteristics is a fundamental finding, and it has been replicated in increasingly large-scale studies over three decades (Hammond, Ehrenberg and Goodhardt, 1996; Kennedy *et al*, 2001; Uncles, Kennedy, Nenycz-Thiel, Singh & Kwok, 2012)

Behavioural evidence also suggests that customers regard competing brands as substitutable, and that attitudes are reinforced by experience. Ehrenberg, Barnard & Scriven, (1997) argue that sustained growth through tangible differentiation remains unlikely since market forces dictate that competitors will swiftly match any meaningful advance. In any case, such advances are likely to be at the product rather than the brand level.

Evidence of the normal behavioural response to positioning is clearly seen in the ground-coffee data in Table 5 where wide variation in market share is evident between competing and widely differentiated brands. Douwe Egbert (18% share) is a "continental" brand, while Taylor's (just 7%) competes on the basis of the expertise of its English roasters and blenders. But the difference in brand size is not because Taylor's buyers are any less loyal (they are clearly not), but because there are only half as many of them in the period. Buyers of each brand (with the exception of Tassimo), including Lavazza with its Italian provenance and own brands with a price positioning buy that brand at the same rate over the year, and each brand has roughly the same proportions of light and heavy buyers. Coffee buyers shop around.

The sales importance of light buyers is completely overlooked in customer equity strategies. Even Coca-Cola, the world's most valuable brand (Interbrand, 2011 p.18), has a typically skewed purchase frequency distribution, so that half of its UK consumers buy it only once or twice a year (Sharp, 2010). Ehrenberg *et al*., (1997) argue that because typical purchase propensities are so light, and because consumers

regard competing brands as substitutes, what matters most to any brand is therefore not differentiation but salience, the propensity of the brand to come to mind in buying situations, (Romaniuk, 2003). Salience levels have been linked with defection in subscription markets (Romaniuk and Sharp, 2004) and with advertising effectiveness (Miller and Berry, 1998), which implies that marketers should think less about brand love, and more about herding cats. The objective should be to nudge very large numbers of "lapsed" light buyers back to make another purchase of an acceptable brand that they have probably bought before.

4. 8 Individual-level attitude, preference and intention measures

The reliability of attitude, preference and purchase intention measures is itself brought into question in an experiment conducted by Bass, Pessemier and Lehmann (1972). Here, individual predictions of brand choice were made for a number of soft drinks over a number of choice occasions, based on subjects' stated preference, their previous chosen brand, and most favourable attitude. On average, these measures failed to predict future individual brand choice on over half the occasions, with favourable attitude the least successful predictor of all. Even brand preference, intuitively a powerful indicator of intention to purchase, was accurate in slightly over half the choices. Yet throughout the experiment, as brand choices were recorded over a number of occasions, brand shares remained constant, masking the switching that was taking place. The outcome became a typical stationary market, based on as-if random choices, with each brand attracting a degree of loyalty, and a different but stable brand share.

Dall'Olmo Riley, Ehrenberg, Castleberry, Barwise and Barnard (1997) confirm that attitudinal beliefs are not firmly held, varying around the 50% average previously reported between first and second interview. They found that the variance in repeat-levels at second interview was dependent on the initial response level, thus displaying a Double Jeopardy rather than a brand or loyalty characteristic. Further evidence of unreliability is found in Wright and Klÿn (1998), which examined the correlations between "green" attitudes and "green" behaviour in a replication study covering 21 countries. It reports very low correlations (under .37, and in some cases

no correlation at all). In short, attitude and preference are poor predictors of purchase at the individual level.

Warshaw (1980) points out that purchase intention is often conceived as a moderator between attitude and behaviour (e.g. Howard and Sheth, 1969). It should thus outperform both attitudes and beliefs in predicting brand choice, but Warshaw reports poor correlations previously found between intention and behaviour, supporting Bass *et al*. (1972) in concluding that intention as well as attitude-based predictions of choice are probabilistic. On this basis, Wright, Sharp and Sharp (2002) used the Juster scale to derive aggregated intended purchase probabilities from which the NBD-Dirichlet could be calibrated, and produced from this stochastic interpretation of the intention measure a very close fit to standard panel data results.

These papers have therefore long called into question many dimensions of the brand equity construct, since the degree of attitudinal and cognitive loyalty that any brand can attract has been demonstrated to be volatile at the individual level, not well correlated with a behavioural outcome and better treated stochastically.

4.9 Loyalty as retention

A behavioural attribute of loyalty, customer retention, is predicted to lead to higher profits over time (Reichheld, 2001), but East, Hammond and Gendall (2006) systematically reviewed the evidence for Reichheld's claims here, and found little support. Rather, they suggested that because satisfaction leads to recommendation increased profits were more likely to be achieved from customer acquisition. The evidence for customer loyalty schemes has also long been questioned (Dowling & Uncles, 1997; Sharp & Sharp, 1997; Uncles, Dowling & Hammond, 2003) on the basis of their limited impact on multibrand buying.

Lastly, the existence of brand equity is not itself a predictor of an imminent purchase. Some consumers switch brands following a catastrophic loss of satisfaction, but others may leave for reasons beyond management control, including those who defect from the category itself. Customers leave a brand for many different reasons, and may therefore differ in their levels of post-defection brand equity. In the business-to-business sector Bogomolova and Romaniuk (2009) have shown that only half of the defectors identified actually switched brands, while 60% of all defection happened

for reasons beyond management control, and in these cases, equity was not severely damaged. Importantly, Bogomolova (2010) describes the heterogeneity in lapsed customers in terms of those who *"switched from..."* (implying some negative qualities of the former brand) and those who *"switched to..."* (implying attraction to more positive qualities in the new brand). Both groups of lapsed customers were found to retain some degree of brand equity towards their former brand, although with differing propensities to return to it. Despite the existence of this equity however, even over the long term (five years), that propensity had still not been activated.

4.10 How brands grow (and decline)

In established categories, Barwise and Meehan (2005) argue that brands grow not through differentiation, but by being simply better. Despite competition, brands still have an opportunity to outperform on the generic category attributes, and on that basis they will attract more category buyers of all classes. Sharp (2010) supports this concept. Acquiring new buyers is essential, but because any brand's buyers are first and foremost category buyers, reaching all buyers is vital, especially the light and occasional buyers of the brand.

There is some empirical evidence of dynamic brand performance, but as previously noted, this is either cross sectional (giving no trend data) or short term (raising questions about persistence). Such evidence supports the view that growth, when it does occur, is related more to increases in penetration than in loyalty; retention and higher purchase frequency predictably follow the Double Jeopardy relationship as customer numbers increase. Anschuetz (2002) argues that advertising should not target a narrow segment, but the broad consumer franchise. This is because in any period any brands' revenues depend upon a few heavy buyers as well as a very large number of lighter buyers. When brands grow, the frequency distributions skew very slightly towards the heavier buyers, but all classes gain. Purchase data reported from a rapidly growing dairy brand over two years showed that penetration increases far outstripped average buying frequency, thus confirming the source of growth to be large numbers of light and medium buying households attracted to the brand, but also a few more heavy buyers. The distribution of purchase heterogeneity remains

approximately constant as brands grow – it is just that the growing brand reaches many more households in the observed period.

Bennett & Graham (2010), in an analysis of the car market in Thailand established that the astonishing growth of the leading brand, Toyota, was due not to any special loyalty, but to the fact that the new category buyers were attracted to available brands simply in line with their existing share. Thus, as the category expanded, the Double Jeopardy relationship was maintained. This is a special case, since unlike competition in an established market here there was a large pool of new buyers entering the category for the first time. McCabe *et al*., (2012) also report an extension in a stationary industrial market, using Dirichlet benchmarks to evaluate dynamic performance. In this case, an increase in loyalty driven by promotion preceded a substantial increase in penetration, but it was found once again to be the number of buyers that had the greatest influence on share change.

4.11 Chapter summary and research objective three

Marketing objectives are designed to contribute both short-run and long run returns on investment. In the short-run, investment in price-promotion, advertising and product innovation can deliver substantial sales increases, effects which are clear to see in the aggregated consumer behaviour reported in panel data. As literature reviewed in Chapter Three showed however, these generally have little or no persistence and market shares mostly revert to a long-run mean very quickly. Some brands do successfully increase market share permanently, and in this chapter the literature of long-run marketing effects has been reviewed in order to establish what buying behaviour might drive such change. The main idea is superior loyalty broadly conceptualised in three categories, customer loyalty and brand equity at the individual level and customer equity as an aggregate effect. The three typologies are different but overlapping; each suggests methods for valuing the brand asset based on future repeat buying and offers management models to husband the cognitive antecedents to that behaviour and its outcomes. In each case market structure is predicted to evolve as the brand attracts a growing, differentiated consumer base of heavier spending, persistently loyal buyers. But as Romaniuk, Bogomolova, & Dall'Olmo-Riley (2012) point out, little of the equity literature presents any empirical data except to validate

the measures proposed. The research at hand is concerned not with why things change; that theory can be established later. What is important here is to describe *how* they change, and what impact that has on existing knowledge. Given recent emphasis on long-term returns on marketing investment, it is now more important than ever to identify brands that show persistent growth or decline and to examine the supporting trends in consumer behaviour through systematic observations taken in continuous long-term empirical data. Where such dynamic cases are found, the third research objective must therefore be:

To understand changes in buying patterns attaching to those exceptions.

Brand performance metrics are usually reported for time periods that correspond to standard accounting periods, for example weeks, months, quarters and years. While much is known about the ways in which behavioural metrics develop cumulatively over such periods, there is more to learn about patterns of extended repeat buying, perhaps over years, which have not been observed up until now. In the next chapter the effects of time on behavioural brand performance metrics is discussed, and a fourth research objective established.

CHAPTER 5. VARIATION FROM BEHAVIOURAL NORMS OVER TIME

Two variances from stationary behavioural norms have been reported in earlier longitudinal studies of panel data – the leaky bucket and the excess loyalty observed for some leading brands – which suggest trending purchase propensities. A review of this literature leads to the fourth research objective.

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5.1 Introduction

Managers assess performance at regular and time-bounded intervals, and benchmarks developed from empirical generalisations in monthly, quarterly and annual data are now in widespread use amongst marketing practitioners (Knox & Walker, 2003). The literature reviewed in the previous chapter suggests that the value of consumer loyalty to a firm lies both in short-term differential effects and in the persistence and accumulation of those effects over time. Recent research has begun to argue for longer-term analysis in order to remove potential bias from aggregate loyalty measures, to describe individual-level loyalty outcomes more accurately and to understand some unexplained variances in long-run buying measures.

Bronnenberg, Kruger and Mela (2008) have suggested that short-term buying data may be prone to both right and left truncation. In the latter case, period cut-off may bias adoption data while in the former the stochastic nature of individual purchase timing could lead to biases in repeat or purchase frequency measures that disguise the true extent of consumer loyalty. It is well known that common buying measures vary with the period of analysis. Ehrenberg, (1988), Bound, (2009) and Bennett and Graham, (2011) report the regularities as measures of penetration, average purchase frequency and period-to-period repeat increase in cumulative data, but it is important to test the boundaries of this knowledge by examining brand performance metrics in un-truncated long-run data. For example Stern & Hammond (2004) showed in two categories that over very long purchase sequences share-based measures of loyalty declined rapidly with purchase incidence much as expected, but that heavier category buyers exhibited less switching than predicted at lower purchase levels, thus potentially accounting for the market share premium.

Then, if management is to invest in relationships with their consumers based on weight of purchase it is important to know how stable this might be over time. Although aggregate measures of repeat buying normally reflect equilibrium outcomes, the underlying heterogeneous patterns of individual level buying are both complex and dynamic across successive periods. Early work to connect aggregate and household level data using the NBD in Conditional Trend Analysis (CTA) was limited in examining only two or three periods; by difficulties in obtaining a continuous sample (Goodhardt & Ehrenberg, 1967); and in the biases inherent in describing the large numbers of non-buyers in the period (Chatfield & Goodhardt, 1973; Morrison, 1969; Schmittlein, Bemmaor & Morrison, 1985). The technique has been recently revived for repertoire categories (Trinh, Wright & Driesener, 2012) while in subscription markets the use of the Pareto/NBD model has been generalised to predict customer lifetime value (Reinartz & Kumar, 2003). Available data so far shows great instability in individual-level purchase frequencies from period to period, with obvious implications for the valuation of customer equity.

Finally, two known and systematic variances between observed data and benchmark or model output may have implications for long-term brand growth or decline. One is the erosion of repeat purchase loyalty (Ehrenberg, 1988; East & Hammond, 1996), and the other is well-documented evidence of "excess" loyalty against Dirichlet predictions (Bhattacharya, 1997; Fader & Schmittlein, 1993; Jung, Gruca and Lopa, 2010; Khan, Kalwani and Morrison, 1989; Stern *et al*., 2004.) Over many successive periods, both might trend, leading to boundary conditions for established empirical generalisations.

Much more may be learnt about consumer loyalty by extending the period of analysis. When viewed over the long run do increases in cumulative measures maintain or violate the Double Jeopardy relationship? Does loyalty strengthen over time for some but not all brands? If the constraints of reporting periods are removed, then do the changing distributions of purchase incidence and brand choice reveal cumulative effects that eventually violate stationarity and non-partitioning?

The known regularities in repeat-buying are robust from period to period over the medium term, and the earlier research objectives of this thesis can be met to extend this knowledge by examining longer sequences of standard length periods to the extent of the new panel (that is, twenty-six quarters). However, the variances already observed between benchmarked and observed individual and aggregate level

measures may show early indications of a temporal boundary condition, which need to be explored further. This therefore defines the fourth research objective:

To identify any variance in the expected patterns of repeat buying as a result of increasing the period observed beyond quarterly and annual predictions.

The remainder of this chapter is structured as follows. First, the implications of different length periods of analysis on behavioural and managerial measures are discussed, and a definition of terms established. Next, the relationship between individual and aggregate measures of repeat buying over time is described through a discussion of Conditional Trend Analysis (CTA) and the use of the NBD model of brand purchase. This will highlight two variances from behavioural norms; the first is the systematic erosion of repeat purchase known as the *"leaky bucket"* (Ehrenberg, 1988; East & Hammond, 1997) and the second is excess loyalty. The chapter then concludes with a discussion of the possible long-run implications for marketing management of these variances, thus contextualising the fourth research objective.

5.2 Cumulative patterns of repeat-buying

Most aggregate measures of behavioural brand loyalty are bounded by a time dimension, reporting purchase frequency, repeat purchase, or switching and share based measures within (or between) given fixed periods. In FMCG markets these periods, established initially for management purposes, are commonly reported in scanner and panel data in weeks or months, but can be aggregated into quarters, years, or even longer periods. While managers and researchers focus on loyalty over four- or twelve-weekly periods, the hoped for outcomes of the substantial and growing marketing investments seen for leading brands are both short term and long term.

In order to evaluate the success of such relationship-building investments, marketers must understand the patterns of behavioural brand loyalty that develop as purchase incidence rises over time. Table 6 below reproduces observed purchase data reported in Ehrenberg (1988) to demonstrate the cumulative growth in the two main measures of brand performance for a disguised, but typical product category over a year. In each of the five lengthening periods shown, the market shares of the five

brands A to E remain stable, yet the proportion of total households each brand attracts (*b*), and its average purchase frequency (*w*) behave rather differently over time to maintain those shares.

Reading across the table the penetration of the average brand (and the category itself, Any Brand) can be seen to grow rapidly, more than doubling between one week and four weeks. From a month to a quarter the growth slows, gaining only 60% more households, and slows again flattening considerably between six months and a year. The slowing is caused first by the increasing proportion of repeat-buying households each brand has in the period, and second, by the rate at which households in the population buy the category and any brand at all. There are very large numbers of very light buyers who will be caught as the observation period lengthens but at some point penetration must reach an asymptote where there are no new households available. This occurs before 100% penetration in almost all categories, and the rate of new buyer acquisition necessarily slows because the inter-purchase interval of any remaining "new" buyers becomes increasingly extended.

Table 6: Cumulative observed brand performance measures.

	Market Share	1 Week		4 Weeks		12 Weeks		24 Weeks		48 Weeks	
	%	*b* %	*w*	*b* %	*w*	*b* %	*w*	*b* %	*w*	*b* %	*w*
Any Brand		22	1.2	45	2.3	62	5.0	74	8.8	79	15.7
Brand A	46	12	1.0	28	1.8	42	3.7	55	6.0	62	10.1
Brand B	12	3	1.0	9	1.5	17	2.5	25	3.3	32	5.0
Brand C	6	2	1.0	4	1.7	7	2.8	12	3.9	17	5.1
Brand D	5	1	1.0	3	1.5	6	2.5	11	3.1	14	4.3
Brand E	6	2	1.0	4	1.6	7	3.0	9	4.9	12	6.8
Average	*15*	*4*	*1.0*	*10*	*1.6*	*16*	*2.9*	*22*	*4.2*	*27*	*6.3*

Adapted from Ehrenberg,(1988) pp 33-37

The gradual acquisition of new, but light, buyers also affects the growth in *w*, but this is not so marked. Ehrenberg notes (1988 p.38) that increases in *w* are slightly less than *pro rata* with increases in analysis period length precisely because more lighter buyers purchase in longer periods, depressing average frequency.

The Table also shows the developing Double Jeopardy relationship in cumulative buying. At one, four and twelve weeks, there is very little difference

between the average buying rates for each of the brands, but a great difference in the number of households who bought. From six months to a year however the trend with penetration becomes more marked – *"the more people there are who buy a brand the more often (or slightly more often) they tend to buy it."* (Ehrenberg, 1988, p.35) – so that by 48 weeks Brand A has five times as many buyers as E, and they buy 60% more than the average. Market shares are stable as the number of observed purchases rises with time; the changing sales equation simply reflects the slowing of penetration growth and the increase in purchase frequency necessary to maintain stationarity. The probabilities in the development of the DJ relationship are clearly described in East, Wright and Colombo (2004) with the analogy of counters placed on a chess board to represent brand purchases; as the board fills, the counters must begin to double up more frequently as the number of empty squares (new buyers) diminishes.

Figure 1: The observed cumulative development of *b* and *w* for Brand A
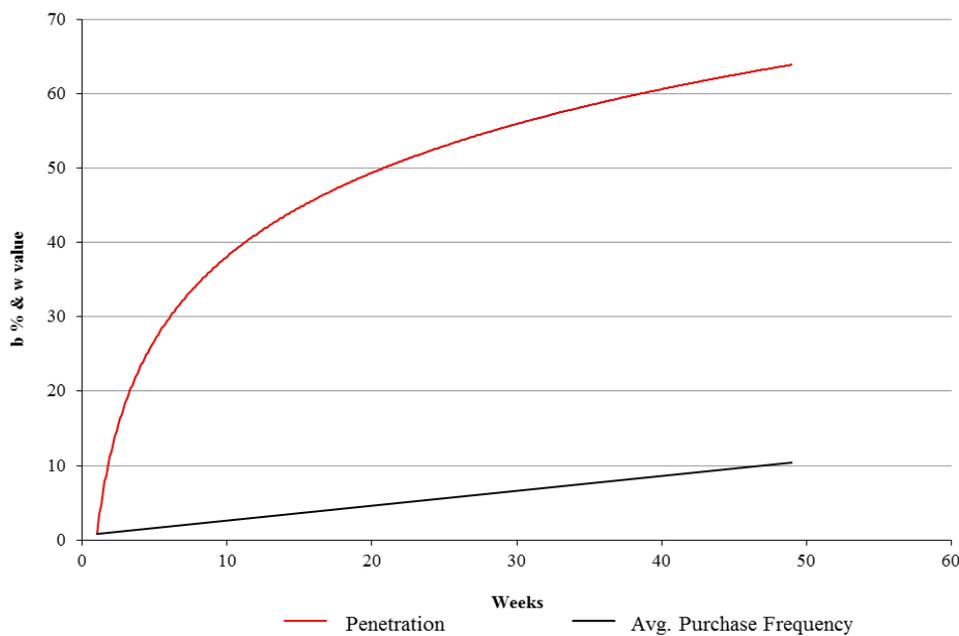
Data source: Ehrenberg, (1988) p. 33-37

Figure 1 graphically describes this cumulative development of *b* and *w* for Brand A in Table 6, showing the dramatic slowing of customer acquisition over time as new buyers dry up, while brand purchase frequency keeps rising. The same pattern exists for each brand in the table, and for the category, (where penetration slows rather sooner). Other expected loyalty measures are also implied in these patterns,

since the longer the period of observation, the more chance any buyer has of making a second purchase. The polygamous nature of buying becomes more pronounced in each period, seen in the growing variance between the average and "Any Brand" measures of purchase frequency in Table 6. As the reference period extends more switching is captured, individual repertoires expand, and the penetration of sole-brand buyers falls, as does share of category requirement.

These over-time patterns are captured in Dirichlet theory, so that the cumulative changes in patterns of repeat buying are predicted in model output, and have been shown to fit empirical data closely. For example, Ehrenberg used the quarterly data in Table 6 to calibrate the model, which then closely predicted the measures in each of the other periods, including the DJ effects seen for Brand A. Some slight variances are noted (1988, p.38); the output in six months and a year systematically over-predicts purchase frequency for smaller brands, and under predicts their penetration somewhat.

Although well-established in periods up to a year or perhaps two, relatively little empirical work has yet been undertaken to extend knowledge of these patterns in longer sequences of cumulative purchase data. Such an approach would remove a bias inherent in the systematic truncation of data that occurs when observing regular management intervals, and would give a more realistic view of brand strength. It is possible that behavioural segmentation could emerge in long run data, which is not apparent when the clock is reset every quarter. Although Stern *et al.,* (2004) present data that shows the expected decline in loyalty slowing over long purchase sequences, their evidence is limited to only two categories. Further replications and extensions are therefore desirable in this emerging area of research.

5.3 Choice and definition of time frames for analysis

The appropriate length of time period for analysis has also been the subject of some discussion in the marketing and strategy literature. There are two questions of interest; first, what is the appropriate period over which to measure loyalty for management purposes? In categories where inter-purchase times are generally long for example, a week or even a month may not produce results with managerial relevance because behavioural loyalty does not manifest in that time. The second

issue concerns the appropriate window in which to view trends in aggregate data in standard formats. It is important to explain and define the different time frames under observation, and standardise the definitions used in this thesis. This chapter continues by drawing attention to the main considerations used in arriving at the definitions of the expressions short-, medium-, and long-term adopted.

Short-term is used here to refer to periods of up to two years. Dekimpe & Hanssens (1995) and Ehrenberg (1988) have argued that in that time most marketing phenomena appear relatively stationary, making it difficult to establish dynamic long-run effects. Although results of tactical interventions are clearly apparent, they must be interpreted with care, as they generally do not constitute evidence of a persistent trend.

As to the appropriate divisions within short-term data, Ehrenberg, Uncles and Goodhardt (2004) emphasise the effects of time on BPM's noting that with greater data volumes a distinction can be drawn between heavy, medium and light buyers, and an analysis of their sales importance conducted. The interpurchase interval is therefore an important consideration in markets where buying frequencies are low, although a quarter is usually long enough to capture at least one repeat (Ehrenberg, 1988). Over the eight consecutive quarters contained in standard panel data, analysis will therefore identify any immediate loyalty effects of marketing interventions. Pauwels & Hanssens (2007) established through an *ad hoc* industry survey that brand strategy is normally determined in rolling windows varying from quarterly to annual review. This means that any findings framed in quarters will have both clear managerial relevance and familiarity.

Medium-term is defined as periods of up to three years. Since most consumer panels are reported over this time-frame, it is safe to assume that the data have been collected consistently (Dekimpe & Hanssens, 1995), so that results here may be compared with scanner data reports, thereby allowing insight into underlying changes both in terms of consumer behaviour but also of marketing effects on for example, revenues and distribution. The reversal or continuation of short-term trends may become more pronounced in this longer window, and over three years data are still available in finer aggregations such as quarterly, or weekly. Nevertheless, three years is still shorter than the usual strategic planning framework.

Long term is defined to mean periods greater than three years. The long-term time frame is managerially important. For example, brand valuation calculations

commonly take into account the NPV of sales over five years (Ambler, 2003; Lindemann, 2004; Gupta, Lehmann & Stuart, 2004). The *Interbrand* consultancy argue that such valuations may be added to the balance sheet, used as the basis of licensing arrangements, to raise capital or secure debt facilities, and to negotiate the contributions from joint venture arrangements.

In the corporate strategy literature Yip, Devinney and Johnson (2008) suggest that a period of between three to five years is not long enough for an analysis of sustainable superior performance. The two prevailing strategic paradigms of competitive positioning and superior resources now require a ten-year life-span for any competitive advantage to be considered sustained. In addition, they find that competitive challenges are episodic, emerging every three to five years, while any strategy must also be contextualised within the business lifecycle, which can last ten years from peak to peak.

Other authors, including Foster and Kaplan (2001) who discuss the creative destruction of innovation, examine even longer windows of fifteen to twenty years. This is because over the long-term the persistence of trends may become clearer, but at the other extreme, while Golder (2000) reports results over almost 75 years, such longer studies necessarily report data very coarsely, in most instances annually, or as variation in a two-sample cross section. Very long-term (two decades plus) observations may also lose managerial significance (although they may be academically interesting), and raise questions of data validity & reliability.

There are very few, if any, long-term continuous samples available from which to examine the detailed consumer behaviour behind evolving trends in aggregate measures, a question discussed in Chapter Three. In the next section we describe current knowledge of the variability of individual level purchasing, the foundation of the established aggregate repeat-purchase patterns in any fixed period.

5.4 The volatile nature of steady purchasing propensities

It is convenient to measure buying behaviour in fixed time periods. The technique provides a clear comparator for researchers and practitioners and leads to a useful simplification in that within a given interval the aggregate repeat-buying of any brand can be described using just two measures, its penetration and purchase frequency (Ehrenberg, 1988, p.11). The regularities and theories of aggregate-level

behaviour outlined in Chapter Two all followed from this finding, and yet the equilibrium outcome is deceptively simple, supported as it is by highly complex cross-currents of heterogeneous individual-level behaviours, each interwoven across successive, equal time periods.

One household may purchase a particular brand intermittently, occasionally switching to it within a regular portfolio of choices. Another may buy the same brand at the same occasional rate, but be sole-brand loyal. A third may be a heavier user, buying the brand regularly and often, but sometimes switching to a more premium alternative. Some apparent non-buyers might eventually make a category purchase given a long enough dataset. Brand choice repertoires themselves may alter too. Romaniuk *et al*., (2010) have suggested this could happen for example with life stage, or when a serious loss of satisfaction forces a defection (Bogomolova *et al*., 2009; Bogomolova, 2010), or when an innovation from a competing brand offers some particular category advantage (Barwise and Meehan, 2005; Pauwels, Silva-Risso, Srinivasan and Hanssens, 2004).

In addition, when seeking generalisable patterns, some categories are bought far more frequently than others, while all contain very different proportions of non-buying to buying households (Morrison, 1969). To add even further complexity, while a certain household may have a steady propensity to purchase the brand say twice a year, those purchases might occur in January and February in one year but not until October and December in the subsequent year without implying any real loss of loyalty (Ehrenberg, 1997). It is therefore quite astonishing given the instability in individual purchase incidence and brand choice that aggregate repeat-buying measures in fixed intervals such as months or quarters could remain in a near-steady state even from one quarter to the next.

The variability of individual-level purchasing creates a churn in buying households in successive periods that appears to have both the potential to develop into non-stationarity over time, and to be chaotic and hard to track, but in fact, under equilibrium conditions, as Sharp, Riebe, Dawes and Danenberg, (2002) report, all brands churn customers predictably. In subscription markets this is easily seen since customers "subscribe" to a single brand for all their category requirements until they switch, and so defection is easily identified. In repertoire markets, consumers shop from a portfolio of brands, and loyalty is often measured as a share of category requirement. In both cases, aggregate loyalty metrics hold steady from one period to

the next, but a proportion of any brand's customers "defect" while an equal number return; this churn shows Double Jeopardy characteristics in that small brands lose (and gain) a larger proportion of their customer base each time.

Wright and Riebe (2010) later found that brand defection in subscription and repertoire markets is therefore predictable simply from a brand's market share, using the Hendry model. This demonstrated that such descriptive stochastic models can provide benchmarks for customer retention but can also usefully model defection levels for competing brands (since they describe category structure) in subscription markets where such data is hard to come by.

Given the predictability of customer churn, Sharp subsequently argued (2009; 2010) that loyalty-driven share increases are problematic simply because growth through improved retention is severely constrained by any brand's current size and by Double Jeopardy.

Individual-level consumer churn may have led some authors to conclude that household buying propensities are not firmly fixed, that they may in fact be readily and fundamentally influenced by marketing activities. In discussing brand and consumer equity, Baldinger & Rubinson (1996) present evidence of changing (improving) loyalty linked to attitude, while Dyson Farr & Hollis (1996) and Hollis (2008) present a hierarchy of loyalty concluding that consumers may be traded up to the "bonding" level.

Ehrenberg (1997, p.10) gives an alternative explanation, based on the stochastic interpretation of observed brand choice behaviour. Under near-stationary conditions, an individual household's purchase propensity is steady and can therefore be viewed as a fixed weekly buying probability of say 5/52, or 0.1. This would actualize as an above- or below-average purchasing rate in different weeks, and, in most weeks (certainly in this case), no purchasing rate at all. When it occurs, purchase timing is simply a random manifestation of the fixed probability of a purchase about once every ten weeks. The events will occur irregularly, perhaps bunched or spaced, but this doesn't mean that the consumer has necessarily changed preference, switched intention or had a radical change of heart to become a non-buyer – the household purchase probability still remains fixed at about a one in ten chance in any week.

From this description it is possible to infer that where evidence is presented of improving loyalty or equity the analysis may have been subject to the regression to the mean fallacy (Bland & Altman, 1994) in ascribing cause (loyalty) to a purely

random event (above average purchase frequency). If this were not the case, then as Ehrenberg points out, why are most brands not growing? The reason is that shifting individual events aggregate into stationary metrics in any usual fixed period, so that increases in "loyalty" are exactly matched by decreases.

Romaniuk and Wight (2010) report that over five categories as many as 30% of any brand's heavy buyers became light or non-buyers by the following year, despite brand shares remaining stable. Far from being the most profitable customers, in FMCG at least, it appears that heavy buyers are susceptible to downward shifts in purchase propensities. This supports published results from a CLV study of a direct mail customer database (Fader, Hardie and Lee 2005) highlighting a dangerous misinterpretation of the evidence in mistaking long-term aggregate level stability for long-term individual loyalty.

Goodhardt and Ehrenberg, (1967) classified consumers in a Dirichlet market by their purchasing behaviour in one period observing the differential changes in the next, a method known as Conditional Trend Analysis (CTA). They then demonstrated how customer churn can be modelled using a bivariate NBD, work revived by Trinh, Wright & Driesener, (2012) in FMCG categories and extended to predict conditional purchasing expectations in subscription markets in the form of the Pareto/NBD (Fader, Hardie & Jerath, 2007; Ma & Buschken, 2011; Reinartz & Kumar, 2003). The NBD itself is a highly generalized model of heterogeneous purchasing in stationary markets, and is discussed more fully in Chapter Six. In the next section its use in identifying a systematic variance in repeat-purchase is described.

5.5 Repeat purchase and the *"Leaky Bucket"*

Under equilibrium conditions, the NBD predicts that there will be no change in levels of repeat purchase either from period to period or between non-adjacent periods. Customer retention is a critical indicator of brand performance for marketing managers, so any persistent trend from this steady repeat-purchase benchmark would therefore indicate the need for some urgent investigation and remedial action.

Even for popular brands the proportion of households that make a repeat purchase from quarter to quarter is often surprisingly low. In many FMCG categories only one third of a brand's buyers repurchase in the next quarter. This doesn't mean

that the brand is failing. Most buyers of any brand will only buy it infrequently, and may miss one and sometimes several quarters before returning to it. Such consumers are therefore better characterised as having a light (although regular) purchase propensity, rather than as being "lapsed" or "new" buyers, and in any quarter, while only around a third of a brand's buyers are repeating from the previous period, two thirds may be returning from earlier periods and from other brands to restore the equilibrium.

In *Repeat Buying* (1988, p47) Ehrenberg reported a deviation both from NBD norms and the expected levels of repeat purchase, which he described as the leaky bucket, *"a repeat buying rate which falls away in non-consecutive periods"*. Table 7 reproduces the data, and presents a comparison of repeat purchase levels for five brands between consecutive and non-consecutive quarters with the theoretical repeat calculated from the NBD.

Table 7: The percentage of buyers in a quarter who also buy two quarters later

Average of Quarters I/III and II/ IV

	Non-Consecutive Quarters	Consecutive Quarters	Theoretical Norm (NBD)
	%	%	%
ANY BRAND	84	85	84
Brand A	75	78	77
Brand B	54	59	65
Brand C	40	50	67
Brand D	52	53	64
Brand E	67	69	69
Average Brand	*58*	*62*	*68*

Source: Ehrenberg (1988) p.47

At the category level (Any Brand) it can be seen that the repeat proportion is high, that it is very consistent between adjacent and non-adjacent quarters, and that it is well described by the model. For individual brands the position is slightly different. There is some variation, but a comparison of the average values at the base of the table shows that one quarter's time lapse leads to a drop in repeat purchase of four points, a decay of 6.5% in repeat purchase loyalty between quarters that sit one quarter apart. The implication is that over time, brand loyalty at the individual

household level may be less stable than the aggregate numbers suggest, and could continue to erode with each passing quarter.

East and Hammond (1996) replicated and extended the investigation from four to eight quarters, using data from nine frequently purchased categories in three countries. The aim of the research was to establish the incidence, scale and shape of erosion, defined as *"the proportionate fall in repeat purchase loyalty"*, to discover if it was systematic, and generalised across brands, categories and continents, or simply an exception in the original data. By following the repeat-purchase rate of an identified group of buyers in comparison with the initial quarterly repeat and the NBD prediction, the study concluded that in the medium term, across the conditions investigated, erosion was indeed systematic, reaching an average 15% loss in a year. The NBD already accounts for the variability in individual level purchasing and the predictable churn described in both Sharp *et al.*, (2002) and Wright *et al.*, (2010), so therefore this is an important and unexplained variance, which reveals a steady and cumulative shift in otherwise steady purchase propensities.

Brand leaders were reported to erode more slowly than smaller brands, but otherwise the phenomenon could not be linked to any other variable such as purchase frequency, country, category, or market concentration. Erosion is therefore *"a consistent pervasive empirical fact that is little related to the other factors studied."*

It has not yet been established for how long the balance between repeat-purchase erosion and acquisition is maintained, or if erosion does have an eventual influence on brand share change over multiple years. It is also not clear if, over time, the rate of erosion slows or if one segment (light buyers say) is less loyal than another, thereby leading to behavioural segmentation. Romaniuk *et al.*, (2010) in episodic data and Stern *et al.*, (2004) in cumulative purchasing have both suggested that loyalty may be partially dependent on purchase frequency.

In short, erosion in FMCG has remained something of an enigma, partly because individual repertoire buying and long inter-purchase cycles make it hard to identify true defectors, but also because brand defection and panel attrition are confounded in standard consumer panel data. Longer-term observation is now possible from the continuous long-term panel, from which the effects of returning "defectors" might be observed. East et al., established that Year One defection was twice that of Year Two, but extended observations of this trend are now possible.

5.6 The market share premium

Further exceptions from behavioural norms that might eventually lead to the breakdown of the Double Jeopardy relationship have been well documented. Perhaps the best known is the market share premium (Battacharya, 1997; Fader & Schmittlein, 1993; Jung, Gruca & Lopo, 2010), cases of "excess" loyalty for large brands beyond the Double Jeopardy curve predicted by the Dirichlet. Khan, Kalwani and Morrison (1988) also reported higher than expected loyalty for smaller "niche" brands and lower than expected loyalty for larger, "change of pace" brands. These variations are each important since they represent exceptions to the necessary mathematical DJ form described in East, Wright & Colombo (2004) and therefore a potential violation of the Dirichlet assumptions. Three questions are therefore of interest to this research. First, are such exceptions systematic? Are they persistent, and finally, do they evolve over time, perhaps leading to market share increases?

In a very large replication study over three retail channels, and covering over 5,000 brands, Jung *et al.*, supported earlier findings in both Bhattacharya (1997), and in Fader *et al.*, (1993) of a strong correlation between SCR and market share, and of the association between excess loyalty and high share brands in about three- quarters of cases. Thus excess loyalty is not universal, but it is prevalent. It may arise for some brands from a distribution bonus (Fader & Schmittlein, 1993), since if a small shop stocks only one brand in a category it will usually stocks the biggest. This replication found no support for the concept of niche brands, but did support Battacharya in identifying that promoting heavily and discounting hard both lead to lower than expected loyalty.

Pare & Dawes, (2012) set out to address the question of persistence and found a similar incidence of excess loyalty (31% of cases across 300 brands in annual measures) in the first year. When these brands were tracked over two subsequent years, fewer showed persistent excess loyalty (25% and 22% of cases), a decline of almost a third. Excess loyalty was confirmed to be a common characteristic of market leading brands (38% of cases) and of Private Labels (32% of cases), but not a universal characteristic. No evidence was found for market share growth over this period although behavioural segmentation of this nature might lead to that result. A possible reason may be that the variance is in fact due to a systematic bias in the Dirichlet itself, rather than to any exceptional brand equity and Li, Habel and Rungie

(2009) report continuing work here, to integrate a lognormal distribution into the Dirichlet to improve its fit to observed data for leading brands.

The excess loyalty variance is central to a study by Sharp & Sharp (1997) who use Dirichlet benchmarks in order to examine the effectiveness of customer loyalty programmes. Expecting to find evidence of excess loyalty for supported brands, they in fact identify a weak excess loyalty trend across *all* brands studied, but no consistency across the supported brands. They identify that the deviation applies to all brand buyers, non-members as well as members of the programme, thus calling into question the effectiveness of the scheme itself, and the existence of other influencing factors on normal purchasing behaviour.

A number of questions remain unanswered. The market share premium represents a behavioural segmentation for leading brands therefore it is important to identify how or if this segmentation trends in successive periods of different length.

5.7 Chapter summary and research objective four

The loyalty and equity literature reviewed in Chapter Four suggests that effective marketing leads to the cumulative realignment of previously steady but split-loyal purchase propensities towards a single brand over the long-term, but provides little empirical evidence in support (Romaniuk *et al.,* 2010). The first three research objectives of this thesis define an approach to this problem in observations of successive periods of aggregate data. Recent research has however begun to argue for longer-term cumulative analysis in order to remove potential bias from aggregate loyalty measures, to describe individual-level loyalty outcomes more accurately in order to value them, and to understand some unexplained variances between individual- and aggregate-level buying measures (Bronnenberg *et al*., 2008).

In this Chapter the relationship between highly variable individual buying behaviour and extremely stable aggregate level data has been explained, and this led to a brief discussion of two systematic variances, both of which may lead to violations of the Dirichlet assumptions of stationarity and non-partitioning. The case was also made for an analysis of consumer loyalty in long-run cumulative data, which might smooth any variances due to stochastic purchase timings inherent in data constrained by regular time periods, and would give a more valid representation of repeat

purchase loyalty over a long run of purchases. The fourth research objective is therefore defined as follows:

To identify any variance in the expected patterns of repeat buying as a result of increasing the period observed beyond quarterly and annual predictions.

In the next chapter the development and uses of the NBD-Dirichlet model are described, leading to the contextualisation of the fifth and final research objective.

CHAPTER 6. THE NBD-DIRICHLET.

In this chapter the development, assumptions, estimation and uses of the NBD-Dirichlet (Goodhardt et al, 1984) and its underlying theory are discussed. The Dirichlet describes the structure of any near-stationary category in detail and with a surprising accuracy of fit, although a small number of systematic deviations have been observed between theoretical and empirical data. The model has so far only been applied over quite limited time periods, and the extent to which its assumptions may hold over extended time frames leads to the final research objective.

6.1 Introduction

A substantial deterministic behavioural literature has evolved in marketing, drawing on psychological and sociological domains to understand, define, quantify and predict the impact of wide-ranging variables on individual consumers' decision-making. Theories of behavioural learning (Skinner, 1938), personality (Aaker, 2002, Schiffman & Kanuk, 2008), information processing (e.g. Gigerenzer, 2007; Howard & Sheth, 1969; Tversky & Kahneman, 1974) and the attitude research of Ajzen & Fishbein, (1980) have contributed in conceptualising and modelling the determinants of consumer choice behaviour, yet as Lilien Kotler & Moorthy (1992) concede:

> *"A model that deals with all aspects of consumer behaviour in complete detail may be theoretically sound but hopelessly complex in terms of its data requirements and potential for calibration."*

(p.24)

This supports the earlier view in Jacoby and Chestnut (1978, p.3) that the causes of repeat purchase are so varied and unpredictable that meaningful causal modelling is almost impossible. On the other hand, stochastic models describe for a given period the outcomes of aggregated purchasing across a market based on an assumption of fixed propensities. They describe ***how*** people buy for the time being, not ***why*** they do so (Ehrenberg, 1988). But since the notion of steady propensities seems hard to believe, even over a few quarters, the aim of this research is to identify the continuing stability of such propensities, and to test the boundary conditions of one of the most important stochastic models available to management, the NBD-Dirichlet.

This aim therefore defines the fifth research objective:

To test the predictive fit of the NBD-Dirichlet model over extended periods.

The format of this Chapter is as follows. The general nature of stochastic models is first described, followed by an account of the evolution and use of the NBD model of brand purchase incidence and later attempts to extend this to multibrand buying. This is followed by a description of the NBD-Dirichlet, its assumptions, estimation, calibration and fit, along with a worked example. A discussion of recent research extending the uses of the model parameters is then presented, followed by a brief description of the five known variances from observed data. The chapter concludes with a discussion of the descriptive rather than prescriptive nature of the Dirichlet and its general fit to many sets of data, thus contextualising the final research objective.

6.2 Stochastic models

Stochastic models ignore the many determinants of choice. Instead, they have their basis in the *as-if-random* nature of the choice process, and use probability distributions to estimate consumer behaviour. Their development began with low-involvement products and categories where conscious decision-making is limited but switching data are plentiful (Lilien *et al*., 1992), but have been successfully applied in many other choice situations over the past forty years, including buying new cars and white goods, pharmaceutical prescription and even TV viewing (Ehrenberg, Uncles and Goodhardt, 2004).

A second simplification in stochastic modelling is that purchase feedback is often disregarded. For a given set of alternatives, any prior choice is considered to be unrelated to the next. Such models are described as zero-order, and the Dirichlet is one of these; indeed the zero-order assumption is a central parameter of the model, and, its authors argue, has a strong basis in empirical evidence (Goodhardt, *et al*., 1984). Nevertheless, higher order models have been developed that estimate the influence of previous (first order) or earlier (second order) purchase on subsequent choice. Khan, Kalwani and Morrison (1986a) offer a taxonomy of such higher order

models, arguing that higher than expected switching might imply a non-zero order process (variety seeking behaviour), while lower than expected switching, might imply reinforcement behaviour resulting in unusually high loyalty to a particular brand. Earlier, Jeuland (1979) termed this "inertia" in brand choice, using a second-order model.

Stochastic models are therefore descriptive: they estimate the effects of aggregated choice behaviour in a given time frame on a wide variety of marketing performance measures including market share, penetration, duplication of purchase and purchase frequency. Outputs are theoretical measures, and are usually used as comparators for empirical data, providing benchmarks for marketing planning or for evaluation of recent activities. One of the most highly generalised examples is the NBD model, introduced into the marketing literature by Andrew Ehrenberg fifty years ago (Ehrenberg, 1959; Morrison & Schmittlein, 1988), and which has been demonstrated to produce a *"reasonable representation of observed customer buying patterns"(p.145)* for a single brand ever since.

6.3 The Negative Binomial Distribution

The NBD is simple, requiring no marketing variables as inputs. For any brand, each household's purchase occasions are generated by a Poisson process with a rate λ. Within a fixed time period the resulting Poisson distribution captures both long-term average frequency, but also the irregularity, the zero-order nature, of purchase occasion timing. Purchase timing appears *as-if* random for all the reasons previously noted, e.g. among many other things, households usually buy other brands, some may stockpile, others sometimes run out without replacing from the category and unexpected visitors with particular needs occasionally arrive. The pattern is represented well by a distribution of independent random events with a fixed mean probability.

Quite apart from purchasing irregularly, individual households also vary greatly in their purchasing frequency: some may buy instant coffee once a quarter, while others may make six or eight purchases over the same time. Over the population their heterogeneity can be described for the period by a gamma distribution, which reflects the very high numbers of light brand buyers, and the low numbers of heavy buying

households. If individual household purchasing rates λ are distributed across the population with a gamma mixing distribution, the result is the NBD, or negative binomial distribution, from which a range of marketing statistics can be predicted for the following period, or used to benchmark observed results. These metrics include brand penetration, repeat purchase rates, proportion of new buyers, and the sales contribution from heavy, medium and light buyers.

The NBD describes "normal" purchasing for any reference period because it assumes that the distribution of household buying propensities remains fixed and that individual households remain as Poisson purchasers with strictly unchanging λ densities over time; it therefore allows a rather precise analysis of any behavioural change in a non-stationary condition. NBD norms have been applied to calculate the period-to-period effectiveness of promotions in attracting new buyers to a brand (Goodhardt and Ehrenberg, 1967), the segmentation of seasonal and regular buyers in the soup market (Wellan and Ehrenberg, 1990), the longer term after-effects of price promotions (Ehrenberg, Hammond and Goodhardt, 1994) and in benchmarking the erosion of repeat-purchase loyalty (East and Hammond, 1996).

Various attempts have been made to improve the fit of the NBD by relaxing some of its assumptions. Herniter (1971), Chatfield and Goodhardt (1973) and Morrison and Schmittlein (1981) discuss a condensed negative binomial model (CNBD) based on an Erlang distribution. This gives a more regular purchase interval, and goes some way to describing the zero class of non-buyers in a sample, while a second distribution, the NBD with spike, specifically accounts for these with a mass point for λ=0, followed by a gamma distribution across the remaining population. However, Ehrenberg (1988) notes little is gained in complicating a parsimonious model and Morrison and Schmittlein (1988, p145) called the attempts *"...tinkering with the basic NBD"*.

6.4 Multi-brand buying patterns

As Ehrenberg (1988 p221) recounts, the realisation that purchase occasion rather than branded unit was the appropriate measure for NBD analysis led to further research avenues opening up, including the exploration of multibrand buying through the analysis of duplication of purchase. In describing duplication in observed data

Ehrenberg and Goodhardt (1970) reported that buying for one brand does not correlate strongly with the buying of another, that the conditional probabilities of buying brand A are independent of brand B. The important but counterintuitive implication from this is that categories are generally un-segmented because competing brands are functionally similar and largely perceived to be substitutable. Duplication of purchase analysis shows that the buyers of a brand are more likely to buy any other brand in general than that one in particular. The only measures needed to establish duplication probabilities are the different penetrations of the competing brands in the category. These findings subsequently generalised across many datasets, and were formalised in the Duplication of Purchase Law (Ehrenberg *et al*., 1970).

The difference between this approach to modelling repeat purchase and the brand loyalty studies of Brown (1953), Cunningham (1956), and Frank (1967) is that it examines the *proportion* of category purchase drawn by each brand in a given period, as opposed to a *sequence* of brand choices recorded by individual households. This approach makes clear the fact that brands share consumers, and that penetration alone defines the proportion of repeat purchase. These ideas underpin both brand choice assumptions of the Dirichlet, and these are discussed next.

6.5 The NBD-Dirichlet and its assumptions

The NBD-Dirichlet is a stochastic model of choice probability distributions for stationary, non-partitioned markets. Since its publication an intense process of scientific replication and testing has led to wide ranging generalisation under varying conditions of category, country and time, leading Sharp to describe it as "one of marketing's true theories" (Sharp, 2010), later asserting on the basis of its extensive applications that brands compete in a Dirichlet world (2012).

Dirichlet output specifies detailed market structure for any period, based on five assumptions, two for purchase incidence, two for brand choice, and one linking incidence and choice. The assumptions (Goodhardt *et al*., 1984; Ehrenberg *et al*., 2004) are that;

1. Category purchases by each household follow a Poisson process, a distribution of random events spread irregularly over a long-run average rate and

independent of previous event timing.

2. Different household average category purchase rates are distributed Gamma across the population. This usually (but not always) means that there are very many more light buyers and far fewer heavy buyers of the category in the reference period.

3. Each household's choices from the available brands follow a zero-order multinomial distribution, so that the choice of Brand A on any particular occasion is independent of any previous brand choice.

4. Different household brand choice probabilities follow a multivariate Beta distribution over the population, the multivariate Dirichlet distribution, which describes the near-independence of heterogeneous brand choice probabilities observed in empirical evidence.

5. Purchase incidence and brand choice are independent of each other. The Beta distributions of brand choice probabilities are independent of category purchase rates; market shares are therefore typically the same across light, medium and heavy buyers.

Two further requirements specify that the category in question should be stationary, and un-segmented, thus defining Dirichlet markets.

Goodhardt *et al.* (1984) argue that the assumptions can be justified by empirical evidence. In established markets consumers are familiar with all the available brands and buy habitually from a repertoire. Their steady purchase propensities thus imply a zero-order choice process which can be described by the fixed probabilities in the model, and which result in equilibrium from one period to the next. Competing brands are simply characterized by their market shares – no other attributes, for example change in annual advertising expenditure, are needed to calibrate the model. The shares are what they are because of past events; for now markets are un-segmented because consumers largely regard available brands as substitutable and undifferentiated, and therefore brand switching tends to be proportional to penetration.

The arguments run counter to the extensive loyalty and brand and customer equity literature (described in Chapter 4), which propose violations of each of the assumptions of independence through the persuasive power of marketing; this, it is hoped, will alter the ongoing propensities of a target group to buy a particular brand.

Emerging evidence of increased loyalty beyond the category average, or any lowering of purchase duplication below the predicted rate (brand segmentation), or higher usage of one brand among heavy users would violate the zero-order purchase and brand choice assumptions, creating a boundary condition to the theory, and limiting the predictive capability of the model.

6.6 Fitting the model

The Dirichlet combines the five assumptions in two probability density functions, the negative binomial distribution (NBD) describing purchase incidence, and the Dirichlet multinomial distribution (DMD) for brand choice, to model simultaneously the numbers of purchases for each brand in a category over a fixed time. In order to fit the Dirichlet, three parameters S, M & K, are usually estimated from some period of panel data through the method of means and zeros or the method of moments, or by using the more efficient likelihood theory described by Rungie & Goodhardt, (2004). Wright *et al.*, (2004) have also reported satisfactory results when estimating the model from survey data using an adapted Juster scale of purchase intention probability. The model can then be calibrated from just four inputs (two for category buying and two for a single brand), and its theoretical output evaluated.

6.7 Parameters

There has been increasing interest in understanding the Dirichlet parameters (Driesener, Rungie, Habel & Allsop, 2003), and in establishing benchmarks for their interpretation (Driesener & Meyer-Warden, 2011; Sharp, Wright & Goodhardt, 2002) since they summarise category purchase incidence and brand choice patterns parsimoniously. It was not originally envisaged that the parameters might be useful metrics in their own right (Driesener, 2005), but recent work has demonstrated that they offer rich insights into category buying. Some findings have already established useful management benchmarks, not least in establishing stationarity (Sharp et al., 2012), and the parameters may be used to describe the shape of changing buying propensities in the population between short and long-run data, Table 8 reiterates and expands a summary of the descriptions found in Driesener *et al.*, (2005).

Table 8: Dirichlet parameter descriptions & definitions

S   The S statistic describes the brand choice probabilities in the Dirichlet multinomial distribution (DMD). S reflects the extent to which people differ from each other in their propensities to buy each brand (Goodhardt, Ehrenberg & Chatfield, 1984). It is calculated from the sum of the brand *alphas* (the measure of the population's propensities to buy each brand in the category), where the higher the *alpha*, the more popular the brand. At one extreme, if S is very high the variance is near zero, meaning all households have a similar probability of buying brands X or Y, and switching is therefore "normal". In this case there are usually many brands in the category, and each is popular. If S is low, the polarity is at its maximum, meaning a proportion of buyers *always* buy brand X, while a proportion *never* do; this implies low switching, high levels of sole buyers and has led to the definition in Sharp, Wright & Goodhardt (2002) of subscription (S<0.2) and repertoire (S>0.6) markets. S has been described as the switching statistic, but it also encapsulates repertoire size, both of which are loyalty measures. In theory, S should not change with longer T, although Stern & Hammond (2004) found that in practice it does.

M   The mean of the distribution of total household purchases of the category in the chosen period of analysis T. This increases with the length of T, given the increase in A (M=AK).

K   The equivalent of the *alpha* parameter of the gamma distribution, K describes the heterogeneity of category purchase rates across consumers. When K is low, households differ greatly in purchase rates, but when K is higher they differ less. According to Driesener, Rungie, Habel & Allsop (2003), K describes the attractiveness of the category, having a critical value of 1. When K >1 (for example in categories such as toothpaste or salt) it would be expected that given a long enough time period, and therefore a large enough A, every household will eventually purchase. When K< 1 (for example with ground coffee) it implies that a certain proportion of households have such a low propensity to purchase that they can be described as "hardcore non-users" (Morrison, 1969), although over long enough time periods some might eventually buy. K describes a characteristic of category buying that is not expected to change with time in a near-stationary situation.

A	The equivalent of the *beta* parameter of the gamma distribution (Driesener *et al.*, 2003) controlling the scale of the purchase frequency distribution across households. It should increase linearly with the length of T since the same households make cumulatively more purchases in longer periods, but in stationary markets A should remain stable in equal time periods. Increases in category purchase rates (for example in an emerging product-class such as flexi-pack pet food) would lead to increasing A values in consecutive and equal periods.
B	The category penetration expressed as a percentage and defined as the proportion of the population buying the product-class at least once in a period. B increases with longer T, but not *pro-rata* since it reaches a ceiling of buyers in established categories, or 100%.
W	The average purchase frequency of the product-class per buyer of the product class in T. This too increases with longer T, but not *pro-rata*, and not as quickly as B.

6.8 Known deviations

A model with such comprehensive output from so few inputs, none of which is explanatory, is likely to produce some deviations from empirical data. Since the assumptions of the model are of strictly stationary, non-partitioned categories, any discrepancies might represent conditions that are of genuine interest to the marketer, or could simply be systematic deviations. Ehrenberg (1988, p.275) calls for further work to ascertain which discrepancies are systematic, in order to identify true exceptions in observed data, and later (Ehrenberg *et al.* 2004), describes five categories of deviation that have been found. Scriven and Bound (2005) have expanded this discussion further. We next describe these deviations in order to inform the analysis of findings against the final research objective.

The variance discrepancy: very soon after the development of the NBD it became clear that there was a shortfall in the numbers of heavy buyers in the observed data when compared to the model output. This became known as the "variance discrepancy" (Ehrenberg, 1988 p.139), and identified as a systematic and regular deviation. In the search for a better fit, Herniter, (1971) reports efforts to replace the

Poisson with the Erlang distribution in the NBD, and explanations were also sought in measurement errors in the data but then discounted. Ultimately it has been dismissed as a statistical artifact. In the first place it only occurs in readings for very frequent buyers; few shoppers however buy a typical grocery product more than thirteen times a quarter. Secondly, it appears to have no impact on the fit of the repeat buying predictions, and therefore is of little consequence, except insofar as it affects the most outlying purchase frequency metrics.

Repeat buying: The model assumes a stationary market, and so the proportion of any brand's buyers that repeats a purchase from period to period is constant in the Dirichlet output. Since most categories are only ever approximately stationary, two discrepancies have been observed here. The first is an occasional over-prediction between adjacent periods, sometimes by between 5% & 10% from quarter to quarter (Ehrenberg, 1988). This is not surprising and simply reflects the cut-and-thrust of brand marketing. When one brand is on deal it may increase its number of repeating buyers for that period, but will lose them to a competitor again in the next. Ehrenberg *et al*., (1994) show that the extra buyers attracted by a promotion are almost always past buyers of the brand.

The second discrepancy from the model reflects a very real non-stationarity, the erosion of repeat purchase. This is evident in the declining levels of repeat buying when observed between two non-adjacent periods, known as *"the leaky bucket"*. In this case, lost buyers are replaced each quarter so that the overall category stationarity is maintained, which means that the fit of the model remains close, although it is not describing observed data completely. No full explanation of this mechanism has yet been offered.

100% loyal purchase rates: the model consistently under-predicts the annual purchase rates of 100% loyal buyers, but this discrepancy varies little from brand to brand except with market share. Its extent is summarised from 20 UK categories and 334 different brands in Scriven *et al*., (2004), reproduced in Table 9.

Although the theoretical penetration is a close fit, it is still under-predicted; however the theoretical average purchase frequency for sole-brand buyers is less than half the observed rate. The explanation advanced is that the Dirichlet strictly says that there are no sole-brand buyers at all. The 100% loyals reported as theoretical are those whose probability of buying is just so low (although still non-zero) that they don't purchase a second brand in the estimated period, in this case a year. In reality the

observed data may well include a few genuine sole-brand buyers who maintain their loyalty, in addition to the extremely light brand buyers who happen to buy the category (and therefore the brand) only once in the period. A small number of true loyals would be enough to cause this deviation without having an effect on the rest of the model output.

Table 9: A comparison of observed & theoretical annual purchase measures for sole-brand buyers

20 Categories 334 Brands UK Annual	100% Loyals			
	Penetration %		Avg. Purchase Frequency	
	O	**T**	O	**T**
Average Brand	10.2	**8.9**	4.6	**2.2**
Deviation	9.80%		160%	

Source: Scriven & Bound, 2004

In any case, the general finding about sole brand buyers still holds (Ehrenberg *et al*. 2004); there aren't many of them, their numbers decrease over longer periods with extended opportunities to make one or more further purchases, and they are light category buyers who buy their single brand no more heavily than anyone else.

A surfeit of medium buyers: the distribution of light, medium and heavy buyers in the category is occasionally a little flatter than the predictions of the NBD. There is no explanation for this over-estimation of the medium buyers so far, but an earlier version of the Dirichlet, the empirical-dirichlet, can be applied in such circumstances (Ehrenberg, 1988 p.274). The disadvantage is that it cannot predict the effects of different time periods, on say penetration growth, as the newer model can.

"Excess" loyalty: perhaps the most discussed discrepancy in the Dirichlet literature is the market share premium, the tendency for leading brands *"to behave like a bigger brand than they already are."* (Ehrenberg, Goodhardt & Barwise, 1990, p.90). More needs to be known about its persistence and its role in market share growth or decline.

6.9 Descriptive *and* predictive applications

The aim of the Dirichlet modeller is not to establish the best fit to a single set of data, but rather to seek an approximate fit to many sets of data under different circumstances of time, place, category or other conditions of interest (Uncles, Ehrenberg & Hammond, 1995). Used in this way by researchers, the Dirichlet will benchmark a normal market structure, thereby highlighting any exceptions to behavioural norms, strengthening known theories of marketing science by uncovering boundary conditions or in further replication of prior knowledge.

The model is also robust enough to be used in everyday applications by firms internationally on both client and agency side (Kennedy *et al*., 2012; Sharp *et al*., 2012). Its uses therefore include evaluating past performance in stationary markets (did we do as well as could be expected?), and in interpreting non-stationarity with steady-state benchmarks (Bennett *et al*., 2010; McCabe et al., 2012).

The approximation approach is also adopted in the interpretation of the model's parameters, which are not simply *ad hoc* coefficients but describe identifiable properties of the buying propensities across the population (Goodhardt *et al*, 1984). For example the extent to which households differ in their category buying rates, or their propensities to switch between the available brands would be clearly seen in graphic representations of the parameters.

The model has predictive applications too, despite challenges to that effect (Ehrenberg, 1997*b*), by projecting what a desired outcome might look like in theory. This can provide insight to planners about what is actually possible − for example there still appears to be a law of nature against loyalty-based brand growth (Ehrenberg, 1988 p.270).

Predictive ability has been built upon replications of the empirical generalisations of non-segmentation and stationarity, but until now these have always been time-limited. Fittings attempted for long run data have been cross-sectional and episodic (for example in Ehrenberg *et al*., 2000) or to successive but non-continuous panels (Sharp *et al*., 2012). If ongoing stable or trending propensities are to be empirically observed with confidence, then long-run continuous purchasing data is required, since aggregated samples may well contain different reporting households.

6.10 The predictive accuracy of the NBD-Dirichlet.

In this next section two examples are given of the predictive ability of the model: first in capturing the evolution over a year of the patterns in *b* and *w,* as noted in Chapter 5, and then in the wide range of measures the model describes.

Table 10 compares the evolution of the two main buying measures in a quarter, six months and a year. The observed patterns in cumulative data reported in Ehrenberg (1988) are replicated here in more recent measures from a different category, and compared with three different Dirichlet fittings. For the leading brands, accounting for 48% of market share, it is clear that the model fit between observed (O) and theoretical (T) measures is good in all three periods, capturing the evolution in *b* and *w*. The column averages fit exactly, although there are minor fluctuations in the individual brand measures, especially over longer periods. The main exceptions to the predicted pattern are the excess loyalty for Pantene in every period, and, emerging between six months and a year, for Head and Shoulders. The emerging deviations are not observed to disrupt category structure since shares remain stable in each of the extending periods, although they become more extreme as penetration rises.

Table 10. Cumulative buying measures in the UK Shampoo category

Brands	Brand Share %	Penetration %						Average Purchase Frequency					
		Quarter		6 Mnths		Annual		Quarter		6 Months		Annual	
		O	T	O	T	O	T	O	T	O	T	O	T
Total		40		55		70		1.8		2.6		4.1	
Pantene	10	5	**5**	8	**9**	13	**14**	1.4	**1.3**	1.8	**1.6**	2.3	**2.0**
Head & Sh/ers	9	5	**5**	8	**8**	11	**12**	1.3	**1.3**	1.6	**1.6**	2.2	**2.0**
L Oreal Elvive	6	3	**3**	6	**6**	10	**9**	1.3	**1.3**	1.5	**1.5**	1.9	**1.9**
Herbal Ess/es	6	3	**3**	5	**5**	8	**8**	1.3	**1.3**	1.5	**1.5**	1.9	**1.9**
Organics	5	3	**3**	4	**5**	7	**7**	1.4	**1.3**	1.6	**1.5**	2.0	**1.9**
Fructis	4	2	**2**	4	**4**	6	**6**	1.3	**1.3**	1.5	**1.5**	1.8	**1.9**
Timotei	4	2	**2**	3	**3**	6	**5**	1.3	**1.3**	1.5	**1.5**	1.8	**1.9**
Vosene	3	2	**2**	3	**3**	4	**4**	1.3	**1.3**	1.5	**1.5**	1.8	**1.9**
Wash & Go	1	1	**1**	1	**1**	2	**2**	1.1	**1.3**	1.3	**1.5**	1.5	**1.8**
Average		*3*	*3*	*5*	*5*	*7*	*7*	*1.3*	*1.3*	*1.5*	*1.5*	*1.9*	*1.9*

Source: Kantar WorldPanel.

A feature of the model is the very wide range of performance measures predicted in its output. As with the main buying measures, these are closely predicted for each brand, and a more complete table of the output for annual category structure is given next over a suite of measures that includes not just *b* and *w*, but the purchase rates for light (once-only) buyers, heavy buyers (5+ brand purchases in a year, i.e. above the *category* average frequency), average category purchases by brand buyers in the year, share of category requirement for each brand, penetration and purchase frequency measures for the 100% loyal buyers of each brand, and predicted repeat-purchase levels from period to period for each brand. These are all commonly used measures of brand performance reported by marketing managers.

The fit of the model is generally good over all measures with column averages within a point or two, correlations between O and T widely in excess of 0.9, and low mean absolute deviations (MAD). Where there are deviations from expected performance, as in the purchase frequencies of Pantene or Wash and Go for example, these are now easily identified, and can be interpreted or followed up by managers in the light of their deviation from Dirichlet benchmarks. The output also presents other facets of the normal Double Jeopardy relationship in wider measures, for example in declining SCR with brand size, or in the higher proportions of light buyers of smaller brands. In summary, buying appears to be just about normal for each brand over the year, with one or two exceptions clearly highlighted against the benchmarks.

Several of the known deviations previously discussed are present in this table, and prior knowledge of these helps to inform the interpretation of individual brand measures. For example the variance discrepancy can be seen in the very slight shortfall of heavy buyers (a one point difference in column averages across the brands), while the model has systematically under-predicted the purchase frequencies of sole-brand buyers. Perhaps the greatest deviation is in the annual repeat-rates which are both more extreme in their Double Jeopardy variance, and rather lower than the model predicts in every case. Therefore while the biggest brands are within a point or two of the theoretical norm, the smallest brands are observed to have fallen far short of it. This has still not been explained, but longer-term studies may provide further insight here.

Table 11: A comparison of observed and theoretical annual buying measures in the UK Shampoo category

Brands	Market Share %	Penetration %		Purchase per buyer		% Buying				Category				100% Loyal				Repeat	
						Once		5+		Purchase		SCR (%)		Penetration		Av Purch.			
		O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T	O(*)	T
Total		70		4.1															
Pantene	10	13	14	2.3	2.0	56	58	10	8	6	6	40	36	24	19	2.5	1.7	48	57
Head & Shlders	9	11	12	2.2	2.0	54	58	9	7	6	6	39	35	26	19	2.2	1.7	52	56
L Oreal Elvive	6	10	9	1.9	1.9	64	60	6	7	6	6	32	34	18	18	1.8	1.6	40	54
Herbal Essences	6	8	8	1.9	1.9	65	60	5	7	6	6	31	33	16	18	1.8	1.6	43	54
Organics	5	7	7	2.0	1.9	65	60	8	7	6	6	32	33	17	18	2.2	1.6	35	53
Fructis	4	6	6	1.8	1.9	66	61	5	6	6	6	29	33	14	17	1.8	1.6	31	53
Timotei	4	6	5	1.8	1.9	70	61	4	6	6	6	28	32	16	17	2.1	1.6	34	52
Vosene	3	4	4	1.8	1.9	68	62	6	6	6	6	31	32	19	17	1.8	1.6	39	52
Wash & Go	1	2	2	1.5	1.8	79	63	2	6	6	6	23	31	10	16	1.2	1.5	23	51
Other	53	52	52	2.9	2.9	41	39	16	19	5	5	64	63	47	42	2.6	2.6	72	75
Average	10	12	12	2.0	2.0	63	58	7	8	6	6	35	36	21	20	2.0	1.7	38	54
MAD		1		0.1		6		2		0		3		3		0.4		14	
Correlation		1.00		0.89		0.86		0.87		0.90		0.95		0.93		0.62		0.88	

6.11 Chapter summary and fifth research objective.

In this chapter the development and uses of the NBD-Dirichlet model have been described, including some findings from an emerging research stream investigating the uses of its parameters in benchmarking category level purchasing. Several known deviations in fit to short-term data have been described and it is possible that these may eventually lead to violations in the key assumptions of Dirichlet theory. If however the model describes long run data well, its uses may be extended to strategic level decisions including brand portfolio analysis and perhaps even to brand valuation models. The fifth and final research objective is therefore:

To test the predictive fit of the NBD-Dirichlet model over extended periods.

This chapter concludes the review of literature. This section has identified and contextualised significant gaps in knowledge of long-run consumer behaviour, not least that brand loyalty is conceptualised as a strategic construct with a value based on consistent aggregate behaviour over time. In the next chapter the proposed research approach, design and methodology is described and justified. The three subsequent chapters will present the findings first from data observations, and second from model fittings, then finally, drawing on this analysis, the contribution to knowledge will be specified, limitations outlined and further research suggested.

CHAPTER 7. DATA & METHODOLOGY

This chapter describes the data used in the research, the collection method, and the general approach to the analysis. Details of the various stages of data reduction and interpretation are given, including the goodness of fit tests. The chapter opens by restating the aims of the research, with a reminder and brief discussion of the specific objectives, setting them in their epistemological context.

7.1 Introduction

The previous chapters have highlighted a polarisation of views in the literature. One position, summarised in Kotler *et al*., supports a "new view" of marketing linking short-term brand interventions to long-term brand value by assuming a cumulative return on investment through the behavioural outcomes of brand equity (Davis & Dun, 2002; Keller & Lehman, 2003). An absence of data has however limited the ability of marketing scientists to fully test this proposition until now. Short- and medium-term analysis continues to confirm that competing brands share customers, that loyalty varies little between brands, that market structure remains largely stationary and un-partitioned and that established relationships such as Double Jeopardy continue to hold under new and varied conditions, at least over a few quarters (Dekimpe & Hanssens, 2000; Ehrenberg *et al*., 2004; Sharp *et al*., 2012). These generalisations can now be examined in continuous long-term buying patterns.

Using a new twenty-six quarter dataset of continuous household purchasing records, the aim of this research is to examine the evidence for persistent stationarity and non-partitioning of market structure under a new condition of uninterrupted and extended repeat-buying. If the two key assumptions of Dirichlet markets remain inviolate, then this polarisation can be resolved, underlying repeat-buying theory can be extended to many strategic marketing applications, and robust and useful benchmarks confirmed and further developed for practitioners that will contribute to the management of long-term behavioural loyalty.

In this chapter the research approach and design are first discussed, followed by a description of the analysis undertaken in order to meet the requirements of each of the five research objectives summarised below.

· The first objective concerns the observation and empirical verification of category equilibrium and known behavioural norms over twenty-six successive quarters.

· The second and third objectives require the identification of any exceptions to equilibrium, and an analysis of trends in the underlying patterns of repeat-buying behaviour observed.

· The fourth objective concerns the effects of time on Dirichlet norms, and repeat-buying generalisations in continuous, cumulative purchasing.

· The final objective is to assess the predictive fit of the Dirichlet to category structure in all 18 markets, and over different periods of time.

After the methodological discussion, the chapter concludes with a description of the data investigated, the specification adopted in constructing the panel and a statement of the data standard used in the analysis.

7.2 Research approach

The research approach adopted is empirico-inductive, and involves the systematic replication and extension of established empirical generalisations through observation of patterns and relationships occurring and recurring in many and differentiated sets of aggregated purchase data.

An empirical generalisation is "*a pattern or regularity that repeats over different circumstances and that can be described simply by mathematical, graphic, or symbolic methods.*" (Bass, 1995), and some of the best-known and useful examples in marketing are described in Chapter Two. Progress in marketing science is made when the strength, scope and limits of an empirical generalisation are developed through replication and extension research (Anderson, 1983; Wright & Kearns, 1998). Results build over time, first in observing low-level regularities, then in establishing, replicating and extending empirical generalisations and then (eventually) by linking them in explanatory theories that are strengthened when exceptions are observed in

further tests (Ehrenberg, 1982; 1995; 2002). The required research design is therefore one of methodical, differentiated replications undertaken in many sets of data (MSoD), ith each test designed to increase scientific knowledge of the varied conditions under which a law-like relationship does or doesn't hold.

Anderson, (1983 p.28) argues that this approach is normal in the field of the natural sciences, which have shown *"…a remarkable ability to solve important problems"* over the centuries. This is in part as a result of the research tradition they may operate within and the established research programme drawn upon. Marketing Science is a new field in comparison, and emerging from a contrasting tradition in which almost all research remains fragmented and scattered, a phenomenon described by Nelder (1999) as the cult of the single study. Most researchers in marketing still draw inferences from fitting models to single sets of data (SSoD), and look for significant differences rather than significant sameness (Uncles & Wright, 2002). Such studies are almost never replicated since the statistical techniques adopted do not easily allow it (Ehrenberg, 1995), and so these results find little practical application (Armstrong, 1998). One important feature of replication studies however is that they do not rely on tests of statistical significance or best fit (Ehrenberg, 1995). The criterion for judging an empirical generalisation is that it approximately describes a regular relationship between two or more variables in many different sets of data, thus acquiring a use as a powerful benchmark with which to evaluate or understand unfamiliar results, or predict future outturns in similar circumstances (Barwise 1995).

Such benchmarks although useful are only descriptive – initially at least, they have no explanatory power. Anderson argued that the marketing discipline requires a greater commitment to theory-driven programmatic research, but how do even the most robust inductive research outcomes lead to theory? Leone & Schultz (1980) suggest that this depends upon current marketing knowledge; once basic answers are available about *how* marketing variables are related then interpretation of that knowledge will lead eventually to the development of theory – *why* they are related. The Dirichlet is a good example of this process where empirical generalisation and theory are intertwined (Uncles, Ehrenberg & Hammond, 1995). Here, theory development only became possible after many years of replicated observations allowed established regularities and related models to be amalgamated into one single comprehensive model of buyer behaviour. Even now the theory is still limited. It does

not yet explain for example how consumers adopt the brands they do, or why the different competing brands are the size they are.

Thus the object of the scientific method as defined by both Aristotle and Newton (Blackstone, 2004) is to let reality speak for itself. Wright and Kearns (1998) address two well-known epistemological difficulties with empiricism. The first is the question of measurement error associated with the observations (although questions of reliability and validity are not restricted to empirical research alone). The second is that *"it is logically impossible to prove any universal statement or theory as true."* Anderson (1983) also proposed a third and related difficulty, the theory-dependence of observations, or confirmation bias. Any researcher may be prone to seeing only what they believe to be true, and can therefore easily keep demonstrating it – the earth remained flat for centuries after all.

As to the first, this is addressed later through discussion of the analysis procedures undertaken here. As to the third, Uncles and Wright (2004) suggest that all classes of replication should be undertaken by different researchers in order to counter potential bias, and it is a precept of the scientific method that results should be disseminated as widely as possible to encourage this.

As to the second, the danger inherent in logical empiricism is that its scientific outcomes may not be founded on objective reality, because they are necessarily interpreted in the context of *a priori* knowledge. Popper (1972) proposed falsification as a methodology to overcome this problem, in order to refute rather than support hypotheses developed when theory and observation clash. As Ehrenberg points out (1995), one inherent advantage of this is that even if the theory turns out to be wrong one still has the empirical generalisation with which to try out another.

Wright *et al*. (1998), in common with many practicing scientists (Anderson, 1983), maintain that the first condition of empirically based science is falsification, that a contradictory observation for any theory must be created and rigorously tested to develop rational and objective knowledge. Only falsifiable theory can lead to scientific progress in marketing.

This thesis has therefore argued, for example in Chapter Four, that in principle, despite existing knowledge of category structures, it is possible that a segmented customer base might emerge over time in a category. If this theory can be refuted through the empirical evidence observed, then existing generalisations will be strengthened. Again, perhaps brand growth will emerge in the data, where the

expectation is for stationarity. Such exceptions always lead to advances in knowledge, which can then be confirmed through close replication under similar conditions, and thus become gradually more robust. Theory can then be expanded through further differentiated replications under new and varied conditions, and by including new variables to increase generalisability. Eventually such a programme of research will lead to the discovery of conditions under which the theory systematically fails. Identifying the boundary conditions may well then lead researchers to re-examine much of what is already known. Progress can largely be seen as a continuous interaction between theory and empirical generalisation in order to reach higher-level theories and further generalisations.

The question of what makes a good empirical generalisation has been addressed by Barwise (1995). He suggests that good empirical generalisations have scope, precision, parsimony, usefulness and are linked with theory. As to scope, empirical generalisations should be routinely predictable under a wide range of conditions. Further replications can increase these and establish where they begin to break down. Precision relates to the best possible description of the phenomenon, while parsimony relates to the quantity of possible variables that can be excluded from that description. Both characteristics leads to improved usefulness, and should encourage further practical applications among managers. Finally, an empirical generalisation is better if it can be explained by a theory. The theory can then account for the generalisation, and for its scope (e.g. Double Jeopardy doesn't always hold for individual own-brand products because their distribution, and hence their penetration, is restricted).

This research is concerned with well-established empirical generalisations, and will therefore focus on three of these five characteristics; scope (through temporal extension), usefulness (in adding to knowledge of long-term loyalty effects) and the link with theory (in testing and perhaps establishing the limits of that theory).

7.3 Research design

Research in marketing science of this nature thus requires a complete shift in design away from mainstream hypothetico-deductive studies, both in terms of suitable data and of its analysis. A single set of data will not be sufficient; what is required are

many sets of differentiated data, and an analysis schedule that seeks not statistical significance and best fit to a SSoD, but a theoretical model that holds across many sets of data. Uncles and Wright (2004) describe the process of establishing, testing and extending empirical generalisations, shown in Figure 2.

Figure 2: The Process of Establishing Empirical Generalisations
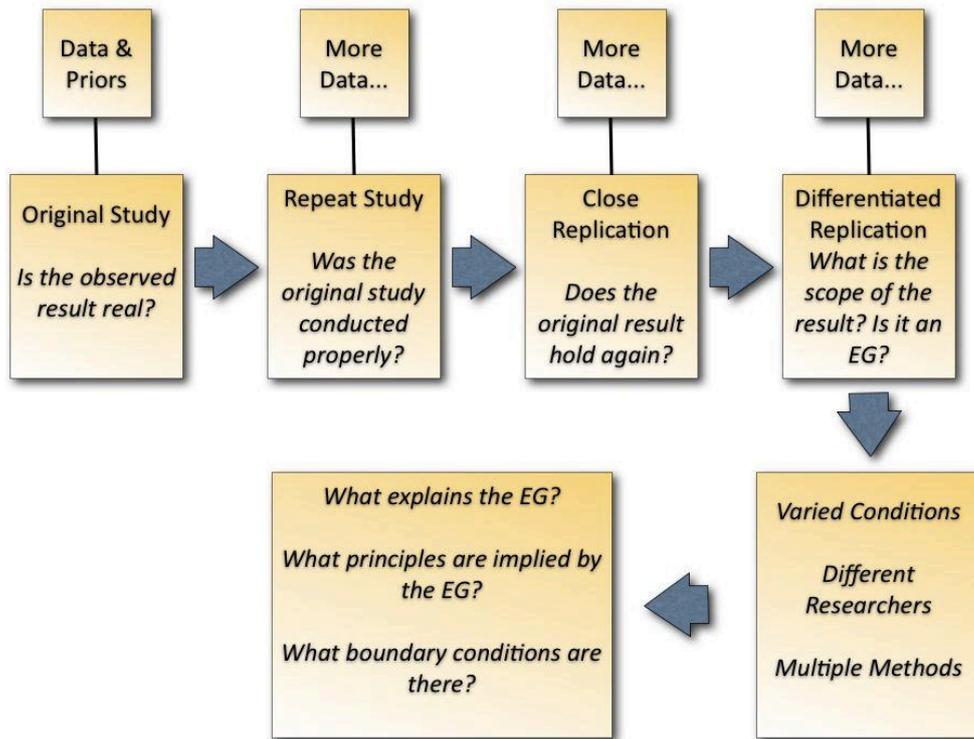
Source: Uncles and Wright, (2004).

They argue that following an original study the natural scientist would repeat the research, perhaps with an independent research team, in order to verify the results. This rarely happens in marketing studies, where the two main methodologies are close replications and differentiated replications. In conducting this research it is therefore necessary to have access to not one but to many differentiated datasets as Figure 2 suggests. Following the flow chart, a close replication keeps most aspects of the study invariant, but is useful in establishing whether there is a basis for generalisation. In this research, because the panel itself is of a specialist nature, initial observations of patterns in quarterly data will be reported in order to establish that expected behavioural norms do in fact generalise over the short-term, in effect a close replication of well-known findings. The next step is to conduct numerous

differentiated replications under varied conditions of time, category, shopping style etc. using multiple methods, first observation and then through model fitting. The purpose here, as the chart suggests, is to test the limits of established theory and thereby develop a better understanding of long-term repeat buying. In the next section, the specific research approach to each objective is set out.

7.4 The Research Objectives

This thesis has five research objectives, and each require a number of different steps in their investigation. These are now described in detail.

7.4.1 Empirical Verification of Dirichlet Assumptions Over Time

In order to determine the stability of the Dirichlet assumptions over time, a close replication of existing studies is required, first across the 18 categories in the dataset, and then through an extension study, across 26 consecutive quarters. Three initial analyses will be undertaken to verify the two assumptions of near-stationarity and non-partitioning in the data. The first is to determine the existence of trends in purchasing measures at both category and brand level, second to examine stability in underlying brand purchase heterogeneity and loyalty measures and third to describe the persistence of the Double Jeopardy relationship that summarises them. These tests should thus meet the first research objective:

To describe the nature and extent of market equilibrium, and the patterns of repeat buying behaviour that underpin stability and growth, in order to confirm the NBD Dirichlet benchmarks.

A discussion of time series analysis was presented in Chapter Three, from which a definition of equilibrium was derived:

> *"...the situation where there is no short term change in the aggregate sales or penetration level of the brand or item in question.*
>
> (Ehrenberg, 1988, p.12)

The objective of this first analysis is thus to obtain simple descriptive measures of the main properties of the repeat-buying metrics in time-series in the data. It is expected that these will show promotional & seasonal spikes at the quarterly level, but in order to identify any underlying systematic trend these must be removed. The smoothing process used estimates an average quarterly value in each year for each metric and from these a time plot is then produced for observation. Chatfield (1989) suggests that simply plotting the time-series will reveal residual features of interest, including any outliers, discontinuities and turning points, and so the initial process is to plot the category and brand measures against time. Table 12 lists the average quarterly metrics produced for each of the six consecutive years.

A stationary time series is generally described as one where the mean, variance and autocorrelation structure do not change (Dekimpe & Hanssens, 1995) but in this thesis, following Ehrenberg's precedent, rather than following a precise econometric definition, "trend" is used as a rather subjective term. If it looks like it's moving, then it probably is[1] – and if it *is* moving, is that movement persistent or simply a temporary spike? A graphic time plot will be adequate to determine this, and to observe relationships with other stationary or trending measures.

Category penetration is described first, in order to assess the equilibrium in repeat buying contextually, followed by a brand share analysis since share growth is a primary marketing objective.

Once a description is obtained of the degree of equilibrium in the data, loyalty and purchase heterogeneity distributions will be examined. For each competing brand these should be observed to hold approximately constant in a stationary category, but evolving customer equity effects would be observed for example as increases in Share of Category Requirement, or decreasing proportions of light buyers from period to period. It is thus a simple matter of data reduction to tabulate the underlying measures for each brand and observe their stability.

Buying behaviour in the data should remain both constrained and defined by Double Jeopardy, a relationship which summarises two fundamental characteristics of category-buying; first that the buying of competing brands is independent across consumers, and second that competing brands do not differ in how often their buyers buy the product category (Ehrenberg, Goodhardt & Barwise, 1990). The regularity

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[1] I am grateful to Gerald Goodhardt for reminding me of this adage at an early stage of the research, and suggesting it as an appropriate methodology.

therefore allows for buyer heterogeneity, but not segmentation. It has been frequently replicated in single time periods (in over 50 categories by 1990, and in very many more now), but here we can examine its stability over the long-run for the first time. If the relationship holds approximately constant over consecutive equal periods, then the observed category remains un-segmented, and there is no evidence for emerging customer equity effects. Even in cases of brand decline or growth, the relationship between penetration and purchase frequency is expected to remain constant (Anschuetz, 2002). If on the other hand the relationship fails or changes dramatically, then underlying buying behaviour may be segmenting the category structure in favour of one or perhaps two competing, dynamic brands.

Table 12: Standard Brand Performance Metrics

Category Level Metrics	Brand Level Metrics
Category Penetration	Brand Share
Category Purchase Frequency	Brand Penetration
Double Jeopardy constant, w_o	Brand Average Purchase Frequency
Category Repeat Purchase Proportion	Proportion of Once-Only Buyers
	Average Category Purchase Frequency of Brand Buyers
	Share of Category Requirement
	Penetration of 100% Loyals
	Average Purchase Frequency of 100% Loyals
	Brand Repeat Purchase Proportion

The Double Jeopardy relationship (Ehrenberg, 1990) states that:

$$w_x(1 - b_x) \; = \; w_y(1 - b_y) \; = \; w_o$$

where b_x is the proportion of all buyers who purchase Brand x in the period, and w_x is the average rate at which they buy it. The expression $(1 - b_x)$ thus identifies the penetration of non-buyers of Brand x in the period, which according to the rule must *decrease* as their purchase frequency increases. The constant, w_o is estimated as the average value of $w(1 - b)$ for all itemised competing brands. In order to assess equilibrium in buying behaviour, the approximation is calculated for each category in a single period initially as a close replication in order to establish the presence of the

Double Jeopardy characteristic. The estimations are then extended to each period, and observed in a time series, with any exceptions noted for further investigation.

7.4.2 Identification and description of dynamic cases

The expectation is that there will be at least some exceptions to share stationarity over such an extended period, and the second and third research objectives concern the identification and description of buying behaviour towards growing or declining brands in the dataset. It is an aim of this thesis to discover if and how trending purchase propensities violate the Dirichlet assumptions. Some parts of the literature suggest that share change outcomes can be routinely achieved in any category, but this is still contentious. The second and third objectives are thus:

To identify exceptions to stationarity (sustained growth or decline in share).
To understand the changes in buying patterns attaching to those exceptions.

In order to identify exceptions, they must be categorised in some way. This is done using two observational criterion, and results assessed against the literature for face validity. The first criterion is of persistence. This will be observed in run plots, from which seasonal and promotional peaks and troughs can be distinguished from underlying trends or turning points. The second criterion is scale. At what point can a brand be deemed to have grown or declined? As discussed in Chapter Three, absolute rather than relative market share change is believed to be the best metric for this analysis. Ehrenberg suggested *"a few percent up or down"* (1988, p.12) as a measure, and later commented (Ehrenberg *et al.,* 2000) that brand growth was likely to be gradual, evolving over years. These comments are interpreted here in identifying a range of between three points and six points of change in absolute brand share from the start to the end of the six-year period (i.e. equivalent to a gradual change from between 0.5 to 1 share point annually), a value also adopted by Buzzell *et al.,* (1975).

As an additional check on persistence, in order to smooth out seasonal or non-systematic promotional fluctuation, the analysis will calculate the mean share for each brand in the opening four quarters of the dataset, and compare it to the mean share in the closing four quarters. In order to evaluate results, the proportion of qualifying

dynamic brands in the dataset may then be compared to previous findings in the literature, achieved using other methods.

Having identified a set of dynamic brands from the data, these will then be isolated for further investigation in order to answer the third Research Objective. First, the nature of the change will be described from the brand run-plot. This should identify if the evolution is indeed gradual or the sudden result of some dramatic intervention. Second, an investigation of the case history is needed to provide a context from which it may be possible to generalise to other cases. More importantly, in each case the underlying repeat-purchase behaviour can then be examined to determine the underlying cause of the change. Once again, the Double Jeopardy relationship will be examined over time to clarify if these brands are trending into behavioural segments defined by exceptional loyalty, or remain constrained within the expected purchasing norms.

The analysis and findings from these initial descriptive observations will meet the first three research objectives and are presented and discussed in chapter eight. The second phase of the analysis is concerned with variances from the Dirichlet norms and the fit of the model. The methodology adopted to meet the final two research objectives is discussed next and the analysis and findings presented in chapters nine and ten.

7.4.3 Variances from Dirichlet norms over time

Two known variances from the Dirichlet norms may, over time, lead to changes in market structure. The first, instances of a market share premium, might evolve with time. Recent work by Pare and Dawes (2012) confirmed such excess loyalty to be a characteristic in around a third of leading brands in any period, but found that its incidence was not completely persistent, showing a decline in two subsequent years. Of interest here is whether over longer periods any brands exhibit not just a persistent, but an intensifying market share premium, in other words does the segmentation thus implied become more pronounced.

A second variance, the leaky bucket (East & Hammond, 1996; Ehrenberg, 1988) deals with levels of repeat-purchase, and the unexpected churn in buyers from period to period. Previous research has identified that despite a decline in repeat purchase at the individual level, stationarity is maintained in aggregate. This

phenomenon indicates that any brand's market share relies on a constant influx of "new" (probably returning) buyers to replace those that have left. It is not clear for how long this maintenance can be supported, or if indeed the mechanism can lead to brand growth.

Finally, penetration and purchase frequency are time dependent, but it is not known at what point, or if the Double Jeopardy relationship breaks down. If brand or customer equity effects are cumulative, it may well be that in longer periods than those so far observed, they might lead to violations of the Dirichlet norms, and limits to the theory. Very little work has so far been conducted in this area. Stern *et al*., (2004) suggests a breakdown of the zero-order assumption for heavy buyers in the earlier part of a long purchase sequence, but only examines two categories. More replications are now possible, and so the penultimate research objective calls for an examination of three known variances that may well be time dependent:

To identify any variance in the expected patterns of repeat buying as a result of increasing the period observed beyond the quarterly and annual predictions.

For instances of excess loyalty, the examination calls for a replication of the techniques adopted in Pare *et al*., (2012). First and second leading brands in each category will be tested for variance in excess of the Double Jeopardy norm in the initial period. These brands will then be tracked across the data in an extension study, and the persistence of the effect confirmed, as well as its intensity.

As to the second, the technique involves identifying the proportion of customers in one quarter who repeat the purchase in the subsequent quarter. This percentage should remain virtually constant from quarter to quarter although in practice it is affected by seasonality or promotion. Following East *et al*., (1996) a smoothing procedure is again adopted, but here based on the inter-year repeat rate; the proportion of buyers purchasing in Q1 Year I who repeat in Q1 Year II, the proportion buying in Q1 Year II who repeat in Q1 Year III and so on. From this, an "average quarterly repeat" measure is estimated for each year as the mean of the four quarterly values, and it is expected to remain largely stable. This may then be compared to a second repeat measure, derived by identifying those buyers who purchased in Q1 Year I (and smoothed across each of the four quarters in the year), but then following those buyers across each of the subsequent five years. Earlier

literature suggests a widening variance between the two measures indicating an apparent loss of loyalty. The expectation is that this will be replicated and extended.

Finally, in order to discover the possible limits of known empirical generalisations, the buying metrics for every brand in each of the eighteen categories will be aggregated in order to produce a cumulative category structure over 26 quarters. From this tabulation, "eyeballing" the data (Uncles & Wright, 2004) will quickly reveal the extent to which regularities and behavioural norms hold, or if indeed the effects of "anything goes" marketing will become apparent. At this point no statistical tests are necessary as the broad patterns will be evident (or not) and can therefore simply be interpreted in the light of prior knowledge (for example, the exposition in Chapter Two of five known regularities in repeat-purchase behaviour).

7.5 Testing the NBD-Dirichlet Fit

Dirichlet output has acquired some predictive validity over many replications. Once calibrated it can be estimated to describe differing period lengths, or, given the stationary nature of buying, predict market structure in successive or non-adjacent periods of the same length. Its use might be extended to describe long-run outcomes under stationary conditions if it can be fitted to extended data, therefore the final research objective is:

To test the predictive fit of the NBD-Dirichlet model over extended periods

Having identified the extent to which behavioural norms persist through the examination conducted in step four, the final stage of the analysis is to estimate the NBD Dirichlet for each category and test goodness of fit. As noted at the outset of this chapter, the Dirichlet is a descriptive rather than a predictive model of category structure, and is normally assessed on the basis of an approximate fit to many sets of data rather than a best fit to one single set. Nevertheless, a suite of measures of fit has recently been developed and tested by Driesener (2005), and these tests will be applied here. The thresholds given in Table 13 were arrived at from a review of the literature, and subsequently refined by application to 54 categories of data. The theoretical outcomes (T) can generally be deemed to fit observed data (O) closely if:

- There is a very high correlation between observed and theoretical measures of penetration and of average purchase frequency (Scriven & Bound, 2004)

- The variance between average column values of Observed and Theoretical measures is low (Scriven & Bound, 2004)

- The mean absolute deviations (MAD) for each array show low residual values (Scriven & Bound, 2004; Wright, 1999).

- The mean absolute percentage error (MAPE), a relative measure of fit, remains within a range below 20% (Wright, 1999; Wright, *et al*., 2002)

- The sum of the deviations (O-T) in the purchase frequencies of the highest share brands in the data is positive, and greater than the cumulative deviations across the smaller brands (Dreisener, 2005).

Of course, as Driesener points out, the value of Dirichlet modelling is not in finding a best fit, but is often in identifying exceptions, brands that do not fit specifically because of some marketing intervention or other factor. These exceptions are valuable because they can increase knowledge of category structure, especially where they then generalise, while for practitioners they have obvious diagnostic use.

Table 13: Fit thresholds for Dirichlet testing

	Test	Fit Threshold
Penetration	Correlation	≥ 0.9
	O-T	$\leq 0.5\%$
	MAD	$\leq 3\%$
	MAPE	$\leq 20\%$
Purchase Frequency	Correlation	≥ 0.6
	O-T	$\leq 0.2\%$
	MAD	$\leq 0.9\%$
	MAPE	$\leq 20\%$
	CD	>0

Source: Driesener, 2005, Table 11

Nevertheless, in calibrating the model to each of the eighteen categories in periods ranging from a single quarter, six months, a year, and twenty-six quarters, and in projecting steady-state norms from short-run to long-run, some overall test of predictive ability is helpful. Using these tests, goodness of fit can be assessed and exceptions identified. Results should thus also confirm any findings from research

objective four. Finally, in order to compare underlying purchase propensities in the population the evolution in the Dirichlet Parameters S, K and A can be observed over time, and assessment made of any unexpected variances in form.

Having described the necessary tests to meet the five research objectives, the next sections discuss the sampling and compilation of the long-term continuous panel.

7.6 Data description and panel composition

The data for this research have been provided by Kantar WorldPanel, a leading supplier of commercial consumer-panel information, but are of a new design. Standard panel data typically report the purchasing of a large quota sample of households (now around 15,000) for periods of up to three years. Over this duration some households inevitably stop reporting, but they are replaced in order to maintain the quotas of the original sample. Since the questions at hand in this research are concerned with continuous purchasing over extended periods, empirical results from consecutive sets of standard panel could be confounded by such panel attrition. It is also a prerequisite of stochastic theory that the data modelled be continuous; the theoretical distributions imply fixed propensities in the population, and a stable proportion of non-buyers. Both would be disturbed by panel defection (Driesener, 2005).

In order to avoid this measurement error a new kind of dataset was needed, and so purchase records from a sub-sample of the main Kantar panel, consisting of the continuous and recent reporting of nearly 4,000 UK households between 1999 and 2005 (six and a half years, or twenty six quarters) was compiled. This panel is smaller than standard but the important difference is that it contains only continuous reporters rather than a sample with replacements, thus making it possible to examine repeat purchase at both brand and at individual household level for the complete period with confidence.

The working datasets were compiled as follows. For each of 18 product categories, three consecutive batches of standard household panel data were merged in order to obtain a continuous six-year report, an operation conducted in consultation with *Kantar WorldPanel*, the data provider. The required sample of continuous purchasers was then drawn from this, but two potential errors were foreseen in the

selection. First, a confound between panel defection and very light purchasing and second, the effects of reporting fatigue – a tendency over time for some households to under report, perhaps just prior to defection. From the 78 consecutive four-week time periods resulting from the merge, a sample of reporting households was therefore specified as follows:

- Every standard panel demographic to be at least represented.
- Panelists to have reported in at least 75% (58 of 78) of the four-week periods.
- Panelists to have reported in the three first and three last four week periods.

The sub-panel therefore remains largely representative of the UK population, although an exact quota specification is not as important here as in the commercial data because the research is examining regularities between changes in brand share and repeat-buying behaviour rather than in any absolute sales number.

Table 14: A comparison of brand shares in continuous and standard panel data

Average brand share in rank order	Continuous Panel Q22-26	Full Panel 52 w/e 30th Jan '05	Variance
Brand A	17.0	17.6	3%
Brand B	11.5	10.8	-6%
Brand C	6.7	6.5	-3%
Brand D	3.7	4.0	6%
Brand E	2.8	2.8	2%
Average			*0.4%*

Source: Kantar WorldPanel. Comparison across 14 categories & 70 brands.

More importantly, it enables analysis of continuous repeat purchase at both brand and household level for the entire period with reasonable confidence. It is believed that a panel of this extent and nature has never been constructed before. In their comprehensive review of the use of time series models in marketing for example, Dekimpe & Hanssens (2000) list only one paper that examines market shares over an equivalent period, but even this (Srinivasan, Leszczye & Bass, 2000) only investigates two categories from standard scanner data. In order to assess the comparability of the sub-panel with the main sample the top five brand shares were collected from fourteen categories for the final year of the dataset (annual format for

the main panel and the average of four quarters for the sub-sample). These are shown in Table 14. Although there is clearly some slight statistical wobble, it does not appear to be systematic. A further observation of category penetrations in the sub-sample also failed to detect any evidence that might indicate reporting fatigue (see Figures 4(a) and 4(b)), therefore since the variance across the brand share rankings is small, the long-term sample was accepted for the study.

The 18 categories selected vary widely in purchasing style, to provide ample opportunity for differentiated replication, and a range of standard performance metrics were tabulated by category for 140 well-known brands (but excluding own-brands). The extended and continuous nature of the panel then allows analysis at three levels.

· 26 successive standard quarterly periods of aggregate brand performance metrics

· 26 successive quarters of household-level repeat purchasing.

· Cumulative aggregate metrics in six month, annual and six-year periods

The 18 category descriptions are given in Table 15, ordered by purchase occasion in an average quarter. This varies widely between categories, from 266,000 occasions for wrapped bread to 6,000 for ground coffee.

The two closely related measures of market penetration and category purchase frequency show marked differences between categories. For example, although canned dog food reaches 15% of households, canned cat food is bought by 20%, clearly indicating different levels of pet ownership. But while dog food is bought 12.7 times a quarter, a regular weekly purchase, cat owners appear more mercurial, buying around 18 times in a quarter. The mean purchase frequency of 5.6 across the categories indicates that unlike bread and pet food, most fast moving consumer goods are not in fact that fast moving, many categories being purchased by an average household less than once a month, and some barely once a quarter.

The last metric in Table 15 is market concentration. This is calculated as the average share of market held by the top 5 brands in the category, an indication of competitive intensity. In the shampoo category as the top five brands hold just 34% we can see that the market is highly fragmented; on the other hand the combined market share of the top five brands of butter is almost double, and above average at 58%, representing a greater concentration of market power. Greater brand strength may have implications for, or associations with permanent changes to loyalty patterns and therefore to category structure.

Table 15: Average quarterly descriptive metrics for 18 UK categories of frequently purchased consumer goods

Category	Total Purchases (,000's)	Penetration %	Frequency	Top 5 Brand Concentration %
Wrapped Bread	266	95	11.5	37
Canned Cat Food	90	20	17.9	64
Everyday Biscuits	83	64	5.3	24
Margarine	82	82	4.1	49
Flexipack Cat Food	56	13	17.6	83
Canned Dog Food	47	15	12.7	55
Butter	45	46	4.0	58
Crackers	41	53	3.2	49
Hair Conditioner	41	35	2.5	32
Instant Coffee	40	59	2.9	51
Male Deodorant	29	53	2.6	45
Analgesics	28	26	2.3	24
Shampoo	27	31	1.9	34
Female Deodorant	19	60	2.7	42
Vitamins	13	14	2.0	22
Still Water	13	18	2.9	32
Soap	13	32	1.7	49
Ground Coffee	6	11	2.3	36
Average	52	40	5.6	44
MAD	37	25	4.2	12

Source: Kantar WorldPanel

7.7 Data standard

From the raw data, a number of decisions have been made in order to standardise the approach to the analysis, and to reduce an extremely large quantity of individual readings into a form that is meaningful. For research into consumer behaviour, the unit of analysis proposed by Ehrenberg (1988, p.10) is the purchase occasion, a measure of the frequency of purchase, rather than its value or volume. Ehrenberg argues that since in fact it is a single unit that is mostly bought on any given occasion the distinction becomes trivial, but by aggregating multiple unit or multiple pack-size purchases when they occur, the simplification allows further analysis, especially of brand switching, to be conducted more easily.

Purchase occasions in panel data are most usually recorded at a household level, with individual household members' preferences subsumed into a single

shopping basket. A difficulty here, as Kahn, Morrison & Wright (1986) have argued, is that aggregating individuals in this way may create the impression of zero-order brand switching from individual higher-order choices, thereby distorting partitioning or segmentation studies. On the other hand, in stationary markets the reliability and validity of a stochastic approach has long been demonstrated beyond household-level panel data, for example in the early individual-level experimental work reported in Bass, Pessemier and Lehmann (1972) or in Charlton & Ehrenberg (1976). In any event data here, as in the commercial setting, are reported at the household level and so care is taken in the analysis to make inferences about individual households rather than individuals.

Analysis is based on the standard reference period of a 12-week quarter. For objectives four and five, periods are accumulated into one 26-quarter span. The focus of the analysis is on brand rather than own-brand, and while this is acknowledged to be a limitation of the research, it will be addressed in later studies. Table 12 demonstrates that on average, the top five brands account for 44% of purchasing in any period. In the initial observations of stationarity, seven or eight competing brands in each category will be considered individually, including some brands with just 1% market share. In the subsequent analysis and model fittings this number will be reduced to the top five brands as shown in Table 15.

7.8 Chapter summary

In this chapter the research approach and design have been expanded and discussed, in order to place the thesis in the domain of marketing science, and to contextualise it within an existing research programme. The contribution to knowledge made here will build upon a very substantial body of work in the field, through systematic replication and extension of prior studies.

In the following three chapters the main findings are presented. In the first of these, empirical observations describe the extent to which stationarity and non-partitioning are maintained over the long term. In the second, known variances from Dirichlet norms are investigated, and in the third, various fittings of the Dirichlet are assessed and findings reported on the limits of Dirichlet theory.

CHAPTER 8. DESCRIPTIVE RESULTS

In response to the first three objectives of the research, results obtained from observing long-term patterns of continuous repeat-buying behaviour are presented. The main findings are that established behavioural patterns very largely persist in a near-steady state, so that Double Jeopardy continues to define non-segmented category structures. Brands are categorised as stationary, near-stationary and non-stationary. Trending share is observed to be exceptional, but while this takes several forms, penetration systematically accounts for any observed change rather more than loyalty.

8.1 Introduction

In this chapter, in response to the first three research objectives, the results of several descriptive analyses are given which identify the scale and scope of market share stationarity over twenty six quarters. The main findings are that:

- Of 18 categories observed, penetration was near-stationary in ten, two showed slight growth and six were in decline.

- Of 150 named brands observed, nearly two thirds were entirely stationary; only ten showed change in excess of six share points, even over six years.

- Patterns of brand buying remained constrained by Double Jeopardy. In dynamic cases penetration changed far more than loyalty so categories remain largely unsegmented.

- Some exceptions were observed, but these occurred at the product level where a functional innovation was changing buying patterns in three related categories, and purchase metrics become volatile as it diffused across competitors. Brand-level buying remained as predicted.

- Share increases were largest for bigger brands, were often driven by exceptional factors in the marketing environment and mostly occurred in categories with declining overall penetration.

The first stage of the analysis was to describe the category context for brand performance and in the next section category penetration findings are presented, before the chapter continues by reporting individual brand level metrics.

8.2 Equilibrium in category-level buying

In markets characterised by split-loyal purchasing, the intensity of competitive rivalry is defined by the evolution of category buying, for example the higher entry barriers brought about by brand loyalty and brand size in established markets, or the rush to acquire new buyers in growing markets (Porter, 1985). Before proceeding to a brand-level analysis it was therefore important to describe the category-level context of the long-term dataset. Findings from that initial investigation might then provide insight into long-term brand performance.

To establish the nature of any changes in category penetration over twenty-six quarters, two methods were used. The first was to tabulate readings to define the scale of any trend and the second was to produce a time plot to observe its shape and any turning points. Figure 3 shows a typical 26 quarter time-series from the analysis, showing an underlying slight upward trend in penetration but with a great deal of variance around this mean. The peaks and troughs are mainly systematic, indicating intense seasonal spikes, uplifting around 15% beyond the mean once a year or so, but falling back below it once again.

Figure 3: Category Quarterly Penetration Run-Plot

Source: Kantar WorldPanel

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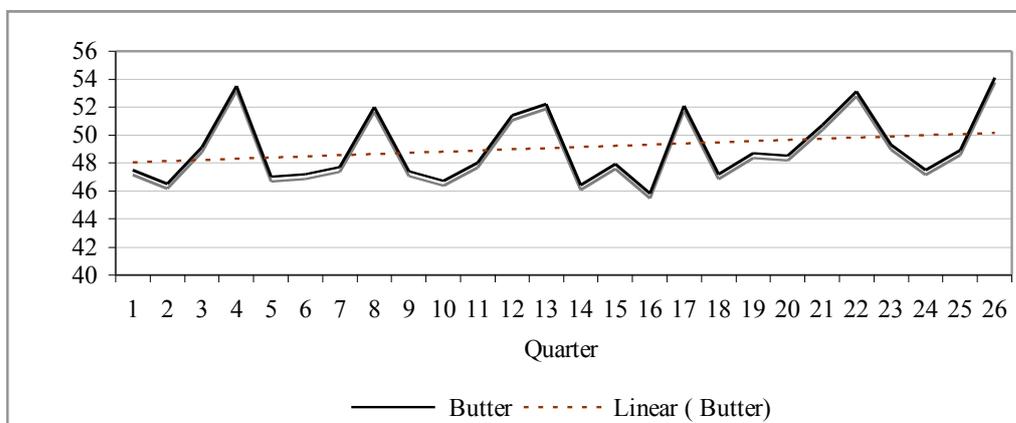
This level of noise makes the identification and comparison of underlying trends difficult, but such fluctuations can be removed before further analysis by adopting a smoothing procedure (Chatfield, 1989) as follows. For each year, an average quarterly value was first obtained and then be compared with an equivalent observation calculated for each subsequent year. The operation was then repeated for each category.

Table 16 presents the values thus obtained for each year in the dataset, and for all eighteen categories, while Figures 4a) and 4b) show the same measures in the form of time plots. From these it is possible to evaluate equilibrium and the scale and shape of any change more easily, in order to assess category-level buying.

Table 16: Six-Year evolution in average quarterly category penetration

Category	Category Penetration (Avg. Quarter)						Y6-Y1
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Stationary							
Crackers	55	55	57	56	57	59	**4**
Hair Conditioner	34	33	35	35	36	36	**2**
Vitamins	21	20	21	20	21	22	**1**
Butter	49	48	49	48	50	50	**1**
Female Deodorant	61	59	60	61	62	62	**1**
Male Deodorant	56	53	54	56	57	57	**1**
Analgesics	35	35	35	36	35	35	**0**
Wrapped Bread	97	96	96	95	95	96	**-1**
Ground Coffee	13	12	11	11	11	11	**-2**
Shampoo	42	40	40	39	39	38	**-4**
Dynamic							
Still Water	14	15	17	20	20	19	**5**
Flexi-P. Cat Food	11	13	14	15	15	15	**4**
Canned Dog Food	19	17	16	15	15	13	**-5**
Margarine	88	87	86	84	83	82	**-6**
Everyday Biscuits	74	72	70	67	68	68	**-6**
Instant Coffee	70	68	66	60	61	61	**-9**
Canned Cat Food	27	25	22	20	18	17	**-10**
Soap	42	37	35	34	32	31	**-11**

Source: Kantar WorldPanel

Table 16 is ordered by descending rate of penetration change, the variance in the final column. The division between stationary and dynamic categories was arrived at following visual inspection of the run plots at 4a) and 4b). Ten categories were

categorised as stationary, three moving from or to a low base were categorised as dynamic, while five categories were clearly in decline.

Figure 4*a*: Category stationarity
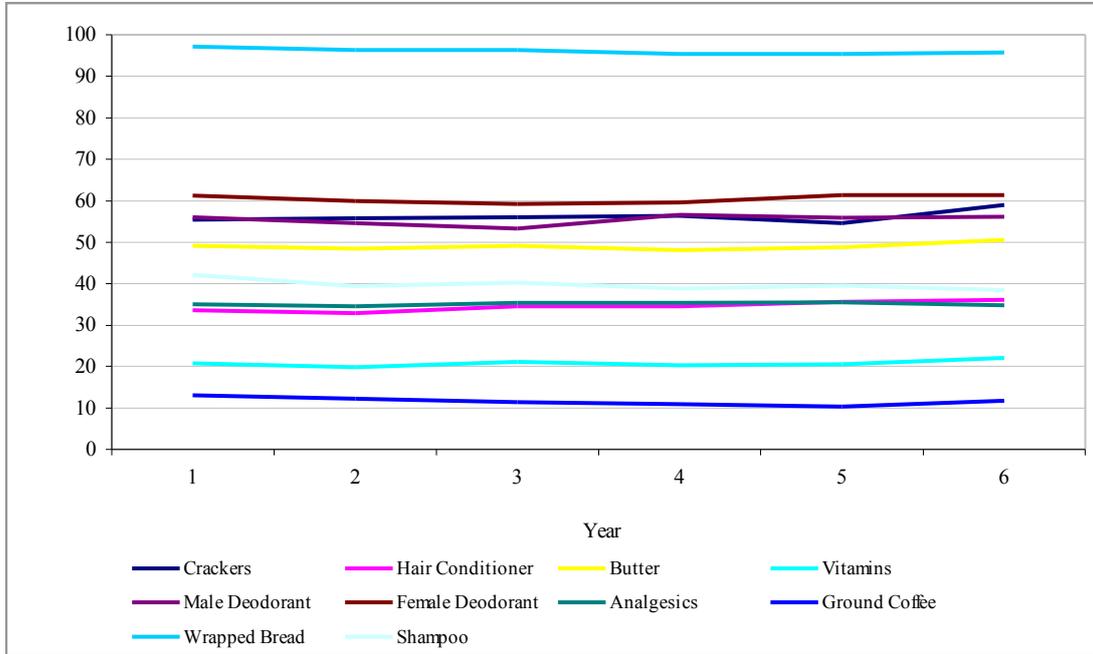
Source: Kantar WorldPanel

Figure 4*b*: Category dynamics
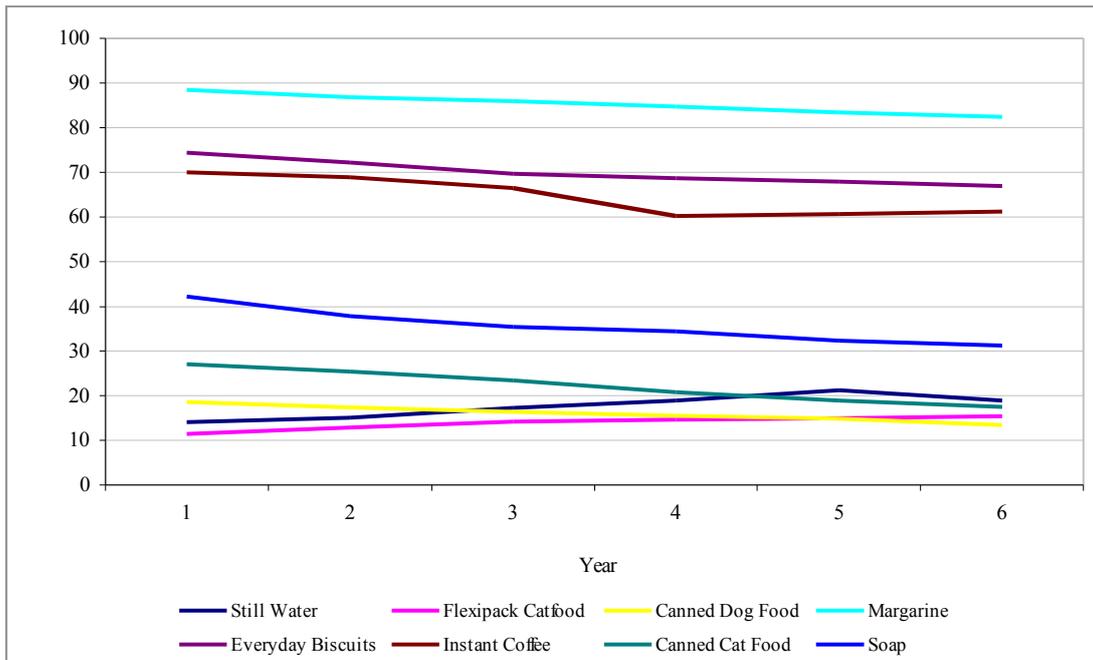
Source: Kantar WorldPanel

The growing and declining time-series in Figure 4*b* show some change in pace in their evolution, for example the Instant Coffee category initially declines slowly, the pace then accelerates and then levels off. On the other hand the Still Water category grows steadily over three years, and then levels out at the fourth. Such well-defined turning points require investigation as they may indicate marketing-driven changes in purchasing propensities towards an individual brand or an external driver for the entire category.

The analysis also confirmed that the data was not apparently biased by systematic reporting fatigue. If such a bias were present it would manifest in a gradual decline in penetration metrics for every category, yet nine of the datasets showed almost total stationarity, four showed slight growth and of the remaining five, only one, Margarine, showed a steady decline. The others displayed one or more turning points, but at different years of the sequence. Taken in conjunction with the closeness of fit between the closing market shares in the full and the continuous panel (see Table 14) this was interpreted to mean that the analysis could proceed to examine evolution in brand level data.

8.3 Brand share stability

Data at the brand level showed the same type of noise as was observed at the category level. Again it was a mixture of seasonal peaks in some cases, coupled with spikes from promotions, which crossed and re-crossed the mean. Figure 5 shows an example of two closely competing brands in the Male Deodorant category. One, Lynx, has a non-trending brand share, while the other, Sure, trends slowly downwards but only by a couple of points across the 24 quarters shown. The offsetting nature of the competitive relationship can be clearly seen, a typical pattern that was repeated regularly in the brand-level data observed. As consumers are polygamously loyal they are able to switch between brands in response to some promotion or new marketing initiative, but are then swiftly switched back by a retaliating action. This effect has long been described in the literature (Bass & Pilon 1980; Lal & Padmanabhan, 1995), and it is generally accepted that the effects of such marketing activities do not persist beyond a few quarters. That appeared to be the case here, where the off-setting

phenomenon (seen at Q5 and at Q8 for example) between the brand shares continued to fluctuate around a near-stationary mean over the period.

Figure 5. Off-setting peaks in market share between competing brands
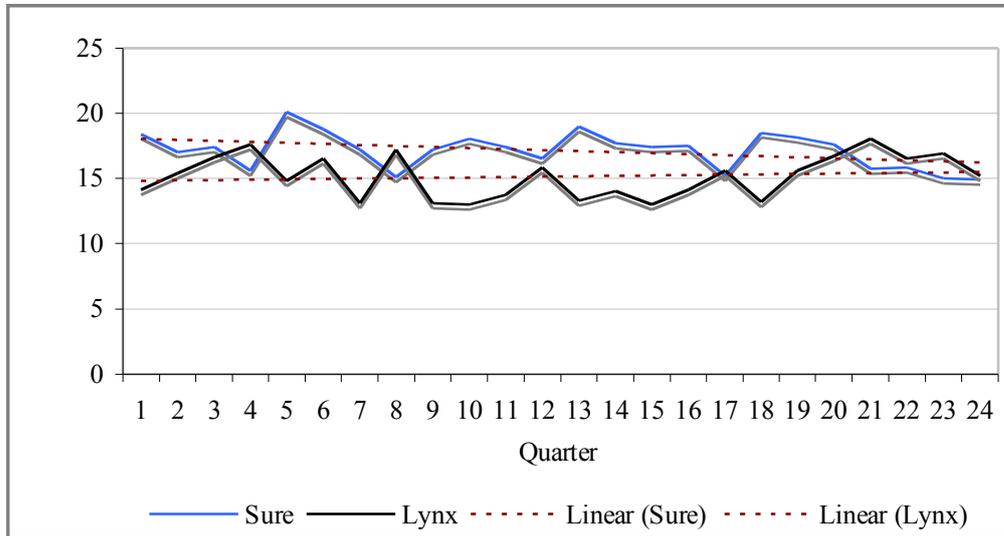
Source: Kantar WorldPanel

The same smoothing technique was consistently applied across twenty-six quarters, to arrive at a complete dataset of average quarterly metrics. The procedure was undertaken only for named brands in the data, and own-label and aggregated entities were removed from the analysis at this point to leave 147 brands (in effect the leading eight or nine in each category). The results then revealed an astonishing and persistent equilibrium in brand shares.

Brand dynamics were categorised at seven levels of absolute share point change between the first and last years, in conjunction with an examination of the time-series plot to identify persistence. The levels were defined as changes of:

- +/- one share point
- from two to three share points up or down
- from four to six share points up or down
- greater than six share points up or down

Table 17 gives an overview of the data, reporting the frequency distribution of brand share change across the seven classes. Well over half the brands (55%) were

found in the first class, remaining within one share point of their opening value, and 81% of the sample remained within three share points. A cumulative total of 93% of the observations remained within the six-point change category, at or less than the equivalent of one share point change for each year in the dataset. A residual total of ten dynamic brands was found, seven showing growth and three decline.

Table 17. Frequency distribution of market share changes

Description	Named Brands	%	Cum. %
No Change (+/-1)	81	55	55
Change +2 to +3	21	14	69
Change -2 to -3	18	12	81
Change +4 to +6	6	4	85
Change -4 to -6	11	8	93
Change > +6	7	5	98
Change > -6	3	2	100
Totals	147	100	

Source: Kantar WorldPanel

Near stationarity therefore appeared to be a norm, not just in a quarter or over a year, but as a competitive condition that extends into the long-term. Even where brand share change was seen, it appeared to be limited to just a few points over many years. In dramatic cases of decline, loss of share was terminal and two of the three brands in this category were subsequently withdrawn from the market. In the extreme cases of growth, gains appeared to be persistent, at least over the term of this dataset.

Such extensive near-stationarity is a new finding and has a number of important implications. Not least of these is that annual market share growth objectives seem hopelessly optimistic for a majority of brands. A second major implication is that in nearly all categories the stationarity assumption of the Dirichlet continues to be met over the long-term.

In order to meet the first research objective, the next stage of the analysis was to examine patterns of repeat purchase, to assess the second Dirichlet assumption of un-segmented structure. These patterns are first reported for the absolutely stationary brands (those that showed only +/- 1 share point change) in the next section, in order to identify benchmarks against which to assess the remainder of the sample.

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8.4 An example of stability in purchasing for one brand

First, buying metrics for a single stationary brand are described, in order to ascertain in a second stage whether they generalised over the entire class. The Lynx brand was selected on the basis that it appears to be a case of target marketing. Brand-share stability could be an indication that sales are supported by a discrete segment of buyers for whom the brand is resonant, and who are manifesting Keller's "intense, active loyalty" (2008). The brand advertising, using the tag line *"Spray More Get More",* would suggest that such a consumer base is being targeted to increase its purchase frequency, so that although the brand meets one Dirichlet assumption in its brand share stability, it would violate the other in having exceptional repeat-purchase and other loyalty measures. In order to examine this, smoothed quarterly performance metrics were analysed in a single year, and then tracked across all six years for the existence of trends.

Two findings emerged. The first was that in Period I, patterns of buying were absolutely as expected. The brand's buyers showed no unusual loyalty. The second finding was that the performance metrics, in common with the market share, remained extremely stable. In other words, there was no evidence for any segmentation in the first year, and none emerged later. Table 18 shows the mean values for each measure across the six smoothed quarters, and the Mean Absolute Deviation for comparison.

The extremely low MAD's demonstrate just how stable all measures remained, while the absence of any observed trend suggests that the average quarterly values represent the first, last or any other quarter in the data against which temporary fluctuations might be assessed. Aggregate buying conforms to the expected patterns and norms. Lynx was bought by 12% of the population in one quarter, and those buyers on average purchased the brand less than twice. In fact, nearly three quarters of the buyers bought it only once, although they bought the category three times in total, giving a Share of Category Requirement of just 50% in a typical period. Lynx buyers in any quarter therefore showed a characteristic split loyalty, and those that did remain loyal (about a third) bought a little less than average for the brand. When evaluated against established Dirichlet benchmarks there was nothing surprising about the buying of Lynx in any quarter over six years.

Table 18: Variance in average brand performance measures over six years

Brand Performance Measure	Avg. Q. Value	MAD
Market Share %	14	0.69
Penetration %	12	0.62
Avg. Purchase Frequency	1.7	0.03
Penetration of once-only buyers (%)	72	0.69
Category Purchase	3	0.04
SCR (%)	50	1.1
Penetration of 100% Loyals (%)	37	1.1
Avg Purchase Frequency of Loyals	1.6	0.03

Source: Kantar WorldPanel

A further analysis was however needed to benchmark the brand against its competitors. This was conducted using the Double Jeopardy statistic, to establish whether Lynx was showing a rather higher than expected purchase frequency, an "excess" loyalty compared with other brands in the category. It would also identify if such loyalty were evolving (although here this second point seemed unlikely given the stability in all measures).

Table 19 puts the Lynx performance measures in their competitive context, laying out category structure with mean market shares and penetrations for the nine leading brands and an aggregate "Other" variable over six years. These are then compared with the average purchase frequency for each, and following Ehrenberg and Goodhardt (1990), with theoretical quarterly purchase frequencies.

The closeness of fit between the two final columns is clear to see, from both the column average and from individual values, yet there are two important exceptions. First, the fit is poor for "Others". This is to be expected since it is an aggregate consisting of many small brands (with low purchase frequencies) and a few large own-brands (with relatively low penetrations). Second, while the model exactly predicts purchase frequency for the brand leader Sure, there is a small variance for Lynx, which shows a slight "excess" loyalty. Lynx has the highest buying rate for any single brand, and a little beyond its anticipated value, an example of the market share premium although not an extreme case (MAD = 0.03).

Table 19: Double Jeopardy in average quarterly purchasing

Brand	Observed Share %	Observed % Buying	Average Frequency of buying the brand	
			Observed	$\dfrac{w_o}{(1-b)}$
Other	49	35	1.9	2.2
Sure	16	14	1.6	1.6
Lynx	14	12	1.7	1.6
Rightguard	7	6	1.6	1.5
Gillette Series	3	3	1.4	1.4
Adidas	3	3	1.4	1.4
Vaseline	3	3	1.4	1.4
Arrid	2	2	1.5	1.4
Physio Sport	2	2	1.4	1.4
Brut	1	1	1.3	1.4
Average	10	8	1.5	1.5

Source: Kantar WorldPanel. DJ category constant = 1.4

In short, the fit of the Double Jeopardy statistic across the category, including its prediction for Lynx, demonstrates that Lynx buyers are simply typical category buyers. Their multi-brand loyalty and heterogeneous purchasing are predictable and habitual. What is new is that these patterns of buying remain so entirely stable over time that future brand purchasing-rates can be simply modelled to describe the long-run nature of repeat-purchase loyalty. The question is whether the male deodorant category is exceptional in this, or if the same patterns generalise to fit other product fields in the study.

8.5 Underlying purchase behaviour for stationary brands

Having established the extent and scope of equilibrium for a single brand, the analysis was next extended to the 81 brands identified in Table 17 with share changes of plus or minus one per cent. This would then provide a benchmark for equilibrium against which results in the remaining distribution of near-stationary brands could be compared.

For the steady-state brands, Table 20 presents the main performance measures calculated as before but as an average value for the set, for the average quarter in the first year, and then in subsequent years. As might be inferred from the equilibrium characteristic of the brand shares, these means remained almost unmoving from start

to finish. The observed stability in purchasing seen for Lynx was therefore generalised across half the dataset. It can be seen that the majority of the stationary brands are small, with an average market share of 4%, but stability is not confined to small brands alone. The set also contains ten brands with double-digit shares, including Nescafe instant coffee (42%), McVitie's biscuits, and Lynx deodorant (both around 14%). The measures in the table reflect the typical multi-brand loyalty patterns, but further describe their extension over time. There is no question that behavioural loyalty persists over the long-term. Indeed it is maintaining the stable market shares seen for the brands in the Table, yet it remained predictably split across competing brands, and from this analysis there was no evidence that any emerging customer or brand equity outcomes were creating a competitive advantage to upset established category structure.

Table 20: Stability in repeat-purchase for 81 brands over six years

Brand Performance Measures	Average Quarter in each year						Avg.
	I	*II*	*III*	*IV*	*V*	*VI*	
Market Share	4	4	4	4	4	4	4
Penetration %	4	4	4	4	4	3	4
Purchase Frequency	2.1	2.2	2.1	2.1	2.1	2.1	2.1
Once-Only Buyers %	65	65	65	65	66	66	65
Category Purchase	7	7	7	7	7	6	7
SCR %	41	42	42	41	42	43	42
Penetration of 100% loyals	31	32	32	31	32	33	32
Purchase Frequency	2.6	2.6	2.5	2.3	2.4	2.4	2.5
DJ w_o (81 brands)	2.0	2.1	2.0	2.0	2.0	2.0	2.0

Source: Kantar WorldPanel

Quarter after quarter the average brand in this set showed a share of four percent in its category. It was bought by four percent of the population who bought it just over twice on average in each period. Some bought far more, some much less than this; since two thirds of its buyers bought it only once in the quarter, a few bought it far more often than the average. These patterns are absolutely normal in one quarter, and it is well established that they should repeat from one quarter to the next over a year or two. It can now be seen that they appear to be as regular and precise as Swiss clockwork in the long term, here repeating regularly over twenty-six quarters.

Category and brand buying exactly follow established loyalty norms in every year. The average brand buyer shops the category seven times in a quarter, but devotes less than half of those choices to that brand. The proportion (SCR) of those purchases then barely changes from quarter to quarter and from year to year.

Of course there are loyal buyers in each period. In each quarter about a third of a brand's customers bought no other brand, although their purchase frequency remained at about the brand average, as expected. If anything, Table 20 shows that the purchase rate for sole-brand loyals declined slightly over five years. The conclusion must therefore be that any marketing efforts undertaken to increase the long-term value of loyal customers have had no discernible effect. The stability in penetration and average purchase frequency, and the regularity in all loyalty measures presented, confirm that these brands are not developing any exceptional behavioural loyalty.

Perhaps this is not surprising, since the data so far described contains only brands selected on the basis of their stationarity, yet the fact remains that these account for the majority of all cases observed. Attention was therefore then turned to the more volatile remaining brands, in order to complete the description of the nature and extent of market equilibrium and the patterns of repeat buying behaviour in long-term market data.

8.6 Underlying purchase behaviour for dynamic brands

Beyond the 81 stationary brands, a further 39 changed share by less than three points, 17 by less than six points, and a further ten brands gained or lost over six points. The biggest gaining brand in the dataset was Felix cat food in flexi pack format. The brand increased its share over the period from 18% to 28%, most of the increase being seen over the final two years. In order to understand the purchasing behaviour underlying this increase, the main performance metrics were isolated, as shown in Table 21.

This shows a dramatic surge in share in the final two years of the period, and it can be seen that some of this increase was accounted for in a substantial penetration growth (around 60% increase from *I* to *VI*), that followed the market share increases in the second half of the data. Growth was also fuelled by an increasing average purchase frequency (by over 100%), which was gradual over six years, suggesting

that a growing number of buyers were becoming increasingly loyal. In order to assess this interpretation, the Double Jeopardy constant was calculated for the category in Period *I* and then applied to the brand penetrations across the time-series to predict the expected purchase frequencies of the brand, a similar analysis to that conducted for Lynx buying in Table 19.

Table 21. Felix flexi-pack performance measures over six years

	Average quarter in each year					
	I	*II*	*III*	*IV*	*V*	*VI*
Market Share	18	18	20	18	23	28
Penetration	5	5	5	6	7	8
Purchase Frequency (O)	6.1	6.9	7.7	8.5	10.7	12.7
Predicted Frequency (T) (w_o = 6.2)	6.5	6.5	6.5	6.6	6.7	6.7
Variance in w (T-O)	0.4	-0.4	-1.2	-1.9	-4.0	-6.0

Source: Kantar WorldPanel

The model does not fit. Purchase frequency was initially under predicted, even in the period from which the constant was calculated. The subsequent variances in the opposite direction between theoretical and observed measures became increasingly large indicating that buying behaviour for the brand was changing fundamentally and could not therefore conform to the generalised patterns. Further analysis was therefore necessary to discover if this was an unusual case of successful "anything goes" marketing, or if dynamic brands generally break known empirical generalisations. If so, the exception established here would support the customer equity concept, since Felix appeared to be attracting more buyers who bought far more often than the category norm allowed.

In examining the data it became clear that three of the eighteen categories were exhibiting dynamic patterns of overall category buying and brand share evolution. These dynamics, all in pet food, were caused by a disruptive innovation (Christensen, 1997) where new pouch-style flexi packaging was being introduced. The new packaging format offered an important consumer benefit, a single serving, but also required a change of behaviour in that purchase frequency must be increased for those households adopting it. The innovation successfully encouraged consumers first to switch brands to enjoy a meaningful benefit, and then as more brands adopted the innovation, to switch between formats within the brand.

In order to contextualise such volatility, Figure 6 shows a time-plot of buying measures for the entire Felix brand, both flexi packs and the original canned varieties. It can be seen at the top of the chart in yellow that total brand share (sales of both old and new formats) was almost stationary, varying within one or two points of its mean of 22%. The next plot (grey) is the brand penetration. This declined steadily over the period from 16% to 13% (but in line with a steady four point fall in total category penetration, not shown in the figure). These measures are compared with the purchase frequency (purple) for the entire brand, again almost stationary at an average of 11 times per quarter. In other words, the *total* brand performance was almost completely stationary. The final two plots reflect the dramatic changes that supported this equilibrium: the steeply declining plot is the purchase frequency of the canned variants which is falling away in line with penetration and market share (Felix in cans shows one of the biggest falls in market share in the data set). The flexi pack variant was launched just before the start of the continuous panel and its steep rise in the final plot reflects its adoption and expansion in household repertoires. The increasing purchase frequency of the flexi pack is thus a functional outcome of a smaller pack size, coupled with within-brand switching.

Figure 6. "Total Brand" performance measures for Felix cat food
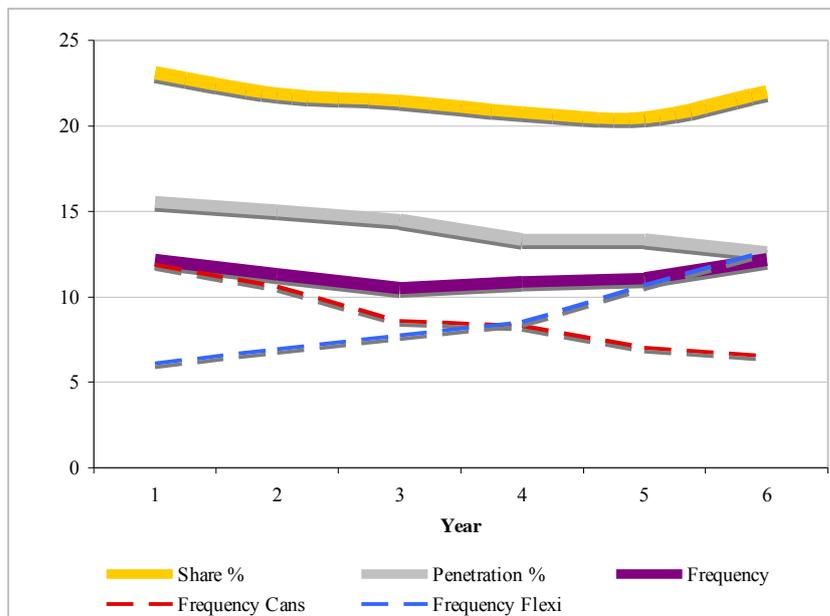
Source: Kantar WorldPanel

The analysis led to several conclusions. First, market share is not a simple measure of performance, and must include the context in which any gains or losses in share are achieved. Second, it is clearly possible to change consumer behaviour, including behavioural loyalty, but in this case, as with Tassimo earlier, the increases in purchase frequency were due to functional changes in category usage rather than to changes in brand attitude. Analysis of further dynamic brand performance would confirm the predicted existence of brand equity outcomes. Nevertheless, marketers at Felix had maintained overall share despite dramatic customer movements, and brand and category penetration remained in line, indicating that existing buyers had likely been retained by the brand despite the fundamental change in offer. Third, even at the total brand level, a small drop in penetration was matched by a slight increase in purchase frequency. This runs counter to the laws of marketing and does not reflect the steady DJ relationship seen for the many stationary brands. It means that this brand and its category are clearly exceptional.

Given that the analysis of pet food may have been conducted at a variant rather than at the category level, three pet food datasets were removed from the analysis before considering the other dynamic cases. Brand variants and extensions are expected to follow Dirichlet norms almost instantly (Singh, Ehrenberg & Goodhardt, 2004; 2008; Singh, Scriven, Clemente, Lomax and Wright, 2012), but in these categories, undergoing the punctuated equilibrium defined by Pauwels *et al*. (2007), equilibrium is returning more slowly than expected. They will form a part of a later analysis but next, buying for the remaining brands was analysed to identify the presence or absence of Dirichlet patterns there.

8.7 Dynamic brands in fifteen categories

Thirty-two pet food brands in three categories were removed from the dataset. About half of these (18) showed share point changes in the first (+/-1%) category, but the rest were exceptionally volatile. From the full dataset, of the ten dynamic outliers identified, four were pet food brands.

The remaining brands were classified in their defining tiers, and average quarterly performance measures calculated for each tier in each year. These values are shown in Table 22, along with the stationary brand measures to provide a comparator.

Table 22. A comparison of performance measures for 115 brands in fifteen categories (excluding petfood).

Performance measures by class for 115 brands	No. of Brands	Average Quarter in Each Year						VI - I
		I	*II*	*III*	*IV*	*V*	*VI*	
	115							
Market Share								
Over 6	5	10	12	14	16	17	18	7.8
From +4 to +6	6	10	12	13	14	14	15	5.0
From +2 to +3	19	4	4	5	5	6	6	2.3
Stationary	**63**	**4**	**4**	**4**	**4**	**4**	**4**	**-0.1**
From -2 to -3	15	8	8	7	7	6	6	-2.5
From -4 to -6	6	12	11	10	9	9	8	-4.8
Over 6 points	1	9	9	5	2	2	1	-8.4
Penetration								
Over 6	5	13	14	16	16	17	18	5.0
From +4 to +6	6	16	17	17	18	18	18	2.0
From +2 to +3	19	3	3	4	4	4	4	1.4
Stationary	**63**	**4**	**4**	**4**	**4**	**4**	**3**	**-0.4**
From -2 to -3	15	6	6	5	5	5	5	-0.9
From -4 to -6	6	7	7	6	6	5	5	-2.6
Over 6 points	1	7	7	4	2	2	1	-6.3
Avg. Purchase Frequency								
Over 6	5	2.9	2.9	3.0	2.8	2.9	2.9	0.0
From +4 to +6	6	2.5	2.7	2.7	2.7	2.7	2.7	0.2
From +2 to +3	19	1.7	1.7	1.7	1.7	1.8	1.8	0.1
Stationary	**63**	**1.8**	**1.8**	**1.8**	**1.7**	**1.7**	**1.7**	**-0.1**
From -2 to -3	15	1.7	1.7	1.6	1.6	1.5	1.4	-0.2
From -4 to -6	6	1.8	1.7	1.7	1.5	1.5	1.5	-0.3
Over 6 points	1	2.8	2.8	2.2	1.9	1.9	2.0	-0.8
w(1 - b)								
Over 6	5	2.5	2.5	2.5	2.3	2.4	2.4	-0.1
From +4 to +6	6	2.1	2.2	2.2	2.2	2.3	2.2	0.1
From +2 to +3	19	1.7	1.6	1.7	1.6	1.7	1.7	0.1
Stationary	**63**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**0.0**
From -2 to -3	15	1.6	1.6	1.6	1.5	1.4	1.4	-0.2
From -4 to -6	6	1.6	1.6	1.6	1.4	1.4	1.4	-0.2
Over 6 points	1	2.6	2.6	2.1	1.9	1.8	2.0	-0.6

Source: Kantar WorldPanel

Whereas these remain almost invariant it is clear that the other levels of the distribution behave rather differently over time. A Double Jeopardy statistic was thus calculated for each tier in order to estimate the nature of the relationship between the main performance metrics of penetration and purchase frequency. If this remained relatively constant for the dynamic brands, it would indicate that loyalty and penetration were changing in an expected ratio, maintaining the Double Jeopardy relationship. This would support Anschuetz (2002) and Sharp (2010). If not, then

further investigation at the individual brand level would be required since growth could be resulting from segmentation and evolving excess loyalty.

As for the declining brands, very little has yet been reported about how these should behave over time, but again it might be expected that the same DJ relationship would hold, with purchase frequency declining in line with the number of buyers in an approximately steady relationship, necessary to maintain equilibrium in overall category buying.

The buying metrics revealed a very clear picture of the evolving patterns that drive change in share. First, there is a relationship between brand size and absolute brand share change as Caves *et al.*, (1978) suggest. The four categories of more dynamic brand, those with growth or decline in excess of three points, have an average "opening" share of ten percent, more than double the average of four for stationary brands. On the other hand, relative share growth in this data is not inversely proportionate to brand size as they suggest. The greatest *relative* increases and decreases seen were also in line with brand size (e.g. relative changes of +78% and -93% for the most dynamic and largest brands, but +50% and -40% for the next tier in, and so on), which was slightly surprising, although only the top four brands in each category were considered by Caves *et al.*, in their analysis of the PIMS database. In any case, findings suggest that market power is closely related to growth potential, but offers little or no defence in decline.

Care must however be taken when drawing conclusions from the lowest tier in this data, since it consisted of only one brand, St Ivel butter, which was being withdrawn from the market over the period.

What is far clearer to see is the close relationship between penetration and share change, which is completely in line with earlier empirical investigations (Anschuetz, 2002; Baldinger *et al,* 2002; Bennett *et al.*, 2010; Sharp, 2010). Penetration rises for growing brands, and declines for shrinking ones, sometimes dramatically but generally at the same rate and in proportion to share change, so that the correlation between share and penetration classification variances in this data is extremely high ($r = 0.98$). In order to grow, a brand must acquire more buyers; in decline brands lose buyers in line with their loss of market share.

The changes in average purchase frequency were far less marked, but still appear to grow and decline largely in line with share changes. The relationships showed one surprising exception. For the fastest growing brands, purchase frequency

hardly changed. This is because, of the five brands contained in the class, four are in declining categories; their share growth was related to maintaining rather than improving performance measures in the face of category decline. For a successful brand in these circumstances, stable buyer numbers translate into penetration growth simply reflecting their greater proportion of declining category buyers. Combined with steady average purchase frequency the end result is an increase in share. This is shown graphically in figures 5*a* to *c*.

As a result the correlation between penetration and purchase frequency variances although high ($r =0.87$), was not quite so close. The relationship across this dataset was generally maintained in growth, stationarity and decline as the Double Jeopardy constant reflects, even in the most extreme cases, indicating that category structures are un-segmented.

In summary, the first research objective called for a description of the nature and extent of market equilibrium and the patterns of continuous repeat buying behaviour in long-term market data. Such an analysis had not been conducted before to the best of the researcher's knowledge, and several new findings have been presented. First, penetrations in established markets appear to remain largely stable over time. In a dataset of eighteen categories, eleven were categorised as stable, two were seen as growing and five showed gradual decline over six years. Within the competitive context, off-setting marketing effects were clearly seen to hold a majority of brands in absolute or near-equilibrium, although a few outliers grew or declined quite substantially. Patterns of repeat buying took two forms. In the normal condition, observed in fifteen of the eighteen categories, buying remained predictably constrained by the Double Jeopardy relationship in growth, equilibrium and decline. In three exceptional categories, functional product innovation was driving changes in category buying patterns, and for the time being, despite near-stationarity being observed at a total brand level, the Double Jeopardy relationship was not seen to hold as packaging changes drove increases in purchase frequency and innovation diffused across the population and competitors.

In the next section the second research objective will be addressed, before the analysis returns to these dynamic cases in order to respond to the third objective.

8.8 Definitions of stationary and near-stationary performance

The second research objective requires a definition of stationarity in order to be able to identify ***non-***stationary brands. Remember that in the full dataset well over half the brands (55%) were found to have shares that remained within one point of their original position. If a definition of "stationary" were extended to include the plus-or-minus three share-point category (less than half a point change per year), a further quarter of the sample would be classified as such, an equilibrium proportion of 81%. This finding is relatively close to results reported in Dekimpe & Hanssens (1995a) who conducted a meta-analysis of studies covering over 400 markets. Using an econometric test of evolution, they reported stationarity in 78% of cases observed. The near-replication of that finding confirms this level of equilibrium to be approximately normal, but extends it in showing that it is more enduring than previously thought.

Figure 7. The distribution of share changes
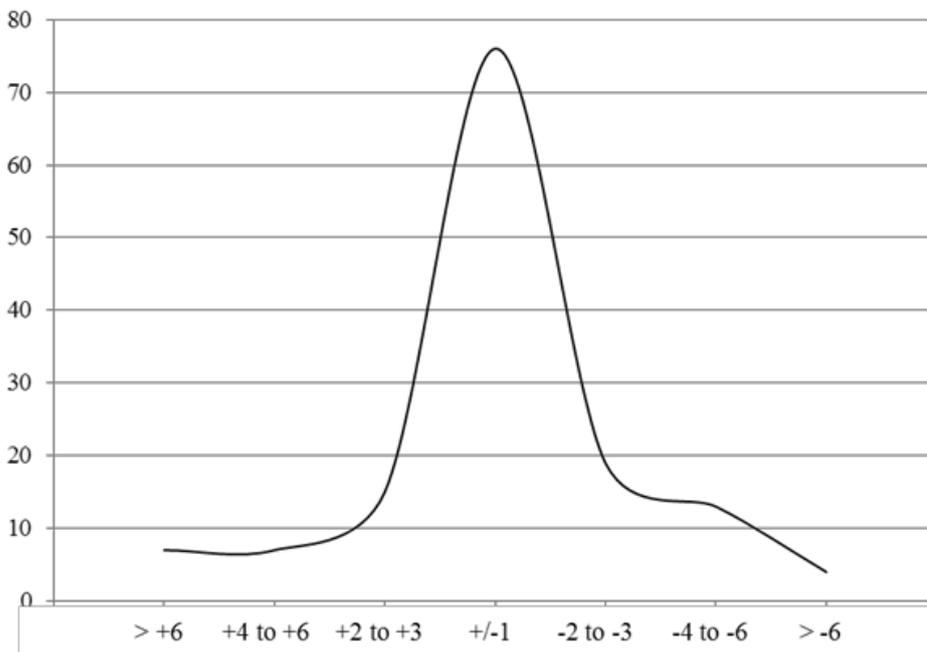
Source: Kantar WorldPanel

A second broad classification of "near-stationary", or "near steady-state" is frequently given in the literature (e.g. Ehrenberg, 1988; Ehrenberg *et al.*, 2004) and it is proposed to adopt this definition for brands with shares evolving more than three points but less than six points across the period. Using this classification, 93% of the

brands observed are stationary or near-stationary, leaving a residual total of just ten dynamic brands, seven showing growth and three in decline.

In support of these definitions, the distribution of the share-change frequencies in the full dataset was found to be approximately normal (Figure 7) and very tightly bunched around the stationary frequencies, although slightly uneven in its tails, with rather more growing than declining brands. This distribution has a mean of zero, and a standard deviation of 3. The shape of the distribution, the regularity in purchasing generally, and the earlier *"few points up or down"* definition all contribute to the justification for the broad definitions now suggested, so that stationary brands sit within one SD of the mean (+/- 3 share point change), near-stationary brands are between one and two SD's of the mean (+/- 3 to 6 share point change) and non-stationary brands are beyond two SD's and are therefore those that grow or decline by more than six absolute share points between the start and finish of the period. Adopting this definition of stationarity, ten non-stationary brands are now identified in Table 23.

Table 23. Ten dynamic outliers

Brand	Category	Market Share						
		I	*II*	*III*	*IV*	*V*	*VI*	*VI - I*
Felix	Catfood (Flexi)	18	18	20	18	23	28	**10**
Kenco	Instant Coffee	8	9	15	16	16	16	**8**
Flora	Margarine	16	19	22	22	24	25	**8**
Country Life	Butter	5	6	7	9	13	13	**8**
Dove	Soap	14	16	17	19	21	22	**8**
Winalot	Dog Food (Can)	8	13	13	15	12	15	**7**
Warburtons	Wrapped Bread	8	10	11	12	13	15	**7**

137 other brands in declining rank order
between +6 and -6 absolute share point change

Brand	Category							
St Ivel	Butter	9	9	5	2	2	1	**-8**
Friskies	Catfood (Flexi)	11	14	13	2	1	1	**-10**
Felix	Cat Food (Can)	24	23	21	20	17	14	**-10**

Source: Kantar WorldPanel. Data are rounded. Full table contained in Appendix.

The table shows that of these ten exceptional brands, seven have grown and three have declined in excess of the six-point benchmark. Four of the brands are pet-foods, emphasising once again the profound effect of repeat-purchase turbulence on category

structure; the remaining six brands are in five categories, Instant Coffee, Margarine, Butter, Bread and Soap. They are of very different sizes, with shares ranging from 24% to just 5%, and dynamics ranging from plus ten to minus ten absolute share points over six years. It is also clear that growth and decline have taken several forms, from the sudden jump in popularity of Kenco and Flora to the sudden death of Friskies or the gradual rise of Warburtons over the period. Despite these dramatic differences in performance, there are some generalising observations, and these are described in the final sections of the chapter.

The second research objective has thus been met, extending existing knowledge of long-term category equilibrium at the sales level derived from scanner data (for example in Dekimpe & Hanssens, 2000; Pauwels, 2007; Srinivasan et al, 2000; Van Herde et al., 2004) to the underlying behavioural level described in continuous household purchasing records. A definition of stationarity has been developed from data observation and from the literature, and then applied to the dataset to categorise stationary, near-stationary and non-stationary brands. From this analysis only ten dynamic exceptions have been identified, confirming a prolonged and widespread persistence in the established patterns of repeat buying over many brands and categories. The finding extends current knowledge of the first Dirichlet assumption, that of equilibrium in buying, and partially supports the second, non-partitioning, which is further examined in response to the remaining objectives.

8.9 The shape and context of brand growth & decline

Market share growth or decline may be driven by factors beyond the control of brand marketers, who look to achieve a strategic fit with their environment to achieve competitive advantage. The third research objective is to understand the changes in buying patterns attaching to the ten exceptional brands and the first task is to contextualise these changes in the same way that pet food buying has been described. A context is presented for the five remaining categories and Figures 8*a* to 8*e* show the shape of the main metrics in time-series for analysis.

Dove Soap (+ 8 points) According to Mintel (2004), the bar soap category was declining over this period as households switched to newer liquid alternatives. It can be seen in Figure 8*a* that category penetration dropped by nearly a quarter over six

years. At the same time, two brands increased their market share dramatically, one, Dove, from 14 to 22% the other, Imperial Leather, tracking it closely. The dotted lines represent the penetrations of the two brands, from which it is clear to see the characteristics of equilibrium, so that their customers continued to buy these brands as normal, while overall category penetration fell away. The result is a dramatic increase in share.

Figure 8*a*: Brand dynamics in the soap category
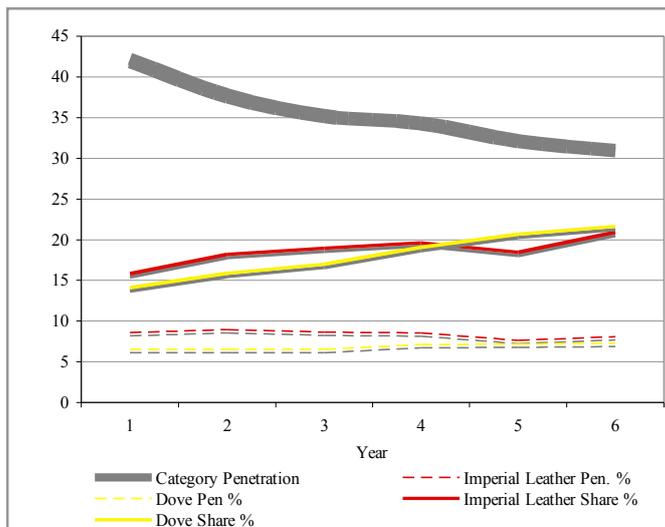
Figure 8*b*. Brand dynamics in the instant coffee category
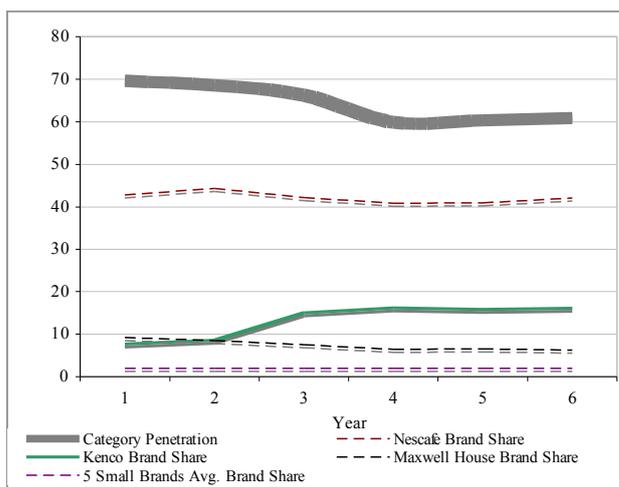
Kenco instant coffee (+8 points). According to Eggleston (2000), Kraft Jacob Suchard (KJS) launched an extension to its Kenco brand (Rappor) in this period. The objective was to increase overall category penetration by attracting young, non-

buyers, and the support budget is quoted as £20m over three years. Figure 8*b* shows category penetration declining by around ten points, but the rate appears to slow following the launch of Rappor. Nescafe dominate the category with a 45% share, which remains near stationary, but Kenco's share doubles, jumping from eight to sixteen percent, a persistent improvement. The higher dotted line in the plot represents the Maxwell House share, which appears to decline as a result. Maxwell house is a KJS brand. A duplication of purchase analysis in Graham (2009) confirms that the launch drew disproportionately from Maxwell House buyers.

Yellow fats; Flora (+ 8 points), Country Life (+8 points) & St Ivel (-8 points). The yellow fats category includes both butter and margarines. The latter segment is declining. Figure 8*c* shows overall penetration reducing by ten points over the period and Mintel reports that this is due to the introduction of spreadable butters in the other side of the category (Mintel, 2005b). Unilever dominates in margarine, with several brands accounting for just under half of all sales, the biggest being Flora.

Figure 8*c*. Brand dynamics in the margarine category
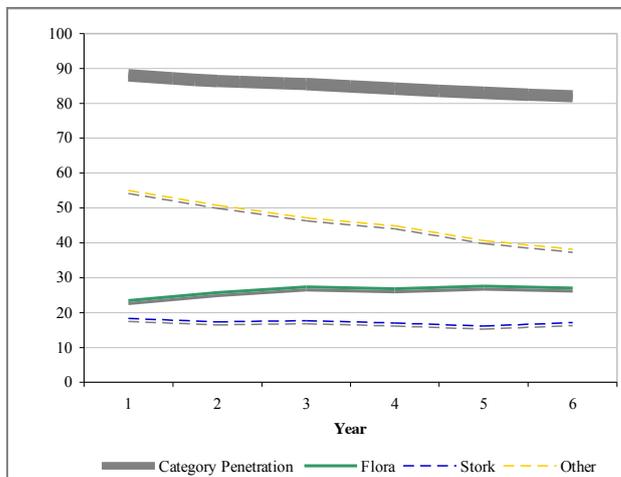
During this period several new variants were launched offering additional health benefits, which expanded market share incrementally (Mintel, 2005b) as seen in the figure, an eight point rise. A second Unilever brand, Stork, remained near-stationary over the dataset and this is shown for comparison. Brand ownership in Yellow Fats underwent substantial change over this period, with consequent realignment of portfolios and marketing spends. At the start of the analysis Dairy Crest, owner of

Country Life butter acquired St Ivel's branded spreads, and eighteen months later Arla Foods formed a joint venture that gave it control not just of Lurpak, but also of Anchor butter (The Grocer, 2002).

Figure 8d. Brand dynamics in the butter category
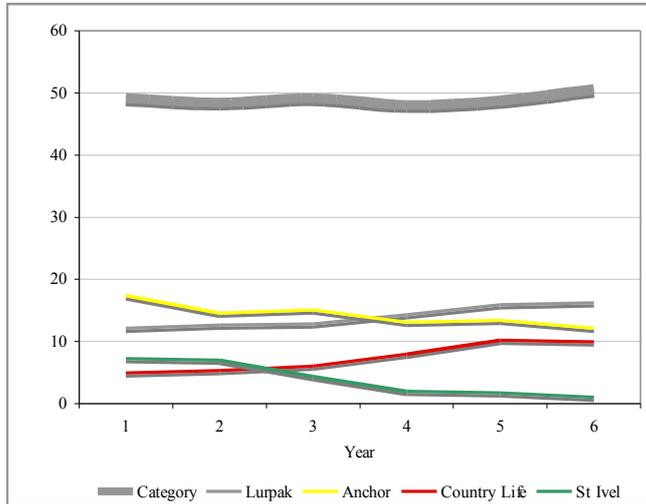
Figure 8d shows the results. Category penetration remained stationary at around 50%; St Ivel butter was withdrawn from market (-8 points) but Country Life, benefiting from a spreadable brand extension and additional support (Mintel, 2005b), added eight points. The Arla brands also changed places so that Anchor declined, but Lurpak attained a leadership position due to new spreadable and light versions (Mintel, 2005b).

Warburtons (+7 Points). The wrapped bread category shown in Figure 8(e) can be seen to have a stable and almost total penetration. The second plot represents own brand penetration, which declines from about 90% to around 80% over the period. Mintel (2005a) reports that during this study a reliance on price-cutting was reduced and more premium strategy introduced by retailers. This left a space for brands, and three emerged to dominate the market; Hovis, Kingsmill and Warburtons. Shares for each can be seen to gradually trend upwards over the period, but Warburtons grew fastest since it expanded its distribution from its northern base and invested in new plant to become a national brand during this time. A year after the dataset ends, AC Nielsen rated Warburton as the UK's second most valuable brand after Coca-Cola (Mintel, 2007).

Figure 8*e*. Brand dynamics in the wrapped bread category
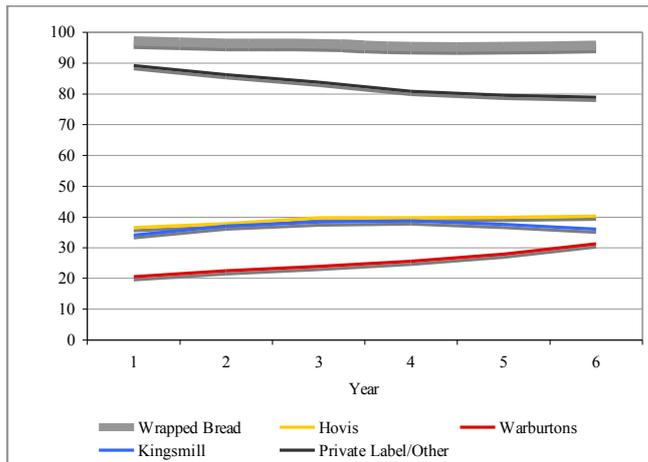
It can be seen that in each of these seven cases and in the three pet food examples (Felix cans and pouches and Winalot cans), exceptional forces sometimes beyond the category level, have influenced extreme brand dynamics. For Wrapped Bread an opportunity arose because retailers wanted added value; Warburton were ready and able to invest in their business to expand and supply it. For Yellow Fats changing brand ownership brought new money, innovation, and the strategic withdrawal of brands to create space in the butter category.

Brand size is also a success factor. Exceptionally dynamic brands are bigger than near-stationary brands. Flora, Felix and Dove were on average achieving a quarter of all category sales by the end of the period. The biggest brands have the most customers who buy most often. This amplifies the effects of increases achieved by successful brand innovations, and supports brand maintenance in declining markets.

A generalising finding is that brand share can grow in a declining market through customer retention. In Margarines, Coffee and most obviously in Soap, buying for one or two brands stayed stable while the category declined. Share must then by definition increase. It is this phenomenon that led to the Double Jeopardy variance in Table 22, where a lower than expected average rate of purchase for fast growing brands was caused by the stability in purchasing in the Soap category for Dove and Imperial Leather.

Finally, as John-Philip Jones suggests (1990; 2004), outspending share of market can also increase rather than maintain that share, so that the Kenco performance, and growth for Felix and Whiskas was being supported by extraordinary

promotional expenditure. The important point here is that it appeared to do nothing for purchase frequency; growing sales were related far more to penetration than to loyalty, (with the exception of the functional changes in pet food packaging) as Table 21 showed. Even when brands demonstrated extremely dynamic characteristics this relationship appeared to prevail, but a further examination of loyalty measures was undertaken to confirm the picture.

8.10 The evidence for brand & customer equity

The final part of the analysis was to observe specific loyalty measures across all brands and categories in order to identify emerging loyalty-based segmentation. All loyalty measures in stationary, un-partitioned markets must change together (Ehrenberg et al., 2004), and so for the classes of stationary, near-stationary and non-stationary brands the evolving loyalty metrics are now presented and discussed following the example in Table 1. This will give some insight into any changes to the structure of underlying buying heterogeneity and the differences between growing, declining and stationary brands. Given that the pet food categories have already been identified as exceptions, this analysis was conducted on the same basis as in Table 22, that is, for the remaining brands in fifteen categories.

The first measure in the table is the average proportion of "light" buyers for brands in each class, those that bought only once in a quarter. If a customer base becomes exceptionally loyal, and partitioning develops, it would be expected that this proportion would fall dramatically, as fewer buyers bought more heavily. For bigger brands that have slightly more loyal customers this proportion is expected to be lower than for smaller brands, and in this table that pattern can be seen. The more dynamic brands are larger, and around a half of their customer base consists of light buyers. For smaller brands this rises to about three quarters. It has been noted that the penetrations of dynamic brands changed considerably, especially for the fastest growing and declining examples, and yet these proportions of light buyers remained quite stable for growing brands, declining only slightly in line with rising market share. A surprising feature of the declining brands is that the proportion of light buyers was falling here too. This may mean that as a brand declines its loyalty increases! The finding is not so counter-intuitive. Light buyers may be the first to

defect (more properly, not repeat) since a declining brand may be becoming less physically available, leaving a hard core of the brand's heavier buyers. This is further evidence of the crucial sales importance of very large numbers of light buyers in maintaining brand share.

The next set of measures describes share of category requirement. Again, if loyalty were to drive sales then more buyers would have to buy the brand more often, increasing its role in the household repertoire. For every tier in the analysis, the first measure, category purchase frequency remains almost completely stationary. This means that underlying category purchase behaviour remains in equilibrium for whatever buyers the brands have in the period. When shares change therefore either the ***number*** of buyers is moving or brand choices are being distributed differently across competitors. To assess this, the Share of Category Requirement metric describes each brand's share amongst its own buyers. In Table 24 this behaves absolutely as expected: SCR is rising, and faster for bigger brands, falls for declining brands and is completely stable for the stationary brands.

The final measures describe sole brand loyalty – not brand resonance but mostly light buying. Nevertheless, these measures grew and declined a little with brand size, as expected. In short, from this analysis of loyalty metrics there were no exceptions to the pattern established in short term data. Brand dynamics were not driven by purchase frequency beyond what was predicted by Double Jeopardy.

Table 24: Loyalty measures for 115 brands over six years

	No. of Brands	Average Quarter in each year						*Avg*
		I	*II*	*III*	*IV*	*V*	*VI*	
	115							
Once-Only Buyers								
Over 6	5	45	45	43	43	42	43	43
From +4 to +6	6	57	56	54	55	53	54	55
From +2 to +3	19	72	74	73	74	69	71	72
Stationary	**63**	**68**	**68**	**68**	**68**	**69**	**69**	**68**
From -2 to -3	15	69	70	70	73	68	64	69
From -4 to -6	6	72	73	73	58	59	59	66
Over 6	1	48	46	59	62	65	63	57
Share of Purchasing								
Category Purchase								
Over 6	5	7	7	6	6	6	6	6
From +4 to +6	6	8	7	7	7	7	7	7
From +2 to +3	19	4	4	4	4	4	4	4
Stationary	**63**	**6**	**5**	**5**	**5**	**5**	**5**	**5**
From -2 to -3	15	3	3	3	3	3	3	3
From -4 to -6	6	3	3	3	3	3	3	3
Over 6	1	6	5	5	5	5	5	5
SCR								
Over 6	5	50	51	55	56	58	58	55
From +4 to +6	6	46	50	51	52	53	54	51
From +2 to +3	19	46	47	48	48	50	50	48
Stationary	**63**	**43**	**44**	**43**	**43**	**44**	**44**	**43**
From -2 to -3	15	53	53	54	52	48	48	51
From -4 to -6	6	55	55	53	47	46	47	51
Over 6	1	49	52	42	37	37	38	43
Sole Brand Buyers								
Penetration								
Over 6	5	35	34	38	40	41	42	38
From +4 to +6	6	34	38	39	40	38	42	38
From +2 to +3	19	36	38	39	41	39	40	39
Stationary	**63**	**33**	**34**	**34**	**33**	**33**	**34**	**34**
From -2 to -3	15	44	46	47	46	39	38	43
From -4 to -6	6	46	48	45	40	40	40	43
Over 6	1	31	29	26	22	18	20	24
Avg. Purch. Frequency								
Over 6	5	4.0	4.1	4.0	3.7	3.9	3.7	3.9
From +4 to +6	6	3.4	3.4	3.5	3.6	3.5	3.5	3.5
From +2 to +3	19	1.8	1.7	1.8	1.7	1.8	1.8	1.8
Stationary	**63**	**2.0**	**2.0**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**
From -2 to -3	15	1.7	1.7	1.7	1.6	1.5	1.4	1.6
From -4 to -6	6	1.9	1.8	1.8	1.6	1.6	1.6	1.7
Over 6	1	3.2	3.1	2.6	2.5	3.1	2.9	2.9

Source: Kantar WorldPanel

8.11 Main findings

In responding to the first three research objectives, this analysis has yielded four findings as follows:

1. Near stationarity in patterns of period to period repeat purchasing behaviour was replicated from quarter to quarter and extended in its persistence over six and a half years of analysis.

2. Temporary and dramatic fluctuations in market share are found from quarter to quarter, but any sustained and substantial trend in either direction is exceptional. Stationary, near-stationary and non-stationary tiers of brand performance were defined, with only ten brands classified as non-stationary.

3. In these cases, although factors beyond brand marketing were generally involved, trends were constrained by Double Jeopardy, even in extreme cases, so that most categories remained both in near-steady state, and unsegmented.

4. Finally, three categories provided an exception to these generalisations, where a functional product innovation brought about a substantial change in buying behaviour. Diffusion of this innovation caused turbulence in buying patterns but it was apparent that a new and regular order was becoming established over the medium term.

8.12 Chapter summary

In this chapter a response to the first three research objectives has established that from quarter to quarter markets appear to remain Dirichlet, both near-stationary and unsegmented. The analysis of one important aspect of consumer loyalty, repeat purchase between rather than within periods, has not yet been given. This type of repeat purchase is examined in the next chapter and further findings presented in order to meet the fourth research objective, once again using the DJ approximation to identify variances between observed and theoretical measures in the long-run data.

CHAPTER 9. THE STABILITY OF LONG-RUN REPEAT-PURCHASE PROPENSITIES.

The second chapter of findings presents results relating to the effects of time on the stability of repeat-purchase patterns. Two known variances from steady-state norms, excess loyalty and the erosion of repeat purchase loyalty are examined in detail. Excess loyalty remains largely stable over time, and does not lead to deepening segmentation, but the effects of ERPL accumulate, accounting for the loss of about a third of a brand's loyal customers in six years. These buyers continue to be replaced, but the variance from stationary benchmarks is considerable. Cumulative brand performance is therefore examined, and while it remains constrained by Double Jeopardy, the fit to the expected measures deteriorates markedly over time.

9.1 Introduction

In this chapter results are presented in response to the fourth research objective, to identify variances in expected patterns of repeat buying in extended periods. First, the analysis centred on two known variances, the market share premium and the erosion of repeat purchase. These were initially examined over the long-run but in successive and equal periods of observation. The data was then analysed cumulatively to identify the development and exceptions to expected patterns in continuous behavioural measures. The main findings are that:

- A market share premium was observed for 55% of the leading brands in the dataset, but showed little or no trend between equal periods, or any clear relationship with brand growth.
- Of the 30 leading brands examined, 40% demonstrated consistent excess loyalty, while for 20% there was a consistently stable deficit in purchase frequency.
- In contrast, the erosion of repeat purchase loyalty was found to trend. In six years the loss of original repeat buyers predicted to repurchase reached 35% of the repeat measure for the average brand.

- Nevertheless the leaky bucket was continuously and systematically topped up with new buyers so that aggregate repeat measures remained stable.

- The erosion of repeat purchase is related to brand growth and decline. Growing brands benefited from a small retention bonus as penetration lifted, while declining brands lost their repeat buyers faster than average.

- Extending the period of observation revealed a growing disparity in cumulative buying measures, such that purchase frequencies which normally vary little between competing brands over six months showed a four-fold difference between largest and smallest competitor in six years.

- This is not the emergence of brand equity effects, but the natural extension of the Double Jeopardy relationship. The data approximately fitted to a longer, steeper section of the DJ slope than is normally seen as the range of cumulative penetrations became wider over time.

- However, it is also became evident that goodness of fit to that line for both larger and smaller brands deteriorated as observation periods extended, indicating that purchase propensities did not remain entirely stable.

The structure of this chapter is as follows. First, findings are reported that relate to the evolution of the market share premium and to the erosion of repeat purchase loyalty over successive equal periods, since trends in either might suggest the violation of the steady state assumption in the Dirichlet. The main patterns of observed repeat-buying in cumulative data are then described, and together these findings will answer the fourth research objective in identifying variances in the expected patterns of repeat buying in extended periods.

9.2 Evolution in excess loyalty

Fader and Schmittlein (1993) described the market share premium of excess loyalty in terms of segmentation: big brands are unlike smaller competitors in having a larger and more loyal customer base than expected. Since the literature suggests that greater loyalty brings about brand share growth through segmentation, the purpose of the next analysis was to observe the phenomenon over time and asses its relationship with the brand dynamics already identified.

In Dirichlet theory all loyalty measures follow each other, so there are a number of possible methodologies available to calculate "excess" loyalty. Battacharya (1998), Fader and Schmittlein (1993) and Jung, Gruca and Rego (2010) all used the predicted SCR measure from the Dirichlet, while Habel & Rungie and Fader *et al*., also used the polarisation parameter. This research follows Kahn, Kalwani and Morrison (1988) in continuing to use the $w(1 - b) = w_0$ approximation to estimate repeat purchase rates, and in a replication and extension of Pare and Dawes (2012), variances in loyalty were analysed just for the two leading brands in each category.

For each of these brands (in fifteen categories, again excluding pet food), the absolute variance between theoretical purchase frequency and the observed measures were derived for the average quarter in each of six consecutive years. These time series were then be compared with observed market share change and against mean absolute and relative variances. Results are presented in Table 25, ordered by the six-year change in share identified in Chapter 8, and sorted by the consistency of the variance – the top half containing brands with excess loyalty in each period.

The tabulation shows that in any one period roughly half the sample exhibited excess loyalty, but over time only twelve brands showed it consistently. These results are relatively close to Pare and Dawes (2012), but slightly lower than the 66 to 75% reported in Fader *et al*. They are extended in revealing a hard core of leading brands with consistent excess loyalty, and almost 20% with a consistent deficit.

The main finding is however that there is no obvious relationship between the market share premium and brand share growth. Of the five (non-pet food) growth brands already identified, only four appear in this table. Dove, Flora and Warburton's appear in the top part, along with others demonstrating a consistent excess loyalty, a set which shows an average 12% opening market share, an average increase of two points on this over six years, and a 17% loyalty premium. Whilst this may seem systematic, no clear relationship emerged. Some increase in loyalty would be expected to occur in conjunction with any increase in penetration. What's more, Kenco, the fourth growth brand appeared in the Table in the lower part with other brands showing a consistent loyalty deficit. More tellingly, of the twelve brands that showed consistent excess loyalty, two thirds were classified as having stationary or near-stationary market shares (a third of which are declining slightly).

Table 25. Excess loyalty for leaders & followers in 15 categories

Thirty Leading Brands in 15 Categories	Share		w_ρ (1-b)	Observed variance on predicted w Average Quarter in Year…						Avg	Var.
	Yr. *I*	+/-		*I*	*II*	*III*	*IV*	*V*	*VI*		
Consistent Excess Loyalty											
Dove	14	8	1.2	0.2	0.2	0.2	0.1	0.3	0.3	0.2	17%
Flora	16	8	2.8	0.3	0.1	0.3	0.4	0.3	0.3	0.3	10%
Warburtons	8	7	3.3	2.4	2.4	2.5	2.1	2.1	2.0	2.3	68%
Lurpak	19	6	2.6	0.8	0.7	0.7	0.6	0.5	0.6	0.6	25%
Soft And Gentle	6	3	1.5	0.2	0.1	0.2	0.2	0.2	0.1	0.2	10%
Evian	11	2	1.9	0.3	0.2	0.2	0.2	0.5	0.3	0.3	14%
Pantene (Cond.)	10	0	1.6	0.1	0.1	0.1	0.4	0.4	0.3	0.2	16%
Lynx	15	0	1.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	7%
Anadin	7	-1	1.7	0.3	0.2	0.1	0.1	0.2	0.3	0.2	11%
Pantene (Shampoo)	10	-1	1.3	0.1	0.2	0.1	0.1	0.1	0.1	0.1	8%
Ryvita	20	-3	1.9	0.4	0.3	0.2	0.2	0.2	0.2	0.2	12%
L Oreal (Cond.)	8	-3	1.6	0.1	0.1	0.1	0.3	0.2	0.2	0.2	10%
Averages	***12***	***2***	***1.9***	***0.4***	***0.4***	***0.4***	***0.4***	***0.4***	***0.4***	***0.4***	***17%***
Intermittent Excess Loyalty											
Kenco	8	8	2.0	-0.2	-0.2	-0.1	-0.2	-0.2	-0.1	-0.2	-8%
Hovis	9	6	4.1	-0.6	-0.4	0.0	0.4	0.4	0.0	0.0	0%
Imperial Leather	16	5	1.2	-0.1	-0.1	-0.1	-0.1	0.1	0.1	0.0	-4%
Galpharm	4	4	1.7	-0.1	0.1	0.1	0.1	0.0	0.0	0.0	3%
Bassetts	2	3	1.5	0.0	0.3	0.2	0.3	0.3	0.3	0.2	16%
Highland Spring	5	3	1.7	0.2	0.0	0.4	0.2	0.5	0.4	0.3	16%
Head & Shoulders	8	2	1.3	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-2%
Stork	9	1	2.5	-0.4	-0.4	-0.3	-0.2	-0.2	-0.4	-0.3	-13%
McVitie	13	1	2.4	0.0	0.2	-0.1	-0.1	-0.2	-0.2	-0.1	-3%
Lyons Maryland	3	-1	2.0	-0.3	0.0	-0.1	-0.5	-0.4	-0.4	-0.3	-14%
Seven Seas	11	-1	1.5	-0.1	-0.2	-0.2	-0.1	-0.2	-0.2	-0.1	-9%
Nescafe	43	-1	2.5	-0.4	-0.4	-0.3	-0.4	-0.3	-0.3	-0.4	-14%
Jacobs	22	-2	2.1	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-11%
Lyons	9	-3	1.8	-0.1	-0.1	-0.2	-0.1	-0.3	-0.4	-0.2	-11%
Sure (F)	19	-3	1.6	0.1	0.0	0.1	0.0	0.0	0.0	0.0	2%
Sure	17	-4	1.6	0.1	0.0	0.1	0.0	0.1	0.0	0.0	3%
Anchor	22	-6	2.6	-0.1	0.1	-0.1	0.2	0.2	0.3	0.1	4%
Douwe Egbert	19	-6	1.8	-0.2	-0.2	-0.2	-0.1	-0.2	0.0	-0.2	-9%
Averages	***13***	***0***	***2.0***	***-0.1***	***-0.1***	***-0.1***	***0.0***	***0.0***	***-0.1***	***-0.1***	***-3%***

Source: Kantar WorldPanel

If as Keller (1996; 2008) proposes the effects of brand equity are cumulative, the intensifying resonance between consumer and brand should result in evolving levels of purchase frequency, and a growing violation of the DJ approximation as the

brand becomes cushioned from its competitors by segmented buying behaviour. In this analysis, despite the fact that when excess behavioural loyalty is observed it must be maintaining a slight partition between competing brands in the way that Fader *et al* have suggested, this premium does not lead to market share growth. Instead, the table shows that levels of excess loyalty remain stable over time; for brands that show consistency, the average of 0.4 purchases per quarter remains stable in each of the six years shown, while in the bottom part of the table the variance for the remaining brands fluctuates only slightly around zero.

There is some variation within this for individual cases, but it seems more related in nature to promotional spikes seen in earlier analyses rather than to any steady and incremental growth. At a later date, further investigation might identify if these spikes are related to particularly heavy promotional activities designed to protect or build share. For example, the Period *V* variance of 0.5 for Evian is clearly exceptional, at 60% above its average. Since promotional investment is often supported with a management focus on availability, this is not inconsistent with suggestions that excess loyalty reflects a segmentation that is based on distribution. Foxall, Oliveira-Castro, James & Schrezenmaier (2007) and Van Heerde, Gupta & Wittink (2003) also report that individual households will buy more of a brand already in their repertoire when it is on promotion (i.e. the promotion does more than simply switch buyers from repertoire alternatives). This might enhance such spikes, so that on deal, existing excess loyalty would peak as a result of additional drivers beyond those expected from the temporary increases in penetration.

The market share premium is not generalised across leading brands. Some of the biggest brands in the dataset, such as Nescafe (43% share), Jacobs (22%) and Douwe Egbert (19%) show a consistent deficit in purchase frequency against the DJ benchmark.

Findings reported in the previous chapter on the stability of Double Jeopardy in dynamic brands mean that stability observed here is not a surprise, yet the analysis confirms that the hypothesised outcome of increasing behavioural loyalty cannot be supported. Customers of these brands do not appear to be buying any more of them over time than the existing premium-level indicates, although of course it is equally true that they are not buying any less.

In summary, the findings support prior studies in confirming that the market share premium is not a systematic or universal characteristic of leading brands. It

extends these studies in finding that over time, excess loyalty remains largely stable, in common with most other brand performance metrics. There is little association with brand growth, and no support for the proposition that any brand can achieve increases through the evolution of loyalty. Instead, a market share premium seems to be a stable feature of ongoing competition in a few categories, although its causes are not apparent from this analysis.

In the next section attention is turned to another loyalty measure, repeat purchase, and findings reported on the extension and replication of the leaky bucket generalisation over time.

9.3 The Erosion of Repeat Purchase Loyalty

The ERPL deviation arises because the pool of brand buyers (or bucket as Ehrenberg refers to it) leaks a little: underlying buying propensities are not absolutely steady, so that a group of buyers identified conditional on a purchase in a period T1 do not repeat quite in line with the stable behavioural norms predicted in the NBD, or the Dirichlet. The unexpected churn in brand buyers accounts for 6% of repeat-buyers over two non-adjacent quarters (Ehrenberg, 1988) increasing to 15% over 18 months (East & Hammond, 1996). The evidence suggests that although cumulatively, more buyers drip out over time, new ones will continue to replace them, so that the leak and the replenishment remain roughly in balance, and maintain equilibrium. From one period to the next this is however only a marginal deviation. Average quarterly repeat rates are about a third of a brand's penetration, so a quarterly erosion of 6% represents a variance of under 2% in the make-up of the brand's penetration, and in the steady state this is replaced in aggregate in any case.

Nevertheless, many managers invest substantial resources in the hope of *increasing* the repeat measure, which is consequently a closely observed metric. Any loss is of concern, let alone one that appears to be both systematic and cumulative. In addition, ERPL is intuitively related to brand dynamics in that any shift in the balance between acquisition and retention must have an eventual influence on brand share change. The existence of this deviation and its cumulative increase suggests that buying propensities may not be as steady as the model assumes. Specific questions addressed in this research are therefore:

- What is the normal extent and shape of erosion in the long run?
- Is any association discernible between erosion and brand growth or decline?
- Does erosion eventually cause a violation of the Dirichlet assumptions?

9.4 Establishing the repeat-purchase measure

In order to address these questions the analysis proceeded as follows. First, the nature of the aggregate repeat measure in the data was described from quarter to quarter over six years, in order to confirm that this at least remained stable. Of all the BPM's used in Dirichlet modelling, repeat purchase is the most volatile, and so the analysis was conducted once again using the smoothing technique adopted for observed data. All repeat measures used were developed as an average quarterly measure in each year, based on the inter-year repeat rate. For aggregate quarterly repeat this was calculated as the proportion of a brand's buyers in Q1 in Year I who repeated in Q1 in Year II. The calculation was then made for the Q2 buyers, and for Qs 3 and 4 to produce an average quarterly repeat for the year. The procedure was then conducted again between Years II and III, III and IV, IV and V and then V and VI to give a time-series of five aggregate quarterly repeats for each brand that had been smoothed to reduce the bias from seasonality or promotion. For the conditional measure (following repeating buyers who purchased in the first period), the procedure was similar, but always returned to the identified buyers in each quarter of Year I as the base period. Thus the first result in the annual time series was always equal to the aggregate annual measure, but variances emerged in subsequent years as the proportion of buyers who bought in Qs1 to 4 in Year I were followed across years III to VI. The variance between the two measures is the ERPL, but also by implication the proportion of acquired buyers since the benchmark is the comparable observed steady-state measure. This technique is a differentiated replication from that reported in East *et al*., in which the NBD was used to predict the steady-state norm. Here the analysis was conducted in order to describe erosion in observed data, before returning to the benchmarks of the Dirichlet.

9.5 Long-run stability in aggregate repeat purchase

The first finding from the observations is that the quarter-to-quarter repeat purchase rates for a typical brand were extremely stable over time, extending several empirical generalisations about repeat buying. Table 26 shows the performance on this measure over five years for the average brand by market position.

Table 26. Stability in quarterly repeat rate by brand size
        (90 brands in 18 categories over six years)

Avg. Brand in18 Markets	Brand Share	Average Quarterly Repeat: Year on Year					Avg.
		1/2	2/3	3/4	4/5	5/6	
Brand A	18	45	45	44	47	46	45
Brand B	12	39	42	40	42	43	41
Brand C	7	34	37	34	35	35	35
Brand D	4	31	31	30	30	31	31
Brand E	3	31	31	28	30	29	30
Average		36	37	35	37	37	36

Source: Kantar WorldPanel

The main pattern continued to be that the measure fluctuated slightly over time but was largely stable, in line with other previously reported loyalty measures. Repeat-purchase remained both consistently and surprisingly low; on average only about a third of any brand's customers repeated from one quarter to the next. This is normal, reflecting both polygamous loyalty and the large numbers of light buyers supporting every brand's sales in any period. It remained in line with frequently reported repeat-purchase predictions in the NBD and Dirichlet models (Ehrenberg, 1988, Wright and Riebe, 2010), and strengthens evidence against positive over-time effects from loyalty-based marketing, for example as presented in Uncles *et al*., (2003).

The table also confirms that in line with other loyalty measures, repeat purchase is constrained by Double Jeopardy. Here, the brand leaders show higher repeat-purchase rates than the smaller brands, and repurchase declines in line with brand size. It demonstrates the normal, steady-state condition of brand buying, but it is important to note that this represents a further strengthening of the empirical generalisation since it is the first time that such a loyalty measure has been extended over the long-run in a panel of continuous reporters. Since panel defection might be confounded with brand defection this is an important consideration in assessing the validity of the finding, again confirming the stability of habitual purchase propensities

in the population. A reliable benchmark for long-run repeat purchase has thus been established which may now be used to conduct the investigation of long run ERPL. The findings from that investigation are reported next, first for a single brand, and then generalised across the data.

9.6 The erosion and maintenance of repeat purchase loyalty

To demonstrate the principle of erosion, repeat-purchase measures for Lynx are once again presented. Lynx, in common with most brands in the dataset, has an approximately constant mean observed quarterly brand share, shown in the first row of Table 27 for years two through to six. This stable measure is then compared with the two repeat-purchase measures previously described, also in time-series. The first, the average quarterly repeat, remains steady not just over a few quarters, but over six years, slightly above the average at around 41%. The predicted quarterly repeat from the output of the Dirichlet (not shown) is also 41%, as a further demonstration of the model's fit.

The third row of the table shows a different story. Here the measure shows the repeat proportion of households identified on the basis of a purchase during an average quarter in Year 1, compared over the subsequent five years against this initial, rather than the preceding quarter.

Table 27: Six-year Erosion of Repeat-Purchase Loyalty (Lynx)

Measures	Average Quarter in year…					Six Year Erosion
	II	*III*	*IV*	*V*	*VI*	*(II - VI) / II*
	%	%	%	%	%	%
Avg. Quarterly Market Share	14	14	13	15	15	
Avg. Quarterly Repeat	41	42	41	40	40	-
Avg. Quarterly repeat on Y1	41	35	33	30	28	32
Erosion	0	7	8	10	12	

Source: Kantar WorldPanel

As expected conditional repeat on year one does ***not*** hold steady, but declines over the period. By year 6 the brand's quarterly repeat purchase of 40% is made up of only 28% who bought in the original quarter and 12% who are repeating from the

previous quarter, but not the original period. Repeat purchase loyalty has thus declined by 32%, the brand's cumulative ERPL measure, and a third of its original Year 1 loyal customer base. The finding extends Ehrenberg, (1988) and East *et al.* (1996) in demonstrating that ERPL continues to trend over time, indicating a substantial deviation from steady-state consumer propensities.

Despite the leak, since quarter on quarter repeats held steady (as did market share), *Lynx* continued to attract new buyers to maintain the constant level in the bucket. The difference between the two rows, erosion, is therefore also the proportion of new repeating buyers acquired. Also, the rate of erosion does not, as predicted in East *et al.*, tail off but continues to decline steadily to Year 6, giving little indication in this case that it will slow down.

The results demonstrate an unexpected churn, and yet it could be argued that for a brand that is so targeted at a particular segment this is hardly surprising. Young men may grow out of the amusing but unsubtle positioning of Lynx and switch allegiance to a more sophisticated grooming product. Their younger brothers may grow into the brand to replace them, maintaining its stationary performance over time. Were this to be the case, then brand purchase propensities across the population would clearly not remain in a steady-state, gradually violating the Dirichlet assumptions. Erosion in this case might therefore be exceptional, the price for such selective targeting, implying a continuing and expensive struggle to support the brand through customer acquisition where retention is commonly suggested to be the less costly route (Reichheld, 2003). Lynx demonstrates a steady and substantial market share over the period, and the Dirichlet predicted repeat rate is accurate, so it is not clear whether in losing a third of its loyal customers it has performed badly, has retained a similar proportion of repeat buyers to brands of a similar size, or has in fact done well. Wider generalisation of these findings would provide a benchmark for this. In addition, since brands grow mainly by increasing penetration, then were Lynx to shift the balance between acquisition and defection inherent in the ERPL mechanism then its share should grow.

The next stage of the analysis therefore extended the study to all brands in the dataset to discover if this pattern of long-run erosion was normal, if it played any part in the growth or decline of the non-stationary brands, and how it affected the assumption of stationarity.

9.7 Replication & extension of repeat-purchase loyalty patterns

For a typical brand, in every quarter over five years, about a third of the buying households will return from the previous quarter, suggesting that purchasing propensities appear to remain stationary up to three times longer than previously reported. Table 28 shows the results of extending the investigation of erosion from this measure from one brand to the top five brands in each category, and thence to all eighteen categories in the data. The Lynx results are replicated across the dataset.

Table 28. Erosion of Repeat Purchase Loyalty in 18 categories

Measures	Average Quarter in year…					Six Year Erosion
	II	*III*	*IV*	*V*	*VI*	*(II - VI) / II*
	%	%	%	%	%	%
Avg. Quarterly Repeat	36	37	35	37	37	-
Avg. Quarterly Repeat on Y1	36	32	28	26	23	35
Erosion	0	6	8	11	13	

Source: Kantar WorldPanel

The underlying quarter on quarter-one metric shows the steady and continuing erosion of repeat purchase for all brands, which by the final year averages 35%, nearly six times the loss identified in Ehrenberg (1988). Substantial erosion thus appears to be a marketing fact of life for all brands, and indicates a cumulative shift in the underlying purchasing propensities assumed in Dirichlet categories.

Paradoxically, long-term stationarity remains the norm despite this loss, and so *every* brand must maintain its penetration by acquiring new customers in period after period. It is not yet clear from where these come, or why their acquisition is so finely balanced with defection. To investigate these questions, the association between ERPL and other measures was therefore sought in further analysis.

There is for example a wide variation in the cumulative erosion rates between categories and between the brands in categories related to brand size. The association with brand size is presented in Table 29, and the association with a variety of other competitive brand performance measures is shown in Table 30.

Table 29: The Relationship Between Market Share & Erosion

	Erosion	Market Share %	
	Year1/6 %	Year 1	Year 6
Brand A	28	19	18
Brand B	29	11	13
Brand C	36	6	7
Brand D	41	5	4
Brand E	44	3	3
Correlation		*-0.89*	*-0.96*

Source: Kantar WorldPanel

In Table 29 there is a strong negative correlation ($r = -0.96$) between market share and erosion. It indicates that bigger brands not only have more customers, but that they also retain them better. This may be the inverse of the DJ loyalty-effects reported in repeat purchase, but could also be associated with movements in market share given the earlier finding that bigger brands are slightly more dynamic. The data shows the average quarterly market shares of each of the top five brands in both Year 1 and Year 6, and the relevant cumulative rates of erosion observed. The picture is of approximate stability, with a slight underlying movement where the second and third brands are closing on the largest. Smaller brands are making no headway. Erosion rates are very highly correlated with market share in both years, but the fact that the association is more marked by year six indicates that there may be a connection between change in share and in retention. Findings are reported from an investigation of this relationship in section 9.8.

As in East *et al.*, with the exception of market share there is little evidence of a substantial relationship between erosion and any other factor; for example it could be possible that given more opportunities to switch, buyers might do so. Categories in this analysis cover both frequently and very infrequently bought goods with very different purchase heterogeneities and so a comparison is possible. Table 30 shows the wide variation in ERPL's in each category, from which associations with various brand-buying measures including average purchase frequency are reported.

It can be seen that *w* is only weakly associated ($r = 0.3$) with erosion. Similarly, associations with changes to category penetration ($r = -0.3$), market concentration ($r = -0.1$), and *change* in market concentration ($r = -0.5$) are also weak. The strongest correlation in Table 30 is with category erosion ($r = 0.81$). This

measure reflects the fact that apart from the decline in repeat-purchase at the brand level, there is also a gradual decline in expected repeat purchase of the category itself, which runs at a lower rate but averages 13% over the entire period. It was identified that several categories had declining penetrations (for example the canned pet foods, soap etc, highlighted in red) and these had very high category erosion rates, a mean of 22% over the period. If the stable categories alone are considered, then their average category erosion drops to just 8%, or slightly over a point a year. The residual average at the brand ERPL level is then still 31%, and cannot therefore be explained much by a decline in product-field penetration.

Table 30. The association between erosion and various other measures

Categories	Six Years		Average Quarter				
	ERPL	Category Erosion %	*w*	*b*	Shift in *b*	Top 5 Conc. %	Change Conc. Pts.
Canned Dog Food	61	37	12.0	15	-4	57	0
Canned Cat Food	61	37	17.1	21	-8	34	-16
Vitamins	50	16	2.0	21	2	22	1
Still Water	45	12	2.9	18	4	33	5
Flexi- Cat Food	40	15	18.8	15	2	78	-9
Instant Coffee	40	14	2.8	63	-7	69	5
Male Deodorant	35	5	2.5	55	4	41	-3
Hair Conditioner	35	7	1.6	35	3	26	-9
Everyday Biscuits	34	16	5.4	69	-4	25	1
Shampoo	33	8	1.8	39	-2	35	3
Soap	30	21	4.1	34	-6	55	11
Analgesics	29	11	2.4	35	0	26	2
Ground Coffee	24	12	2.3	11	-1	34	-6
Margarine	24	6	17.1	84	-5	44	15
Wrapped Bread	24	1	12.4	96	0	56	13
Female Deodorant	23	4	2.6	61	3	44	7
Crackers	22	3	3.3	57	4	49	-4
Butter	12	7	4.1	49	2	58	8
Average	35	13	6	43	-1	44	1
Correlation		0.81	0.30	-0.54	-0.33	-0.11	-0.47

Source: Kantar WorldPanel.

It appears that erosion and acquisition continues to be the *"consistent, pervasive empirical fact"* described by East and Hammond, (1996. p.169), but the effects become more substantial over time than previously seen, and of a different

shape than previously thought. The implications are therefore rather more important than previously recognised since they suggest that a significant evolution in purchase propensities is occurring over time across all categories and brands. The investigation continued by next examining the dynamic cases in the data.

9.8 The relationship between erosion and brand growth and decline

Of the non-stationary brands in the complete dataset, seven grew and three declined by six points or more over the period. While East and Hammond did not review dynamic brands in isolation their sample, it is now possible to consider them here. Figure 9 compares the shape of the mean repeat-purchase measures for growing, declining and total brands, in the dataset.

For the total sample of brands in 18 categories, the average erosion of 35% is a steady and continuing decline in the repeat-purchasing of an original cohort of buyers when measured against the expected quarter-on-quarter repeat. For the growing brands the level of erosion is lower than the average at 24%, and is of a different shape. As these brands increase share, their steady quarter-on-quarter repeat rate is changing (from 51% rising to 53%). The increase in repeat purchase is a normal Double Jeopardy effect as penetration builds (more buyers buying more often), but it can also be seen that the proportionate fall in repeat purchase for the base-quarter buyers has stabilised, and holds steady at around 40% in years 4 to 6.

On the other hand, for the declining brands the opposite is the case. The aggregate quarter-on-quarter repeats are declining (by 16%, from 44% to 37%) and erosion is accelerating, rising to 45% over the period, far in excess of the overall mean level. There is therefore an association between changing brand share and a change in the expected rate of erosion, but it is unclear as to whether this is cause or effect. Up to now, erosion has only been measured against a stable quarterly repeat. In the upward trending cases it might be assumed that an increase in retention has led to the change in share, but for these brands increases in repeat purchase go hand in hand with increasing purchase frequencies (up 20% over six years), and a growth in average penetration of over 50%. Stabilisation in erosion alone cannot account for this increase. Changes in acquisition and retention rates are hard to separate in FMCG categories. Further research using steady-state norms is necessary, but beyond the scope of this study except in highlighting the existence of the marginal association.

Figure 9. A comparison of ERPL rates for growing and declining brands
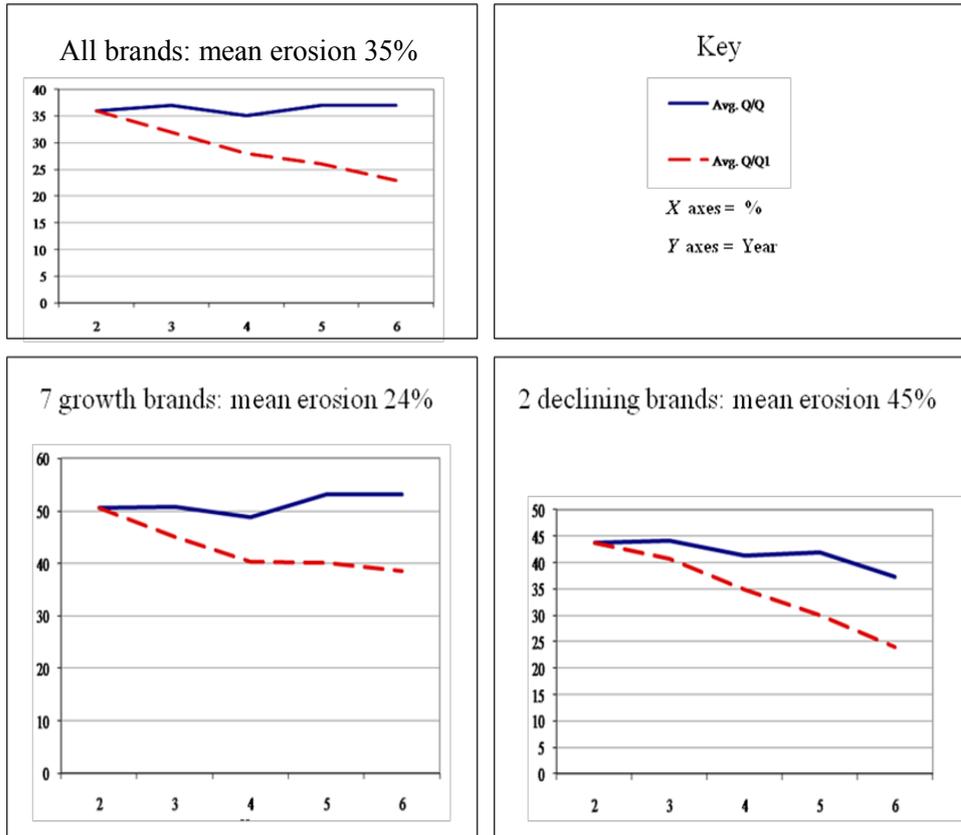
Data Source: Kantar WorldPanel

9.9 Summary: the behaviour of variances in quarterly data

To summarise findings from the analyses of the market share premium and the erosion of repeat-purchase loyalty, this thesis has shown that the two variances behave differently over extended time frames. The market share premium has been confirmed once again to be a significant but not universal characteristic of leading brands. The observation generalised across the dataset, and was extended in showing that excess loyalty remains a consistent characteristic in about 40% of cases over time. It does not trend, a new finding, and therefore provides no empirical support for the concept of cumulative brand equity effects. On the other hand, the ERPL characteristic of repeat buying trends very considerably, conforms to the law of Double Jeopardy and is linked with brand dynamics. It suggests a real and evolving departure from steady-state buying propensities, but still remains unexplained, particularly in its characteristic equilibrium.

9.10 Variances in the expected patterns of long-run repeat buying

The next stage of the analysis was to remove the constraints of time periods from the data, and examine the cumulative measures of repeat-buying over six years, first using the approximations and benchmarks of known empirical generalisations, and then by fitting the Dirichlet to the data and evaluating output against the observations.

The benefit of this approach is that all purchases by all buyers are recorded in an extended period of observation that largely captures very light buying. In effect the technique simultaneously shows aggregate and individual-level long-run repeat-purchase, so that the effects of shifting propensities will become apparent when benchmarked against behavioural norms.

The analysis begins with observations of the changes in the central measures of buying in cumulative data, first in quarters, then over six months and finally in six years. Data is aggregated across the categories to develop average brand performance measures by size. These are now labelled A to E; it was noteworthy that the market shares of each of these "average" brands remains constant regardless of observation period length confirming near-stationarity in the dataset. Table 31 demonstrates the shifting relationship between w and b as T first doubles then expands by a factor of 12, captured in the DJ approximation statistic at the base of the table.

As the total number of purchases increases with time, the relationship between penetration and frequency is changing across the category. In the shorter term these changes have been well documented and are predictable (Ehrenberg, 1988; Ehrenberg *et al.*, 2004), but long-term effects have been less frequently observed, particularly among continuous buyers, and are consequently less familiar.

The growth between a quarter and six months is considered first. Here, category penetration (B) grows with new buyers, but between a quarter and six months these are light users of the product-field who buy occasionally. There are a substantial number of these households since B grows by 20% in six months. The measure of average purchases per buyer (W) grows faster though, increasing by 60% to 8.1 occasions over six months. Because these data are near-stationary, growth in B can be described as the number of buyers in Q1, plus the number of buyers in Q2, less the number of repeating households. As such growth in B is constrained, where growth in W is not to the same degree. Growth in category and brand penetration

measures follows predictable curves, reaching a ceiling over time (B earlier than *b*) as markets saturate. W and *w* will continue to grow over time, but less than pro-rata as before because any new buyers tend to be less frequent buyers, thus constraining growth in purchase frequency a little.

Table 31. Growth in penetration & purchase frequency

Average Brand	Market Share %	Penetration (*b*) %			Avg. Purchase per buyer (*w*)		
		Q	6M	6Y	Q	6M	6Y
Category	**100**	45	54	82	4.9	8.1	62.5
Brand A	**18**	14	19	50	3.0	4.2	17.8
Brand B	**11**	8	13	40	2.7	3.5	13.3
Brand C	**7**	7	9	33	2.4	3.3	11.3
Brand D	**5**	3	5	24	2.4	3.1	8.2
Brand E	**3**	3	4	22	2.0	2.5	6.3
Brand F	**2**	2	3	14	1.6	1.9	4.6
Average	**8**	6	9	30	2.3	3.1	10.3
$w(1 - b) = w_o$		2.2	2.8	7.2			

Source: Kantar WorldPanel

In Table 31, considering the brands next, average *b* grows by 50 % between a quarter and six months, and average *w* grows by a third, yet individual brands behave a little differently. In a quarter there is little real difference in loyalty between competitors as the benchmark states but between here and six months the DJ differences become slightly more marked as *w* for larger brands grows faster than for smaller (by 40% for Brand A, but by only 25% for Brand D), and yet the brands remain tightly grouped around the average with the exception of A, reflecting the excess loyalty seen across the data. Lower growth in *w* than W reflects brand switching, with extra purchases being spread over all available choices in line with share as predicted by DJ. This is supported in Figure 10*a*, where the fit of data in both periods is close to the prediction.

It can be seen that the best fit line in both cases crosses the projection, indicating the existence of excess loyalty for Brands A & B. The fitted slope became a little steeper over six months as the excess became more extreme, and rather more so than the prediction which became a little steeper itself.

Figure 10*a*. Double Jeopardy in six months
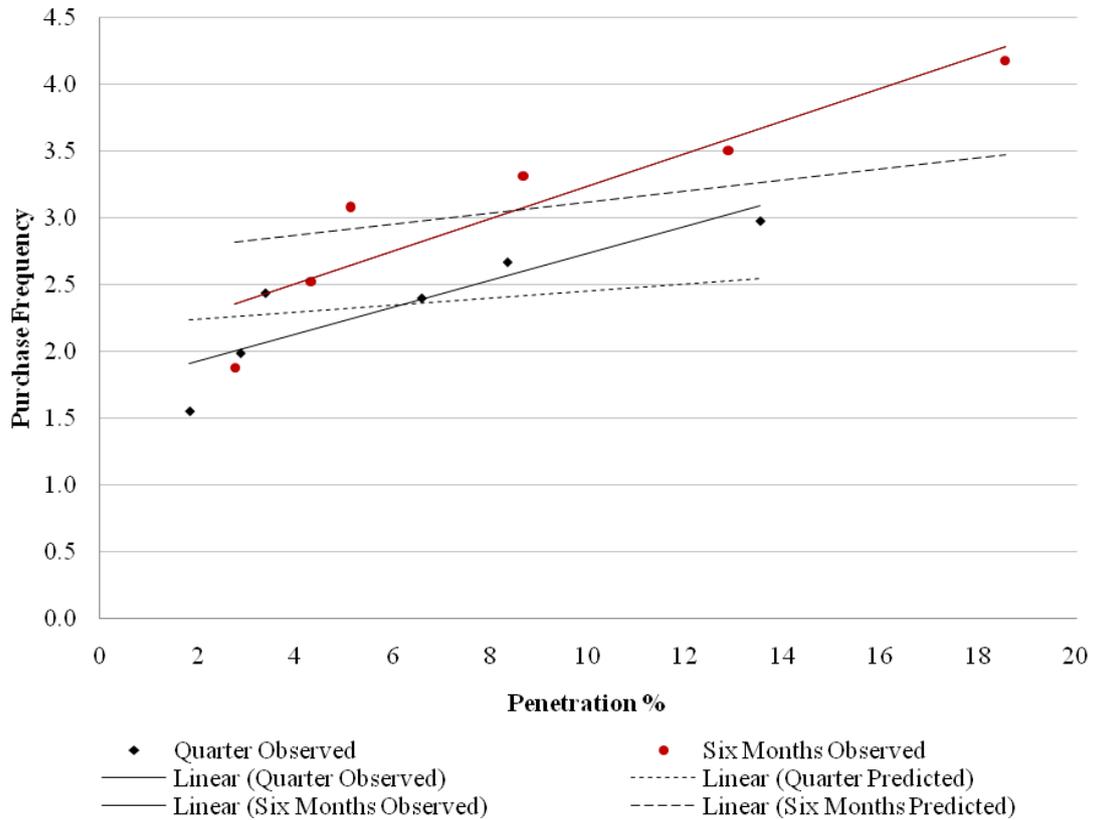
Over six years the changes seen between a quarter and six months became greatly accentuated, and the characteristics of the data changed considerably as the number of purchases increased. The number of households reached almost doubled, from 45% to 82% of all buyers, but average purchases per household increased twelve times. At the brand level, there were now great differences in rate of growth. For big brands (A and B), penetration increased at about half the rate seen for smaller brands, but their purchase frequency grew more quickly, six times, compared with only two and a half times for the smallest brands. The result was that the differential in purchase frequency between big and small brands became rather extreme over six years, so that the biggest brand attracted almost twice the average, and the smallest less than half. When the data were plotted onto the Double Jeopardy curve (Figure 10*b*), the fit was no longer quite so close.

The variances between observed and predicted measures seen in Figure 10*a* have grown cumulatively so that while average purchases were under predicted for Brand A by 16% in a quarter, over six years the brand has attracted 25% more than the model allows for. The average variance for Brands B, C and D is under 10%, and

thus they fit the line quite well, but for the smallest brands (E and F) it reaches a 32% and 45% deficit respectively. The slope of the best-fit line is therefore far steeper than the prediction, and this is itself also steeper than the theoretical slopes over shorter periods. As a summary of goodness of fit over the three fittings, the mean absolute percentage error was calculated for the variances, and this deteriorated from 13% in a quarter to 15% in six months and 21% in the six-year observation period.

Figure 10*b*. Double Jeopardy in Six Years
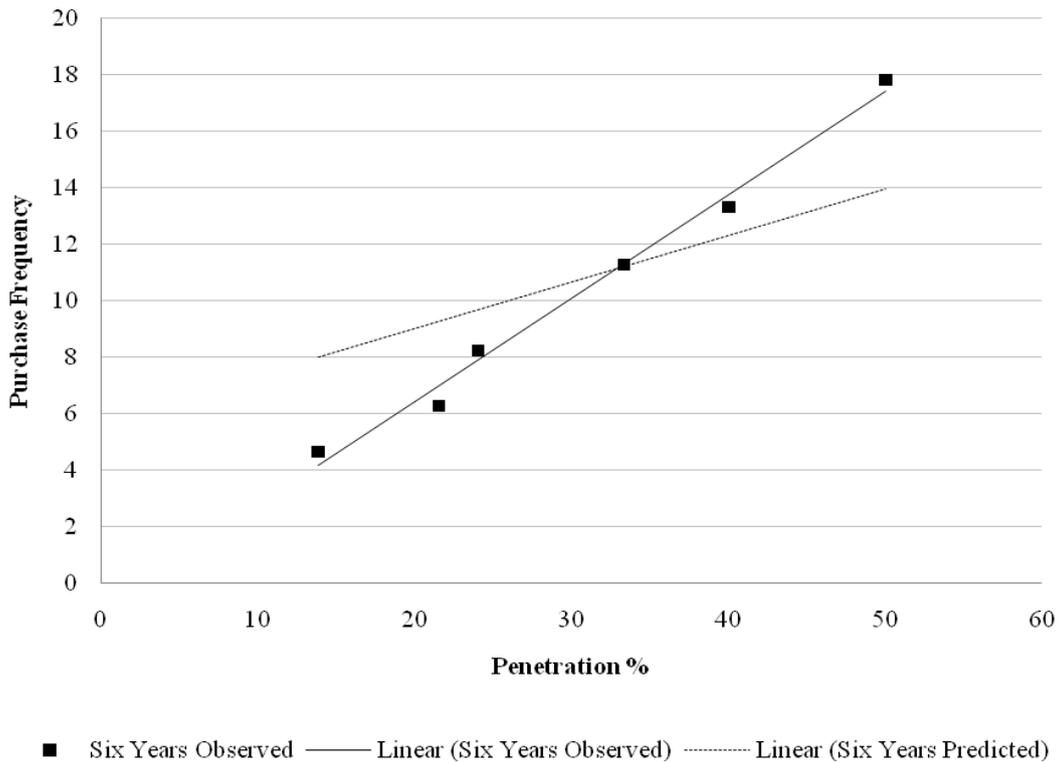
Three characteristics of these datasets are noteworthy. First, it is apparent that the market share premium although stable in successive periods becomes more extreme in continuous data. Over time the "average" leading brand has rather fewer customers than expected, but those they do have bought more frequently than predicted. Second, the smallest brands are falling further below the line, and yet they too are maintaining share, which suggests that they fit the characteristics of "change of pace" brands (Khan *et al*., 1988) in having more customers than expected who buy rather less frequently. This is a characteristic of variances in the amount of switching sometimes observed by Ehrenberg, (e.g. 1988, p.34) in smaller brands in shorter

periods, but like excess loyalty it has become rather pronounced in this long-run data. The result is that large and small brands appear to develop different characteristics from those that support short term buying, and yet these patterns must be inevitable given that market shares remain invariant. Big brands show far greater repeat-purchase than smaller brands, but this cannot lead to growth because there are no more new customers to acquire. This observation alone suggests a new limitation for customer equity strategies, in that customer acquisition becomes almost impossible over time. Small brands can acquire more customers, but can't apparently keep them, so purchase frequencies (and shares) remain low. The final characteristic of note is that over time as the volume of purchases increases the slopes of all the DJ curves become steeper. This supports the interpretation given, suggesting the increasing importance of purchase frequency as new buyers become harder to find, an inevitable characteristic of the DJ relationship. What is new is that while the variance is already known in short-run data, it becomes greater over time.[2]

As it happens, this is a seldom-reported feature of Double Jeopardy. Habel & Rungie (2005) plot a DJ slope and show that it is not a straight line but a dramatically curved J reaching to infinity. They describe the "normal" range of data for which this is plotted, usually showing the relationship only as far as a maximum market share of 15%. Over this range the DJ slope appears shallow and straight, but as brand penetrations grow the curve becomes steeper and brands with higher penetrations must increase purchase frequency relatively more as share increases. At the extreme, the slope becomes almost vertical.

Habel *et al.*, make it clear that penetration is necessarily the key to growth for brands within the normal range of data as Anschuetz (2004), Ehrenberg et al., (2004) and Sharp (2010) have all suggested, since the shallow slope of the DJ line describes very similar purchase frequencies between competing brands of greatly differing size. As penetration rises beyond the "normal" level the slope becomes steeper, suggesting much greater discrepancies between competitors' rates of purchase - the greater the range in *b*, the greater the variance in *w* which should be expected.

It is clear from the comparison between figures 10*a* and 10*b* with Figure 10*c* that the DJ lines shown represent different sections of their relevant curves.

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[2] A fourth point noted in conversation with Professor Goodhardt is that although the fit of the observed data to the theoretical DJ slope is deteriorating, the best fit line is very well fitted at six years, giving a constant relationship of $b = 3w$. This is an area for further research, also noted in Habel *et al.*, (2005).

Penetrations in Figure 10*a* range from 3 to 18 percent at the very left hand end of the lower line in Figure 10*c*, the theoretical six month DJ curve. This data is close to the "normal" range discussed. Figure 10b however has a range from 14 to 50 percent, a far longer, steeper section of the upper slope, and this goes some way to explaining its variance in observed purchase frequencies. Such a wide ranging dataset is infrequently found in FMCG analysis, and its implications have therefore infrequently been discussed, yet the characteristics of the six-year data are almost as expected from their position on the full DJ projection, and are therefore predictable.

Figure 10*c*. Theoretical Double Jeopardy curves, 6 months & 6 years
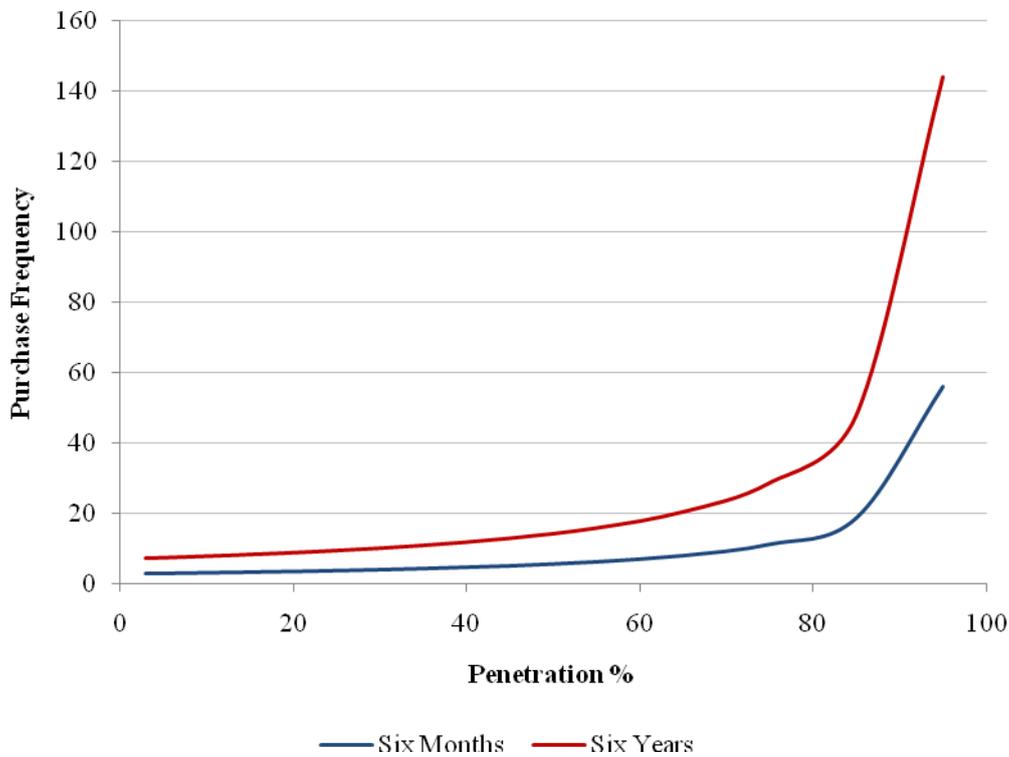
Nevertheless, while the quarterly fittings were good, the increasing MAPE for the extending periods of observation suggests the existence of variances that are hard to see in regular periods of observation. Further investigation of a wider variety of measures of buying was therefore now required to identify and understand these.

The $w(1- b) = w_0$ generalisation is an approximation. Although it continues to hold across the replications demonstrated in this thesis, the Dirichlet is *"more flexible and also much wider ranging"* (Ehrenberg, Goodhardt and Barwise, 1990, p.86). It offers more measures of repeat purchase for analysis, as well as a broader spectrum of

law-like patterns and norms for evaluation. Further investigation of the long-term data was thus next undertaken using the Dirichlet to output benchmarks against which the variances observed over extending periods might be examined. One further aim was to meet the requirements of the final research objective in establishing the extent to which the model continued to describe long-run market structure. In the next sections findings from these last analyses are now presented.

9.11 Chapter Summary

In this chapter a response has been given to the fourth research objective of the thesis in identifying variances in the expected patterns of repeat buying in extended periods. Three areas were considered. First, the excess loyalty observed for leading brands was found to be a significant but not universal characteristic. The new finding here is that it remains stable over time in common with most other buying measures, and so does not lead to any increasing segmentation or customer equity effects. Secondly, the erosion of repeat purchase continues to trend and leads to a systematic and unexpected churn of loyal customers not predicted by the model. This suggests a shifting in brand choice propensities despite the fact that aggregate repeat loyalty remains stationary. In examining the repeat-buying patterns in cumulative data, some evidence for an incremental shift was observed as fittings to behavioural norms became gradually worse in extending periods of observation. Nevertheless, a detailed understanding of these changes can only be gained by more detailed modelling, and this final strand of the analysis is reported in the next chapter, in which Dirichlet fittings to long-term data are reported.

CHAPTER 10. THE FIT OF THE DIRICHLET TO LONG-RUN CATEGORY STRUCTURE

In this chapter results from three different long-term Dirichlet fittings are presented, which reveal that despite apparent stationarity, individual purchase propensies do not remain long-run stable. An initial six-month fitting describes market structure well in similar periods across the six years of the dataset, but when fitted to cumulative data, model outputs reveal that observed switching increases far beyond the steady-state prediction. Although expected to remain time invariant in truly stationary conditions, changes in both S and K parameters describe a systematic evolution in cumulative category buying propensies that account for several known Dirichlet deviations, but leave market shares in equilibrium.

10.1 Introduction

In this chapter the long-run effects of deviations from the expected norms of repeat purchase are described and results presented in order to complete the requirements of research objective four and meet research objective five.

A steady long-run shift in observed brand choice propensies from those estimated when the Dirichlet is calibrated from short-run data is identified. The shift implies a violation of the steady-state assumption but does not lead to loyalty-based market partitioning, or brand share change because it trends uniformly downwards. Over time loyalty measures for all brands decline substantially. Three Dirichlet fitting procedures confirmed the instability of purchase propensies, and a systematic increase in churn of buyers between competing brands. The main findings were that:

1. The fit of the Dirichlet to market structure in successive short-run periods over six years remained good in all categories supporting further long term use.

2. However, when estimated on cumulative data, model fit begins to deteriorate so that only half of the six-year outputs were deemed acceptable. One third failed outright and the rest were considered as marginal passes. The underlying causes, including brand dynamics, were varied and confounding, so clear generalisations were hard to define.

3. The model parameters from the best-fittings were therefore examined. This showed that even in near-stationary data, underlying cumulative purchase propensities changed considerably. Parameter K, rather than being invariant increased with time, and S increased systematically and substantially. For K the change signifies a slightly flatter but fatter-tailed gamma distribution of probability densities than expected but changes in S were dramatic and signalled a substantial increase in switching for every brand.

4. From a final set of Dirichlet fittings using the six-month estimation to derive a six-year steady state prediction, the main pattern observed was that over six years households exhibited far lower brand loyalty than even Dirichlet theory predicts. Purchase frequency was only half expectation and SCR 44% lower.

5. The average penetration of buyers of any brand who bought it over five times in six years was about a third below the benchmark, a deficit matched by an increase in the penetration of once-only buyers.

6. The increased brand switching thus described was closely correlated with, and largely explained the leaky bucket effect. In aggregate period-to-period data the effects of shifting individual-level propensities are marginal (and in fact have long been observed as slight unexplained variances) and their impact only became clear in changes to long-run buying patterns in cumulative data.

7. These changes although systematic varied in extent by category and were captured at the category level in the evolution of the Dirichlet parameters.

The model was estimated for data at three levels in order to test its predictive fit:

1. to twelve consecutive six month periods in each category

2. to the cumulative six year purchasing in each category

3. by extending the six month fit to six years to provide stationary benchmarks.

In this chapter, findings from each of these analyses are considered in this order, in terms of the model assumptions and predictive fit. The first findings reported concern the short-run fittings.

10.2 Consecutive and non-adjacent management periods

Testing fit to six month management periods demonstrated that the model describes repeat buying well even over the long run. This is not surprising in the light of the findings in chapter eight that assumptions of stationarity and non-partitioning

largely appear to hold in successive short-run reference periods. It can therefore be concluded that there is strong support for the continuing use of the model for tactical brand management, and also now for extending these uses to strategy development. Ehrenberg (1988) proposed that the benefits of Dirichlet modelling included the provision of; behavioural norms for stationary markets; a base-line against which to interpret change; benchmarks to guide decision making; and empirical generalisations and theories to help the understanding of consumer behaviour. Findings in this chapter support extension of these uses to encompass long-term brand performance within standard periods.

The study was conducted in the normal way, first by examining observed patterns in one product field and then by replicating and extending the observations across the whole dataset to identify generalising patterns and exceptions. In the first instance the Shampoo category was selected for analysis on the basis of its long-run stability. Replications were then conducted in all product fields, as follows. For each category the model parameters were estimated from the average values of the twelve six-month periods contained in the data, in order to reduce the likelihood of seasonal or promotional bias in any one period. The model was then calibrated using the method of means and zeros and fitting software developed by Kearns (2002), following which the output was tabulated. The fit to two observed buying measures *b* and *w* for each of the leading competing brands was then established in successive periods using a suite of nine tests (Driesener, 2005).

Table 32 shows results obtained from these analyses of Shampoo buying in four non-adjacent six-month periods. The fitting is considered acceptable when it meets over half the threshold criteria (that is, five out of the nine tests) and here the Dirichlet output continues to pass this test over each of the four periods shown, confirming what even a cursory examination shows. Category buying has remained astonishingly stable over six years, but with some occasional turbulence.

The fit passes eight out of nine tests in three periods, and every test in period *IV*. In Period *I* the variance of 200% in penetration between 1% and 3% for the small Wash & Go brand has biased the MAPE measure and caused the failure of that individual test, but the brand is small and this is likely a sampling error. Nevertheless, it is remarkable that the model continues to fit the observed data so well, increasingly further into the future. This is the first time such a fitting has been conducted to continuous observed data over such a time span.

Table 32. Comparative Dirichlet fittings in the UK Shampoo category

Brands	Avg 6 month period			Observed 6 month periods							
	Brand	*T*		*I*		*IV*		*IX*		*XII*	
	Share	*b*	*w*	*b*	*w*	*b*	*w*	*b*	*w*	*b*	*w*
	%	%		%		%		%		%	
Category	**100**	**55**	**2.6**	59	2.7	55	2.6	55	2.6	54	2.5
Pantene	10	**9**	**1.6**	8	1.7	9	1.8	9	1.7	7	1.8
Head & S.	9	**8**	**1.6**	8	1.6	7	1.5	8	1.7	8	1.7
L'Oreal El.	6	**6**	**1.5**	7	1.6	6	1.5	5	1.5	6	1.4
Herbal Ess.	6	**5**	**1.5**	4	1.6	5	1.6	6	1.6	6	1.5
Organics	5	**5**	**1.5**	6	1.7	5	1.6	3	1.6	1	1.6
Fructis	4	**4**	**1.5**	5	1.4	4	1.5	3	1.6	3	1.5
Timotei	4	**3**	**1.5**	3	1.4	4	1.6	3	1.4	3	1.7
Vosene	3	**3**	**1.5**	3	1.5	4	1.5	2	1.4	2	1.4
Wash & Go	1	**1**	**1.5**	3	1.6	1	1.2	1	1.3	1	1.6
Average	5	**5**	**1.5**	5	1.6	5	1.5	4	1.5	4	1.6
Correlation				0.99	0.90	0.99	0.64	1.00	0.77	1.00	0.77
MAD				2	0.1	2	0.1	2	0.1	2	0.2
O-T				0	0.1	0	0	**-1**	0	**-1**	0.1
MAPE%				*26*	1	-8	0	9	-1	19	-2
CD					0.3		0.3		0.6		0
Tests Passed				*8*		*9*		*8*		*8*	

Source: Kantar WorldPanel

It should be pointed out that the tests are being applied to the fit of the named brands only. In this analysis, all brands and private labels were included in the model fitting, but only the largest named brands have been considered individually. The "All Others" category consists of very small brands and some very large own brands, and consequently did not always behave consistently. Since the named brands are the focus of this study, model fitting has been reported and assessed for these alone, ignoring the "All Others" entity. Further research might address this limitation in breaking out the smaller brands, or in considering own brands.

The periods shown in the Table are at irregular intervals to test the robustness of the model in cases of seasonality but in the end this made little difference to the fit. The familiar fluctuations and wobbles of a point or two here and there continue to be seen for each brand, and also at the category level, and the individual tests are useful

in highlighting where these exceptions occur. For example in Period *XII* the Cumulative Deviation measure is just above zero, highlighting the absence of the expected variance in *w* between the smallest and largest brands in the category. Attention is thus drawn to both the Timotei and Wash and Go brands which show higher than expected purchase frequencies for the period. In the case of Timotei it is an isolated spike and probably represents a promotion, For Wash and Go the deviation is consistent and further research might confirm whether this brand is contained in a functionally defined partition with Head and Shoulders. Both variances from the Dirichlet norms can therefore be explained with knowledge of existing empirical generalisations, a strength of this type of modelling. On the other hand, the deviations themselves are not severe enough here to breach the threshold of the test of fit, in common with other fluctuations from period to period, and so indicate that the theoretical assumptions which underpin the model have not been violated in this category over time.

10.3 Extension and replication of short-run findings

On the basis of these initial findings the exercise was continued across the remaining categories to replicate and extend results, even in categories where propensities were known to have changed at either product-field or brand levels. The 18 fitting sets have been summarised in Table 33, which presents the fit of the estimation to the average values for each brand and category across the six-month periods. The table is ordered by goodness of fit, from which it can be seen that seven categories passed all nine tests, a further six passed eight, and three further fittings were within seven of the nine thresholds. A rather worse fitting was produced for Bread (five tests passed) and for Biscuits (six tests) although the average number of thresholds met for any category in this period was eight. These results therefore extended the shampoo category finding, showing that the model predicts near-stationary category buying even up to six years into the future, and even where there has been some change in competitive structure.

The worst-fitting exceptions, Pet Foods, Ground Coffee, Biscuits and Bread can be explained to some extent in the light of prior knowledge. The first condition of fit is stationarity. Bread and all the Canned Pet Food categories have been identified

as being in a state of flux over this period, so the generally poor fit of a stationary model to dynamic data is hardly surprising. All three categories also tend to be very frequently and regularly bought, and such habitual purchasing may bring about a violation of the Poisson assumption of independent random events if the product is being bought on discrete regular occasions rather than randomly in continuous time as the theoretical distribution suggests (Ehrenberg, 1988, p. 75). This type of buying is frequently presented as problematic for the model to describe well (Ehrenberg, 1988; 2004, Goodhardt *et al*., 1984) and these examples seem to be examples of this.

Table 33: Goodness of fit in 18 categories to six-month datasets.

Categories	Penetration %				Purchase Frequency					
	Cor/.	O-T	MAD	MAPE	Cor/	O-T	MAD	MAPE	CD	
Threshold	*≥ 0.9*	*≤ 0.5*	*≤ 3*	*≤ 20%*	*≥ 0.6*	*≤ 0.2*	*≤ 0.9*	*≤ 20%*	*>0*	
Analgesics	1	0.1	1	4	0.78	-0.1	0.2	-6	0.5	**9**
Fem. Deo.	1	0.2	1	9	0.92	-0.2	0.2	-12	1.2	**9**
Inst. Coffee	1	0	0	3	0.88	0	0.1	-4	0.2	**9**
Male Deo.	1	0.1	0	6	0.92	0.1	0.2	-7	1.3	**9**
Shampoo	1	-0.1	0	0	0.84	0	0.1	0	0.4	**9**
Toilet Soap	1	0	0	5	0.78	-0.1	0.1	-6	0.5	**9**
Vitamins	1	0	0	8	0.69	-0.16	0.3	-11	1.3	**9**
Butter	0.99	0.1	1	11	0.89	-0.4	0.6	-17	3.1	**8**
Crackers	0.99	-0.3	1	0	0.72	0	0.3	-1	-0.2	**8**
FlexiCat	0.96	0	1	2	0.83	-0.1	1.4	-7	4.1	**8**
Hair Cond/er	1	0	0	-2	0.55	0	0.1	2	1.5	**8**
Margarine	0.99	0.2	2	3	0.85	-0.1	0.3	-4	-0.9	**8**
Still Water	1	0.1	1	12	0.9	-0.3	0.4	-18	1.4	**8**
Cat F. (can)	0.97	-0.2	1	-5	0.85	0.4	1.4	0	1.7	**7**
Dog F. (can)	0.97	0.1	1	10	0.87	-0.6	1.5	-19	11	**7**
Grnd Coffee	1	0	0	1	0.51	0	0.2	-3	-0.2	**7**
Biscuits	0.99	1.1	2	17	0.9	-0.5	0.8	-29	3.2	**6**
Bread	0.99	1.1	3	19	0.95	0.9	1.3	-35	43	**5**
Average	*0.99*	*0.1*	*0.8*	*6*	*0.81*	*-0.1*	*0.5*	*-10*		**8**

Kantar WorldPanel   *Crackers CD includes Ryvita with very strong Excess loyalty*

The worst-fitting exceptions, Pet Foods, Ground Coffee, Biscuits and Bread can be explained to some extent in the light of prior knowledge. The first condition of fit is stationarity. Bread and all the Canned Pet Food categories have been identified as being in a state of flux over this period, so the generally poor fit of a stationary

model to dynamic data is hardly surprising. All three categories also tend to be very frequently and regularly bought, and such habitual purchasing may bring about a violation of the Poisson assumption of independent random events if the product is being bought on discrete regular occasions rather than randomly in continuous time as the theoretical distribution suggests (Ehrenberg, 1988, p. 75). This type of buying is frequently presented as problematic for the model to describe well (Ehrenberg, 1988; 2004, Goodhardt *et al.*, 1984) and these examples seem to be examples of this.

The case of biscuits is rather harder to assess, except that intuitively it is a category that is defined by variety seeking so that purchase frequency is greatly lower than predicted (a MAPE of -29%) and penetrations for each brand rather higher (MAPE of +17%). As to ground coffee, here the question may be one of available data. The category, even over six months, has a very low penetration and purchase frequency so that the distinction between light and non-buyers is blurred. This could bias the estimation of light buying in the NBD, a problem of appropriate purchase interval discussed in Ehrenberg (1988), and so a longer-term prediction should fit better. It is however also the case here that the category has one or two dynamic brands, so that in addition to problems of parameter estimation, purchase propensities are also known to be in flux.

There is a general pattern in this data, which appears most clearly in the column averages. The polarity of the results for the (O-T) and MAPE tests are opposed for *b* and *w* and while this is not consistent in all categories over six months it indicates a tendency to under predict brand penetrations and over-predict purchase frequencies. This is a slight variance only, since the same averages meet all nine thresholds of the suite of tests.

Normally analysis of Dirichlet fit would not be concerned with finding the best fit to a single set of data, but rather with finding a close enough fit to many sets of data. The principal has been very well established, and has been applied here in evaluating regularities and exceptions in observed data against the stationary benchmarks of the model output. Nevertheless, the fitting tests are important in determining the predictive validity of model output to short-run market structure over extended periods. They show that the model, although theoretically requiring true stationarity, is robust enough to provide a continuing approximation of category structure even where there is some trend in buying propensities.

The general long-run stationarity in brand performance reported in chapter eight, and the continuing fit of the model to this data therefore suggested that similar results might be obtained for a six-year fitting. A reliable six-year predictive fit would clearly have many uses. The underlying theory also suggests that such a prediction could be made from short run data (assuming a reasonable inter-purchase interval) since the distributions of household purchase propensies should remain unchanged under equilibrium conditions. Earlier findings however identified substantial underlying changes to observed purchasing propensies despite apparent period-to-period stationarity which only became apparent in the cumulative data. The model was therefore next fitted to the six-year reference period in order to benchmark the aggregated effects of the observed variances.

10.4 The fit of the re-estimation to six year data

Fitting the model directly to six-year cumulative data did not provide a reliable description of buying over time. Applying the same test thresholds, only twelve of the eighteen categories examined achieved a satisfactory fit, with an average score of six out of nine tests passed. This compares unfavourably with the six-month case where fittings to all categories were found to be good and, on average, eight out of nine tests passed. Variances were not found to be obviously systematic, for example discrepancies were not limited to product fields where individual brand growth or decline already indicated an obvious shift in purchase propensies, or to those showing high erosion of repeat purchase or very large numbers of non-buyers. There was therefore no obvious single reason for poor fitting or indeed for a good fitting where one was not expected. The Toilet Soap market, which gives a very close fitting to the model, showed a substantial loss of category penetration over the period, and substantial market share growth for the two leading brands. Cumulative results must absorb this dynamic cut and thrust, to continue to fit model output so closely.

As before, Table 34 is ordered by goodness of fit, and gives results for each of the eighteen analyses; these are compared with the column averages from Table 33. A clear and general decline in fit for all threshold measures was noted, as seen by comparing the column averages of the six year and six month fittings at the base of the table. The model described cumulative category structure well in half the fittings,

and acceptably in twelve. Six fittings did not pass the required thresholds failing over five of the tests. Of these six categories, two (Bread and Biscuits) were poorly described in the original six month fitting, but the remaining four (Butter, Still Water and Male and Female Deodorant) were well fitted to short run outputs, passing all or almost all the tests. Therefore fit has clearly deteriorated over time.

Table 34: Goodness of fit in 18 categories to six-year datasets.

Categories	Penetration %				Purchase Frequency				CD	
	Cor/.	O-T	MAD	MAPE	Cor/	O-T	MAD	MAPE		
Threshold	*≥ 0.9*	*≤ 0.5*	*≤ 3*	*≤ 20%*	*≥ 0.6*	*≤ 0.2*	*≤ 0.9*	*≤ 20%*	*>0*	
Hair Cond/er	0.99	0.3	1	3	0.97	-0.1	0.2	-5	0.1	**9**
Toilet Soap	0.99	0.3	3	3	0.89	-0.1	0.6	-7	0.37	**9**
Shampoo	0.99	0.8	3	7	0.97	-0.2	0.5	-11	4.0	**8**
Grnd Coffee	0.97	0.2	2	-3	0.8	0.1	0.8	-2	-0.7	**8**
Crackers	0.99	0.1	4	5	0.97	-0.2	0.9	-8	2.4	**8**
Inst.Coffee	1	1.2	2	11	0.98	-0.6	0.8	-14	1.8	**7**
Dog Fd (can)	0.96	0.6	3	10	0.94	-1.5	5.2	-19	41	**6**
Cat Fd (can)	0.95	-2	2	-13	0.98	3.5	4	9	12	**6**
FlexiCat	0.85	0	3	0	0.94	0.9	5	-6	16	**6**
Vitamins	0.99	0.6	2	19	0.89	0.87	1.3	-33	6.5	**5**
Margarine	0.97	3.2	6	8	0.99	-0.9	1.8	-10	3.8	**5**
Analgesics	0.98	2.1	4	12	0.96	-0.6	1.1	-18	3.8	**5**
Still Water	0.99	1.7	4	15	0.98	-0.6	1	-25	3.5	**4**
Male Deo	0.99	3.7	6	18	0.99	-0.8	1.1	-28	6.9	**4**
Butter	0.97	2.2	6	15	0.97	-1.2	2.6	-30	12	**4**
Biscuits	0.96	7.9	9	25	1	-1.9	2.1	-42	8.8	**3**
Bread	0.97	9.5	12	32	0.99	-5.6	7	-81	7.3	**3**
Fem.Deo	0.98	5.1	7	22	0.99	-1	1.3	-34	5.8	**3**
Average	*0.97*	*2*	*4*	*11*	*0.96*	*-0.6*	*2*	*-20*	*7.51*	*6*
6 M/th Avg.	*0.99*	*0.1*	*0.8*	*6*	*0.81*	*-0.1*	*0.5*	*-10*		*8*

Kantar WorldPanel

In addition to the six failed categories, a further three passed just five out of nine thresholds and technically while the description of consumer buying propensities remained acceptable, yet fit deteriorated greatly from the six-month score. These categories are Analgesics, Vitamins and Margarine, which have all declined by three or more tests. The remaining nine categories remained within one or two test results of their initial fitting and here the model continued to perform well.

From the column averages it can be seen that the shape of the observed data continued to be well described by the Dirichlet, but the variances on theoretical and

observed individual brand performances increased substantially between the two periods. Correlations for both *b* and *w* remain strong and the higher purchase frequencies of larger brands captured in the CD threshold both confirm the DJ characteristic of the observed data and on average, these thresholds have been comfortably surpassed.

The model does not perform so well against the (O-T) test and the MAD thresholds, reflecting greater variances between outputs and individual brand measures over time. Average scores here fail in both *b* and *w* and once again, the polarity of each is opposed, and more consistently, a further replication of this regularity. This finding supports the observed systematic shift in brand choice propensities over time, but a near-stationarity in category purchase incidence.

The MAPE fittings are worse in six years than in six months, but on average were met (although only marginally in the case of purchase frequency, where seven categories failed, and some variances, for example in the case of Bread, were extreme). In establishing the nine tests Driesener (2005) relaxed this threshold considerably, so while it usefully standardises the variances in a way that the MAD statistics do not, it still allows for significant variation at the individual brand level. Average variance on this measure was twice as high for *w* as for *b*.

It can be said that the predictive fit of the model to long-term data was therefore not as reliable as it was in the usual short-run management periods. Further analysis was thus undertaken in order to identify any generalising relationships that might inform this. Initial candidates for violation of the Dirichlet assumptions included cases of market share turbulence, category penetration dynamics, evolving partitioning evidenced by excess loyalty to high share brands, the rate of erosion of repeat purchase, or some characteristic inherent in the average rates of *b* and *w*.

Table 35 gives results from these investigations and shows that no single factor could be identified as systematically disturbing the fittings. For example, Bread was identified earlier as an example of a problematic category based on the regularity of its purchase incidence. It also has one of the few examples of a non-stationary brand, as well as a leading brand exhibiting persistent excess loyalty. Category penetration, although high, is also declining. One, all or none of these factors may have contributed to the poor fit, but while Canned Cat Food shares these attributes, here the model fitted the data well in both six months and six years.

Of the nine best fittings, five categories contained non-stationary brands, including all three of the highly turbulent Pet Food categories, Soap and Instant Coffee. For each, although non-stationarity has led to deterioration in fit, the changes in structure may have been slight enough to become subsumed in the cumulative data. For example, in Instant Coffee persistent non-stationarity occurred for only one brand from Year Three onwards, while the brand leader at three times the size remained virtually stable. In the Butter and Bread categories however (and to a lesser extent Margarine) the structural changes involved not just single brands, but pairs of brands so that dynamics may have been too extreme for a continued fit to cumulative data.

Table 35: Possible factors contributing to a violation of Dirichlet assumptions

Category	Model Fit		Avg. Q		Cat. Pen Chge	Brand Chge	Excess Loyalty	Avg Erosn %
	Six Ms	Six Yrs	*w*	*b*				
Conditioner	**8**	**9**	1.6	35	2		2	35
Toilet Soap	**9**	**9**	4.1	34	-11	1	1	30
Ground Coffee	**7**	**8**	2.3	11	-1			24
Crackers	**8**	**8**	3.3	57	4		1	22
Shampoo	**9**	**8**	1.8	39	-4		2	33
Instant Coffee	**9**	**7**	2.8	63	-9	1		40
Cat Food (can)	**7**	**6**	17.1	21	-10	2	1	61
Dog Food (can)	**7**	**6**	12	15	-5	1	1	61
FlexiCat	**8**	**6**	18.8	15	4	1	1	40
Analgesics	**9**	**5**	2.4	35	0		1	29
Margarine	**8**	**5**	17.1	84	-6	1	1	24
Vitamins	**9**	**5**	2	21	1			50
Male Deodorant	**9**	**4**	2.5	55	0		1	35
Butter	**8**	**4**	4.1	49	1	2	1	12
Still Water	**8**	**4**	2.9	18	5		1	45
Fem. Deodorant	**9**	**3**	2.6	61	0			23
Wrapped Bread	**5**	**3**	12.4	96	-2	1	1	24
Biscuits	**6**	**3**	5.4	69	-7			34
Average	*7*	*5*	*6.4*	*43*	*-2*			*35*

Source: Kantar WorldPanel

As for other reasons, ERPL gives no clear explanation. Five of the six failing categories have average or below average brand-level ERPL, while several of the better fitting product fields such as Instant Coffee (40%), and Canned Dog Food (61%) show far higher rates. There is little association here with poor fit.

Categories with high quarterly household penetrations limit the possibilities of misclassifying non-buyers. In theory the Dirichlet may then be better specified, but five of the six failed fittings have above average quarterly penetrations, so this too seems an unlikely explanation.

Heavy category buying gives greater opportunities to switch brands within a period, while lighter buying should lead to greater loyalty. An "excess switching" could be related to brand level erosion, yet three of the six failing categories have purchase frequencies that are less than half the average, and only one (again, Bread) is above average. Thus, it seems unlikely that even this hypothesis could be supported.

Despite the fact that a general deterioration in fit was observed, no consistent or clear patterns emerged from the observations to account for it. The deterioration with time suggests a gradual shift in the purchase propensities assumed in the Dirichlet. The earlier observations of cumulative data and their fit to the DJ approximation in the previous chapter also suggested that by and large, brands remained constrained by Double Jeopardy even where the volume of the data increased greatly. No partitioning emerged to violate the zero-order assumptions in the model, although the fit to the extended DJ curve also deteriorated somewhat.

In order to describe changes in buying propensities between six months and six years, the next step of the analysis was to compare the parameters of the model in the two periods, for the categories where the fit was deemed acceptable.

The Dirichlet parameters describe the ongoing category purchasing propensities of the population in the shapes of the probability distributions they define. Any unexpected changes in these values and shapes might therefore explain deteriorating model fit. To simplify the analysis, and with prior knowledge of the category dynamics, the three Pet Food categories were excluded, as were the non-fitting product fields.

10.5 Stability in Parameters A, K and S over time

The three parameters of the Dirichlet describe the continuing nature of latent demand within the population. Parameters K and A govern the shape and scale of the heterogeneity in latent category selection rates, while S describes the heterogeneity in the distribution of underlying brand loyalties. Goodhardt *et al*., (1984) suggested that

K, S and A should each remain invariant in equal time periods in the equilibrium condition. K and S should also remain unchanging over extended periods, while A should rise linearly to describe increasing category demand, thus defining the scale of the gamma curve for the period. It is this parameter characteristic that controls the ability of the model to describe cumulative performance.

Early work on predicting performance measures for single brands using the NBD (Ehrenberg, 1988) demonstrated satisfactory results when extending the period of observation from four weeks to 12 weeks and up to a year based on the unchanging K parameter. However, in discussing the development of the Dirichlet, Goodhardt *et al.*, (1984) express some doubt about the stability of S in longer periods.

Wright & Stocchi (2010) have demonstrated how these three parameters (and measures derived from them, for example M, the mean purchase frequency of the gamma distribution) remain approximately stable over time. They generated a 26 month time-series for M, K and *phi* in four categories and reported only minor fluctuations. Graham, Scriven and Bennett (2012) found similar results in 18 categories and quarterly data over six years for A, K and S, in an analysis designed to compare category buying in two different household panels. They also confirmed that K remained virtually stable between one quarter and one year.

Table 36. Parameters A and K in six months and six years.

	6Y Fit	6M K	6Y K	Variance	6M A	6Y A	Growth
Hair Conditioner	9	0.29	0.40	38%	2.2	18.7	8
Toilet Soap	9	0.80	0.93	16%	1.4	14.9	10
Crackers	8	0.68	1.00	48%	5.3	43.2	7
Ground Coffee	8	0.10	0.21	114%	5.3	29.5	5
Shampoo	8	0.76	0.82	8%	1.9	20.9	10
Instant Coffee	7	0.90	1.06	17%	4.1	42.7	9
Margarine	5	1.3	1.1	-11%	6.1	82.5	13
Analgesics	5	0.39	0.59	52%	4.4	34.6	7
Vitamins	5	0.22	0.40	81%	3.8	25.3	6
Average		0.60	0.72	40%	3.8	34.7	8

Source: Kantar WorldPanel

In order to identify some generalising pattern that might explain the degenerating fit of the model, the Dirichlet parameters estimated from six-month data were compare with their six-year counterparts from the extended fitting. Tables 36

and 37 present a comparison of the parameters in nine categories and two periods, and show the extent of the changes. Results are presented first for K and A, and then for S along with a related statistic, average repertoire size.

First, category purchase propensity is described in Table 37. In the true steady-state, the mix of heavy and light buying propensities described in the six-month K would remain invariant, while A would simply grow by a factor of 12 to give the six year probability distribution. The two parameters would thus together give a mean category-buying rate, M for six years, of twelve times the value of M in six months (M=AK).

The analysis found that A does not grow linearly in every case, its growth ranging from thirteen fold for Margarine to just five times for Ground Coffee. At the same time, since market shares have remained constant across time periods, there has been a necessary compensating change in K to give the linear increase in M.

Table 36 is ordered by the number of tests passed. It shows that while there are unanticipated and substantial changes in K and A, these cannot be the sole cause of deviations from model output. Soap, Shampoo and Margarine have the closest A and K Parameters to stability, yet very different degrees of goodness of fit. Other underlying causes for the deviations must be found elsewhere, but here the main finding is that category-buying propensities have not remained stable between six months and six years. In these nine categories K has shown an average growth of 40% while A has not grown as expected, suppressed to only eight times rather than twelve times its average six-month value, to maintain the stationarity in mean purchase rates.

10.6 The interpretation of changes in A & K

A and K are closely related to the NBD, but unlike the discrete counts of manifest behaviour, together they describe a smooth distribution of underlying latent demand that will be "fired" by the random purchase events in any period, distributed across it according to the Poisson process. The gamma distribution does not therefore describe purchase events themselves, but the steady propensities to purchase assumed in the population.

In order to help interpret the changes seen in the model parameters, Figures 11*a* and 11*b* show an example of the expected effects of time on the shape of three

hypothetical gamma distributions, and the impact of the observed variances on these. The figures were produced in an Excel programme devised by Carl Driesener to model the evolving shape of the gamma distribution.

In figure 11*a* the K value of 0.74 is assumed to remain stable over three periods of differing lengths, T, 2T, and 2.5T. This represents the assumption of stationarity in Dirichlet theory, requiring that the linear increases in the cumulative mean category purchase rate M from 0.7 to 1.8 and 2.4 is driven by increases in the A parameter of the distribution, here from 0.9, through to 1.8.

Figure 11*a*. Gamma distributions with invariant K

K = 0.74.   **---** (T) A = 0.9; M = 0.7   **---** (2T) A = 1.8; M = 1.3   **---** (2.5T) A = 2.4; M = 1.8
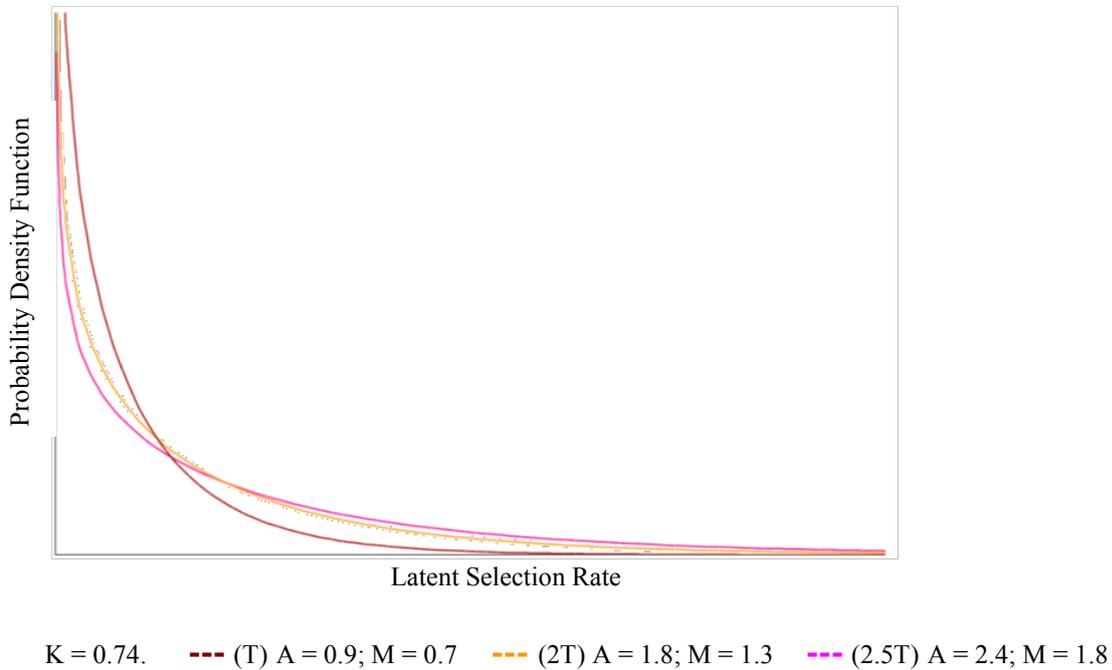
Figure 11*a* is therefore considered to be the normal case and interpreted as follows. The value of K is under 1, and so the distribution remains a reverse J, which in the case of T is steep, does not meet the vertical axis in the plot as shown, and approaches the horizontal axis quickly. This distribution may be interpreted as meaning that a large proportion of the population has a negligible probability of purchasing in a period of this short length, while the demand from those that are likely to buy is mostly low. When triggered by the Poisson it would manifest as the typical buying seen in short periods of analysis; a very large proportion of non-

buyers, sales mostly supported by many once-only buyers and very low levels of repeat-purchase amongst a few heavier buying households.

Given the linear accumulation of latent demand at 2T and a stable K the steepness of the curve softens, first to meet the vertical axis, and then to move down it at 2.5T. This means that in a longer time frame the proportion of the population that *might* buy at all has greatly increased. The likelihood that those that were already buying the category will buy it again also improves, lifting the tail of the distribution well away from the horizontal axis for more of its length. Over time heterogeneity reduces as the probability of repeat-buying spreads further across the population, and demand increases across rather more households.

In order to simulate observations in Table 36, it is assumed that changes in A and K are gradual rather than discrete. This seems likely given the continuing stationarity seen in successive quarters. If it were further assumed that 2.5T represents three years of cumulative purchasing, then following the average change in observed data, the increase in K might be approximately 20%, M would remain invariant, but suppressing growth in A. The new parameters then define a rather more extreme version of the long-term gamma for 2.5T in figure 11a, which is superimposed in black for comparison to give figure 11*b*.

Figure 11b. A comparison of gamma distributions with changing K

K = 0.74.   **---** (T) A = 0.9; M = 0.7   **---** (2T) A = 1.8; M = 1.3   **---** (2.5T) A = 2.4; M = 1.8
In comparison with: --- K = 0.88; A = 2.02; M = 1.8
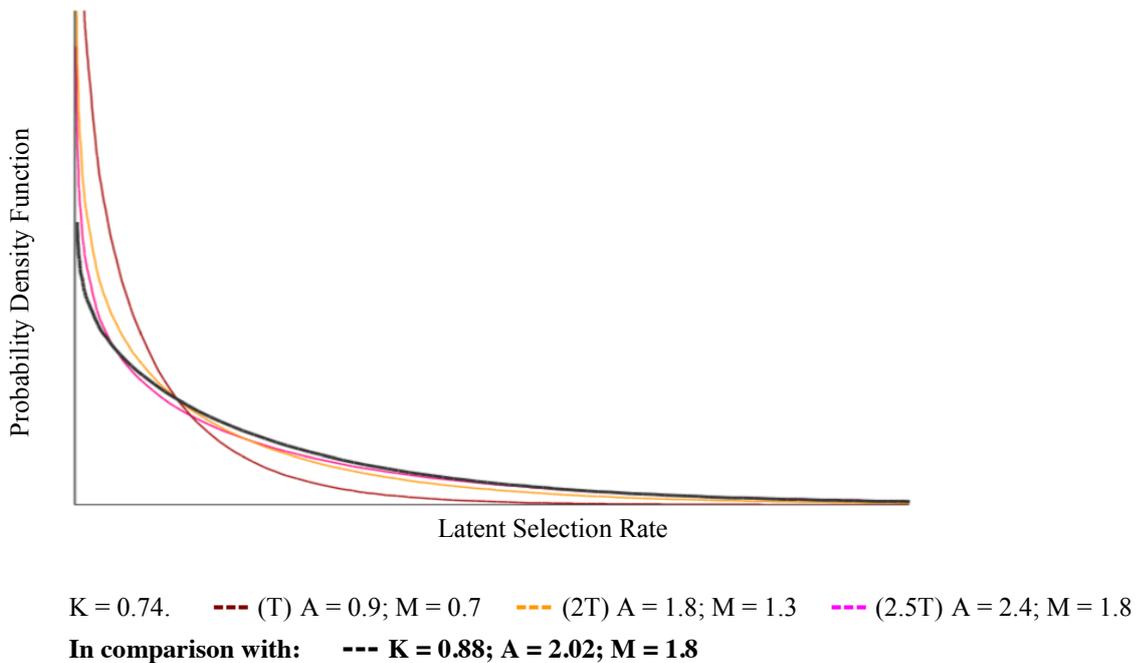
The two versions of 2.5T have the same mean purchase frequency of 1.8 but the change in parameters gives a rather flatter distribution. The lower than expected growth in A suggests a far lower proportion of households in the population with a light buying propensity, but latent demand among medium and heavier buyers is increased lifting above the anticipated level for almost its entire length. When this demand manifests as purchase incidence in the period, the stable mean purchase rate will thus be supported by heavier than expected rates of category purchase among repeat buyers, compensated for by a lower than expected proportion of light category buyers in the population. This effect is seen across the nine categories to a greater or lesser extent. With the exception of Margarine, K has consistently increased with time where it was anticipated to remain stable, and A has consistently grown more slowly than the linear increases expected. Adjustments to household purchase propensities thus appear to vary in degree between categories, are probably incremental, and are largely systematic.

Any increase in K towards its critical value of 1 flattens the shape of the gamma as it transforms from a reverse J to a unimodal distribution (Driesener, 2005). Although under steady state conditions latent demand in longer periods is expected to change its nature with increases in A, the observed changes seen from recalibrating the model to the cumulative data indicate an acceleration of this process. The average 40% increase in K over six years and a lowering of A by around 30% from its expected value sustains stationarity in buying, but with different purchase propensities from those assumed in the six month fitting. While this might indicate that the model was incorrectly calibrated in the six-month period, the continuing goodness of fit and observed stationarity in the short-term analyses might suggest otherwise. A second alternative is that the six-year data has been biased by a deviation from the original assumptions, which is negligible in short run fittings but cumulative in nature. ERPL would seem to be an obvious hypothesis to explore in this context.

10.7 Changes in S and the Erosion of Repeat Purchase Loyalty

The erosion of repeat purchase loyalty suggests an additional customer churn between brands that is not accounted for in the model predictions. It would become apparent if the switching parameter S were to increase in longer data observations.

Table 37 confirms that in addition to the changes observed in K across categories, there are even greater variances observed in S over time.

The table, once more ordered by the number of tests passed, demonstrates that the growth found in the S parameter in the recalibrated model is on average two and half times its six month value. The increase reflects a substantial and unexpected decrease in loyalty across all categories. A simple way to demonstrate this is to show increasing average repertoire size, which doubles between six months and six years. Were S to remain stable as anticipated, average household repertoire would grow over time, but would reach a ceiling with cumulative penetration increases. Banelis (2008) established an average annual repertoire size of two across FMCG categories, and here the six-month average value of 1.6 seems to suggest that cumulatively it too might reach about two in one year. However, re-estimating the parameter from the six-year data shows that average household repertoire has continued to expand indicating a dramatic increase in brand choice propensities across the population.

Table 37: Parameter S in six months and six years

	6Y Fit	6M S	6Y S	Variance	6M Rep.	6Y Rep.
Hair Conditioner	9	1.5	3.5	143%	1.3	2.7
Toilet Soap	9	1.0	2.5	141%	1.3	2.9
Crackers	8	2.0	5.4	167%	2.0	4.7
Ground Coffee	8	0.8	1.7	116%	1.4	2.2
Shampoo	8	1.9	3.7	97%	1.4	3.2
Instant Coffee	7	0.9	2.4	182%	2.4	3.7
Margarine	5	1.1	3.2	191%	2.1	4.8
Analgesics	5	1.0	2.4	141%	1.4	2.9
Vitamins	5	0.7	1.4	83%	1.3	2.0
Average		1.2	2.9	140%	1.6	3.2

Source: Kantar WorldPanel

If this increase were a normal (but as yet unrecognised) empirical generalisation then categories with dynamic brands might be expected to show above average growth in S values. As it happens, this is in fact the case for Instant Coffee and for Margarine, where growth in share came at the expense of rival brands, and thus changed household brand portfolios. In the case of Soap however, S has only grown by the average. This can be explained in that share increases for Dove over six

years were achieved by the buyers of the brand largely ***not*** changing their purchase propensities, while overall category penetration declined.

In the case of Crackers, the S value is already above average, but above average growth indicates additional but unexpected variety seeking; in the Shampoo category the above-average S indicates normally high switching propensities, but stability in below-average repertoire growth. A low S value in Vitamin purchasing suggests households may in this category restrict brand choices exceptionally. These categories, while differing in their choice characteristics, have nevertheless remained in equilibrium, despite a substantial unexpected two and a half fold shift in S.

The main finding is therefore that the amount of switching between brands increases dramatically (and clearly beyond what a fixed propensity model indicates) with time. No category showed a reducing or stable S.

As the parameter increases, the differences in popularity between competing brands becomes less pronounced indicating that *every* competing brand has an increasing propensity to be chosen by category buyers over time. Although the variance fluctuates by product-field, over six years the study has shown that in order to fulfill any particular category need the average household will purchase twice as many brands as previously anticipated. This finding has major practitioner implications. S only changes in one direction, upwards. Although this signifies a general decline in loyalty across all categories, it may still allow the evolution of a differential customer equity for individual brands. It seems unlikely since long-run observed metrics appeared to fit the extended slope of the DJ approximation fairly well, but more detailed repeat-buying measures are available from the full Dirichlet fitting to understand this better, and these results are discussed in the next section. The analysis is crucial because a doubling of repertoire over time indicates an unforeseen and substantial decline in loyalty for all brands, a considerable consumer churn underlying near-stationary conditions, and anything but steady purchase propensities across the population.

The finding of evolution in S also adds to our understanding of ERPL, but does not entirely account for the deterioration in model fit. Although both category purchase incidence and brand choice propensities have not remained as anticipated no clear story has emerged to explain deviations from model output, possibly because too many variables have been observed to change at once. Category penetration, brand dynamics, erosion, and differences in buying styles between categories and brands are

all examples and they may covary. In the preceding analysis the model was recalibrated to achieve a best fit to each cumulative dataset, and this identified changing latent demand characteristics in half the categories. To understand evolving purchase propensities better, a final fitting was needed that would provide a stable baseline of the cumulative steady state for comparison.

10.8 Testing the predictive fit of the projected steady-state.

To achieve a steady-state six-year benchmark, for each category a projection of the cumulative data was run from the six-month parameters by increasing A twelve-fold. This procedure, as described in Goodhardt *et al* (1984), relies on stationarity in long-run purchasing. It thus provided a full set of behavioural metrics against which to evaluate the obvious cumulative variances in buying propensities. The tests confirmed generalising deviations between expected and observed choice behaviour, and less pronounced changes in category purchase incidence. These discrepancies explained many of the Dirichlet deviations described in the literature, for example the erosion of repeat purchase loyalty, the instability in predicted repeat purchase measures and some of the difficulties encountered in extending the use of conditional trend analysis.

The analysis again began with the shampoo category to identify patterns and exceptions there, before moving to an extension and replication across the remaining data. The observations of brand performance measures in cumulative data were tabulated against the projected stationary benchmarks from the Dirichlet output. Once again, consideration was given to the top nine named brands in each category while smaller brands and private labels were aggregated into one variable, "other" so that the model was calibrated on 100% of the purchase occasions for the period.

Table 38 reproduces the main buying measures for shampoo in the UK. To recap the main points, the observed data showed that after six years the category had been shopped at least once by 92% of the sample, almost double the 55% penetration seen over six months. On average just over 18 shampoo purchases were made in the six years by each of those households. The observed (O) measures of category buying, B and W, were well predicted in the projection (T), but the brand level

outputs were individually not as close, showing variances at the household and brand choice level many of which were intimated in the previous findings.

The Double Jeopardy relationship is clearly observable, but it is not as extreme in the model outputs as in the observed data, replicating the finding from the earlier comparison with the cumulative DJ approximation. Brand penetrations are consistently under-predicted and purchase frequencies are consistently over-predicted, including for the brand leaders which therefore show no excess loyalty over the steady-state cumulative Dirichlet prediction.

Table 38. Comparative Dirichlet fittings to long-run observed data

Brands	Market Share	Penetration (b) %		Avg. Purchase Frequency (w)	
		O	*T*	*O*	*T*
Total	100	92	**91**	18.6	**18.9**
Pantene	10	35	**31**	5.0	**5.6**
Head & Sh/er	9	29	**27**	5.1	**5.5**
L'Oreal El.	6	31	**21**	3.5	**5.2**
Herbal Ess.	6	27	**19**	3.6	**5.2**
Organics	5	24	**16**	3.5	**5.1**
Fructis	4	21	**13**	3.1	**5.0**
Timotei	4	20	**12**	2.9	**4.9**
Vosene	3	16	**10**	3.0	**4.9**
Wash & Go	1	9	**4**	2.2	**4.7**
Other	53				
Average		23	**17**	3.5	**5.1**
Test Statistics		*Th/ld*		*Th/ld*	
Correlation		≥ 0.9	0.95	≥ 0.6	0.97
MAD		≤ 3	6	≤ 0.9	1.4
O-T		≤ 0.5	6	≤ 0.2	-1.6
MAPE %		$\leq 20\%$	53	$\leq 20\%$	31
CD				>0	6

Data source: Kantar WorldPanel

Using the same suite of tests, it can be seen that the prediction passes only three of the nine, and the fit must therefore be deemed unacceptably poor. This is rather surprising, since it indicates that although category-level buying is almost exactly as expected (noting that this is a projection from the six month fitting, and not an estimation using observed category measures), the cumulative outcomes of brand

choice and purchase incidence measures do not reflect Dirichlet assumptions of steady-state purchasing propensities at all.

It was then hypothesised that these brand-level variances might be indicative of the churn suggested by ERPL and the changes seen in the S parameter, particularly since headline measures of market share and category buying were both closely predicted. If it were assumed that household category purchasing remained approximately steady over time, but that the range of brands in the average repertoire expanded, then penetrations for every brand would rise as households worked their way around the available options over time, while average purchase frequency for individual brands would not grow as quickly as predicted. Extended variety seeking would mean that the number of light buyers attracted to each brand (and especially to smaller brands) would rise, while the penetration of heavy buyers and the proportion of households that were 100% brand loyal would all decline against the benchmarks.

These variances were found to be exactly as hypothesised. Table 39 continues with results from the analysis, and shows the distribution of purchasing between light and 5+ buyers in observed and theoretical data. In considering the 5+ measure it must be noted that households that buy over five times in six months are heavy buyers while those that buy over five times in six years are not, yet the comparison between once-only buyers who cannot repeat, and a second category who have repeated within the period remains crucial here. Consequently in this analysis, 5+ buyers will now be referred to as "heavier" or "repeating" rather than "heavy" buyers.

On average nearly half (49%) of any shampoo brand's buyers only bought that brand once in six years. This compares with a prediction of a third (36%). The proportion of once-only buyers is expected to be lower for bigger brands, according to the Law of Natural Monopoly (McPhee, 1963) but the variance across brand sizes is much more extreme in observed measures. For the smallest brand in the data, almost two thirds of its buyers bought it just once *in six years*. The variance between the average observed and the average theoretical measures of the cumulative brand penetrations of once-only buyers amounts to an excess of 36%.

At the same time the model over-predicts the prevalence of repeat-buyers, those who made more than five purchases of the brand over the six-year period. Again there is a deficit of 36% between the expected and observed measures, but the deviation is more pronounced for smaller brands. The proportion of repeat-buyers varies greatly between large and small brands, and although it exhibits a DJ

characteristic, this is once again rather more extreme than the model predicts (as previously seen with *b* and *w*), with the smallest brand having three times fewer heavy buyers than the largest, the prediction suggesting only a 10% variance from the average. So while smaller brands have more buyers than expected, many more of them than anticipated are once-only purchasers.

Table 39. Observed & predicted heterogeneity in long run buying

Brands	Market Share %	% buying			
		Once		5+	
		O	*T*	*O*	*T*
Pantene	10	38	**33**	28	**33**
Head & Sh/ers	9	35	**34**	30	**32**
L Oreal Elvive	6	46	**35**	19	**31**
Herbal Essences	6	45	**36**	21	**30**
Organics	5	50	**36**	17	**30**
Fructis	4	51	**37**	15	**29**
Timotei	4	53	**37**	13	**29**
Vosene	3	59	**38**	13	**28**
Wash & Go	1	60	**39**	10	**27**
Other	53				
Average	5	49	**36**	19	**30**

Source: Kantar WorldPanel

This may perhaps point to a different role for smaller brands in household portfolios in the long run, since it appears that a great deal of switching between these brands may account for extremely high proportions of light buyers in their customer base. Of course East and Hammond (1996) found that the erosion of repeat purchase loyalty has a DJ characteristic, and this supports the implication here that smaller brands suffer far higher switching

It is astonishing to think that over six years, over half the customer base of the smallest brands bought those brands only once, but again this highlights the impact of excess switching. The prediction of a third of the customer base being once-only buyers in six years is exceeded by nearly 50% in observed data, indicating a most surprising decline in long-run loyalty even for well-known brands.

To explore this further, Table 40 shows another loyalty measure, Share of Category Requirement. First, total category purchases are compared for buyers of each brand both as observed and predicted measures. There is a very close fitting. The

observed data shows a slightly higher category purchase incidence than the model allows, but the measures show no particular partitioning between brands, indicating that brand choice and incidence remain independent as the theory suggests. SCR is considerably lower than predicted, as might be expected in the light of previous findings. Loyalty to any shampoo brand on this measure is lower by a third against expectation and once again small brands suffer more than larger ones. This again describes an evolving but unexpected increase in switching at the individual household level that is consistent with the concept of erosion.

Table 40. Observed & predicted share of category requirement

Brands	Market Share %	Category			
		Purchase		SCR %	
		O	*T*	*O*	*T*
Pantene	10	27	**24**	19	**23**
Head & Sh/ers	9	26	**25**	19	**22**
L Oreal Elvive	6	27	**25**	13	**21**
Herbal Essences	6	28	**25**	13	**21**
Organics	5	28	**25**	12	**20**
Fructis	4	30	**25**	10	**20**
Timotei	4	30	**25**	10	**19**
Vosene	3	27	**25**	11	**19**
Wash & Go	1	31	**26**	7	**18**
Other	53				
Average	5	28	**25**	13	**20**

Source: Kantar WorldPanel

Sales of smaller brands are thus seen to rely on larger and larger proportions of light buyers over time, confirming again the problematic nature of traditional conceptions of niche brand marketing. Buyers of small brands are far less loyal than expected, by definition the buyers of bigger brands, and heavier category buyers. In order to examine this idea, the next Table (41) shows the incidence of 100% loyal buyers for each of the brands in the six-year period. No shampoo brand has succeeded in retaining more sole-brand buyers than expected, but once again the model under predicts their purchase frequency.

The Dirichlet literature has always considered loyal buyers to be light buyers, largely loyal by default and declining in number over time. In six years of cumulative data it was possible to see the extent of true brand loyalty. While the model suggested

that only 4% of a brand's buyers should remain with it consistently, in fact this number fell even lower, so that on average just 2% remained truly committed over the entire period, buying just over one bottle of shampoo every two years compared with the average category purchase frequency of almost nineteen.

Table 41. Loyal Buyers

Brands	Market Share %	100% Loyal			
		Penetration		Avg. Purchase Freq.	
		O	*T*	*O*	*T*
Pantene	10	3	**4**	5.0	**3.0**
Head & Sh/ers	9	5	**4**	5.4	**2.9**
L Oreal Elvive	6	2	**4**	4.3	**2.8**
Herbal Essences	6	1	**4**	2.2	**2.7**
Organics	5	0	**4**	1.3	**2.7**
Fructis	4	1	**3**	2.3	**2.6**
Timotei	4	2	**3**	5.8	**2.6**
Vosene	3	4	**3**	4.3	**2.6**
Wash & Go	1	1	**3**	1.2	**2.5**
Other	53				
Average	5	2	**4**	3.5	**2.7**

Source: Kantar WorldPanel

To summarise, the steady state prediction of cumulative market structure from the six month estimation achieved a very close fit to the headline measures of category penetration and purchase frequency, but the stable brand shares were defined by very different sales equations in observed and theoretical measures. Model fit was therefore deemed to be unacceptable. This is because observed brand-level data followed a more extreme Double Jeopardy relationship than predicted with far higher *b*'s and far lower *w*'s, a fairly close fit for leading brands but with increasingly large variances for smaller brands. These variances are consistent with observed changes in S, and with the average level and DJ characteristic of erosion, including large increases in the penetrations of once-only buyers.

There is clearly a world of difference between the ongoing propensities underlying the cumulative observed data, and the steady-state outcomes defined by projecting the six-month propensities to six years. An unanswered question so far was whether the model was accurately calibrated (for example, because the full distribution of purchase probabilities cannot be defined from six months of data), or if

correctly anticipated propensities have shifted gradually away from an accurate model. More replications were needed to investigate this, but the first evidence of a generalisation was found in the literature.

The extreme results described in the shampoo category are echoed to a lesser extent in the description of cumulative performance metrics over a year in *Repeat Buying* (Ehrenberg, 1988 p.50). Similar symptoms are described in an otherwise stationary product field – a shortfall of repeat buyers between periods, an excess in penetration between equal periods for smaller brands and lower than expected purchase frequency coupled with an excess of light buyers. Ehrenberg drew the conclusion from these variances that since aggregate repeat rates were normal, the category itself could have been characterised by rather more brand switching than expected in the period, and was therefore a slight exception to the rule. Of course the argument then was to describe the basic regularities seen in the data, the relationship between brand size and penetration, and the far smaller variance in purchase frequency. The significance of these observations may have been overlooked at that time, but it now appeared that they might in fact be empirical generalisations. Further replications in the long-term data were therefore conducted, which then showed this to be the case.

10.9 Replication of steady-state variances across categories

Results are next presented in Table 42 for each of the buying measures, summarised for the leading brands in the eighteen categories, and in Figure 8, a graphic comparison is given of the Dirichlet DJ slopes for the projected steady-state condition, the cumulative fitting and the cumulative observed performance.

Figure 11 is perhaps a useful contextualisation of the differences between the three Double Jeopardy slopes, each of which describe the same brand shares. The steady-state six-year projection is shown in the top slope, predicting the highest purchase frequencies, but the lowest penetrations. The spread in penetration between smallest and largest brand is close to that seen in the observed data, but the individual values are lower by around twelve points and the variance between predicted and observed penetrations is greatest for the biggest brands. The line is steep, indicating the likelihood that the largest brands are reaching a peak in their penetration growth.

It is clear that the steady-state projection barely describes the observed brand metrics, which have far higher penetrations, and far lower purchase frequencies, consistent with the "excess switching" described in the shampoo category. The deviations observed for shampoo buying have therefore generalised across the dataset. An interesting point is that the observed and projected curves are almost parallel, although offset. This implies that the shape of the DJ relationship is well predicted from the projection, but that its scale is wrong.

The fit of observed measures to the slope from the model re-estimation is closer than that to the projection, but reflects the earlier discussion, so that the observed curve crosses the fitting, showing excess loyalty for the top brand, and increasingly poor fit for the smaller brands. The range of observed penetrations is narrower than expected, and the width of deviations in purchase frequency is wider as expected from the nature of the observed changes in propensities.

The main finding from the comparison between projected and observed measures in Table 42 is that over six years households exhibit *far lower* brand loyalty in all categories than even Dirichlet theory predicts, such that for the average brand against its steady-state prediction:

- Penetration is 66% higher but purchase frequency is almost 50% lower
- The penetration of its once-only buyers is about 40% higher than predicted, but a third lower than expected for heavier buyers
- Category purchasing by its buyers fits well, but its SCR is 44% lower
- Penetration of 100% loyal buyers (observed to fall to just 3% in six years) is only half the expected level, with a purchase frequency of just over half benchmark levels.

Table 42 confirms that this dramatic decline in cumulative loyalty is consistent with the greater than expected brand switching described in changes to S, yet supports sales stationarity, since market shares remain stable across increasingly long reference periods. A feature of the excess in observed buyer churn is that it remains governed by Double Jeopardy. Switching buyers are not developing an allegiance towards certain brands, but churning between the choices in line with the duplication of purchase law. If it were otherwise, brand buying would evolve into partitions.

Figure 12. A comparison of two Dirichlet fittings with observed cumulative data

Penetration %

Observed Cumulative data

(T (Theoretical from 6 months))

T2 (Theoretical from 6 Years)
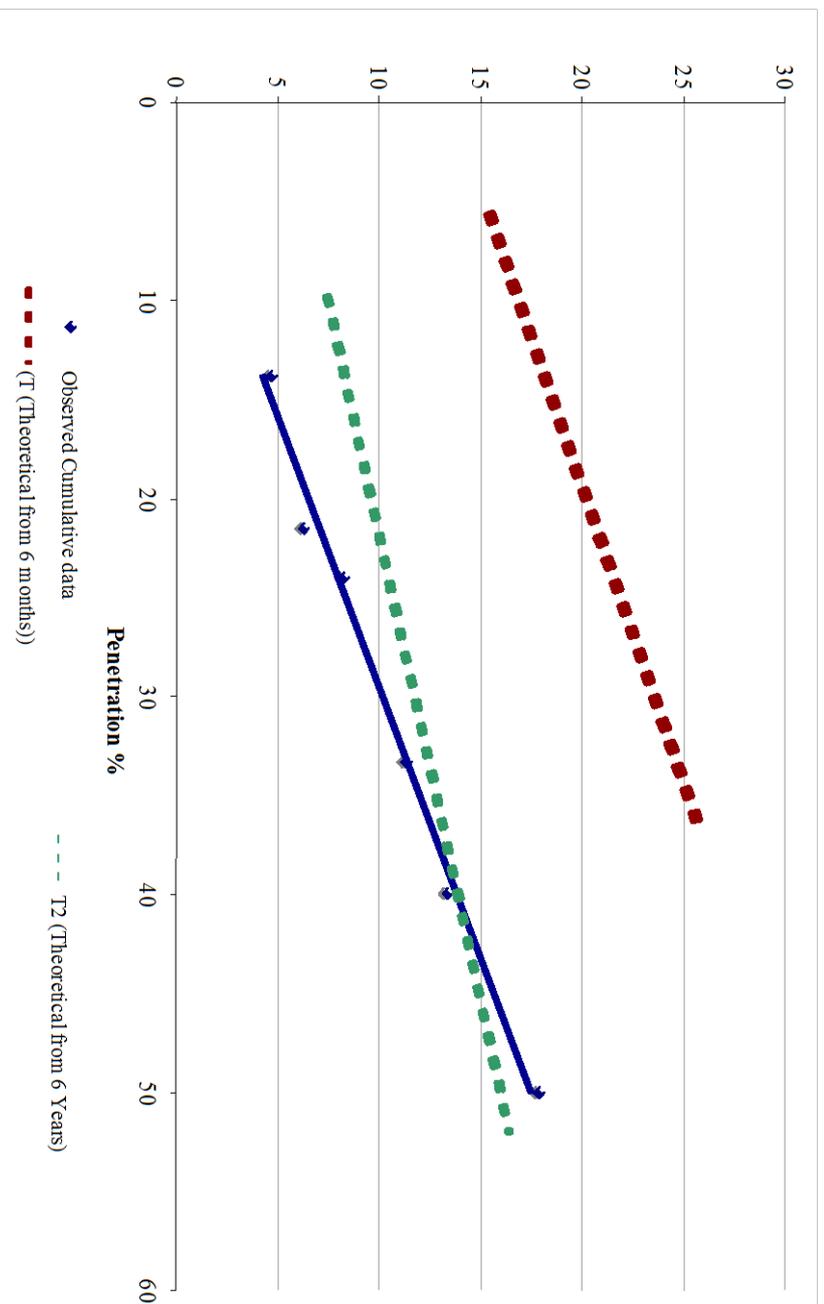
Table 42. A comparison of the projected Dirichlet fitting to the aggregated cumulative six year dataset

| | Market Share % | Penetration % | | Purchase per buyer | | % Buying | | | | Category Purchase | | SCR (%) | | 100% Loyal Penetration | | Av Purchase | |
| | | | | | | Once | | 5+ | | | | | | | | | |
		O	T	O	T	O	T	O	T	O	T	O	T	O	T	O	T
Total	100	82		62													
Brand A	18	50	37	18	25	28	24	44	48	76	84	24	31	7	9	13	17
Brand B	11	40	26	13	22	32	27	38	44	80	86	18	27	4	7	8	14
Brand C	7	33	18	11	20	39	29	30	41	84	87	13	25	3	6	6	13
Brand D	5	24	11	8	18	43	31	26	39	94	88	11	23	2	6	6	10
Brand E	3	22	9	6	18	47	31	22	39	87	89	9	23	3	6	6	10
Brand F	2	14	6	5	13	42	28	20	33	75	68	7	19	2	5	6	9
Average	8	30	18	10	19	39	28	30	41	83	84	14	25	3	6	7	12

Average purchase per buyer is nevertheless only half the expected level, but there is also a rather wider differential between big and small brands than expected. In the model output the biggest brand has about a third more purchases than the smaller, but in observed data that differential has become slightly more extreme. However, since all brands greatly underperform the steady state purchase frequency prediction, this can hardly be interpreted as evidence of successful customer retention. Extreme Double Jeopardy is not however an exception, but as noted in the previous chapter, simply the characteristic of the curve. As cumulative penetration rises to meet the asymptote the DJ slope becomes steeper, creating a wider differential between brands.

Small brands however continue to suffer twice. Even though they attract more buyers than predicted (slightly more than double the estimate), and proportionately more than big brands (which attract just over a third more than anticipated), many more of them than expected buy only once, depressing purchase frequency.

Buyers of small brands are, as expected, heavier category buyers, spreading their choices further than expected over the category. This extension of the law of Natural Monopoly defines the role of the small brand as an occasional choice, highlighting its vulnerability in distribution.

Brand sales over six years are therefore characterised by very large numbers of very light buyers. A final point therefore arises concerning their true nature when calibrating the model to short term data; are they light category buyers or heavy buyers, but one-time visitors to the brand? Future research may find a way to adjust the model to allow for this additional variance now that it is clear how it comes about.

10.10 The erosion of repeat purchase, switching and stationarity

The effects of the unpredicted customer churn on buying heterogeneity are important in explaining the leaky bucket phenomenon. In the previous chapter it was shown that the erosion of repeat purchase loyalty continues over time, and reaches an average of a 35% loss in loyal customers over the five years of data. The leak is persistent and generally systematic, but varies by category and by brand. With the exception of Double Jeopardy it seems almost unrelated to any other variable.

Using the stable-case Dirichlet predictions it is now possible to present an explanation for this variance by examining the unconstrained cumulative data. An

under prediction of penetration for each brand, an over prediction of purchase frequency and a marked variance in the distribution of buyer heterogeneity across households has been noted. All brands have more light buyers than predicted and less heavy buyers, in keeping with the over predicted loyalty across measures, and despite the fact that market shares are the same between observed and theoretical data.

Table 43 gives descriptive measures of buyer heterogeneity in the cumulative data. For each category, the average proportion of each brand's light (once only) and heavier buyers (five or more purchases) is given. Observed measures (O) are compared in the Table with the steady-state theoretical Dirichlet benchmarks (T), with the erosion of repeat purchase for the average brand in each category, and with growth in category penetration (B). The table is ordered by the magnitude of brand ERPL, from which it can be seen that the loss of repeating customers over time varies greatly from just 12% in Bread to 50% in Vitamins.

Variances between observed penetrations and the benchmarks are expressed as percentages (O-T for light buyers and T-O for heavy buyers), and then as an absolute variance, which is a penetration measure for an average brand in the category. The last column then shows the growth in category penetration from six months to six years. It can be seen that penetration in some categories grows further than in others, and in part this relates to the penetration in the original period. It should also be remembered that the households that swell category penetration measures after six months are probably lighter buyers, while brand penetrations can be increased by either light category buyers or by brand switchers. The increases in the K parameter noted earlier imply faster than expected cumulative category penetration growth, but fewer light category buyers in relation to the proportion of heavier buyers.

The pet food categories have been removed from the dataset for this analysis, and so the first point to note is that the ERPL loss in this set of categories was identified as 31% – that is to say, the average brand is expected to lose 31% of its repeat customers over five years when compared with a stable benchmark. Using the extension of that benchmark here it is now seen that the average brand has 29% more once-only buyers and 31% fewer repeating buyers than predicted.

By definition, a household that buys only once in six years cannot be a repeat-purchaser, and there is an excess of such buyers in six years for every brand, on average 12 points of its total penetration. In comparison, from quarter to quarter just over a third of any brand's buyers repeat (see table 26), but over six years, and against

a stable benchmark, 31% of those buyers erode from the measure, a churn of about 12 points in any brand's penetration over time. Every brand has also lost 12 points of its predicted penetration of heavier buyers. Buyers must be replaced in order to maintain equilibrium in penetration, but a drop in the penetration of heavy buyers, and an increase in light buyer penetration dramatically changes the distribution of buyer heterogeneity in the population over time, cumulatively reducing purchase frequency and increasing penetration. While the strength of the association between ERPL and the variances in heterogeneity is reasonably strong (0.67 for the absolute measures in both directions), and the notion of churn is supported by the near-equivalence in the gains and losses in each category, it suggests that this may not be a full explanation.

Of course over time purchase propensities are likely to change for any number of reasons, including some buyers leaving the category altogether. In addition to the systematic variance described here, the data may therefore also include lost and replaced households with different long-term purchase propensities as well as a few cases of brand decline and growth where the buying household characteristics are evolving. Individual, but very different cases may thus account for the residual variation, but the general pattern must be considered to contribute greatly to the evolving variances in model fit.

Growth in category penetration is also slightly associated with ERPL (r = 0.41), and with changing heterogeneity (more so with light buyers than heavier buyers). One explanation might be the shelving characteristic inherent in categories with high proportions of non-buyers. For example, Bread has a category penetration of 97% in six months, a very low erosion rate, and buyer heterogeneity that is closely described. Vitamins on the other hand have a non-buyer penetration of 71% in the original calibration period, a very high variance in model fit and an ERPL of 50%.

Table 43. The Leaky Bucket in Six Year Cumulative Data

	ERPL %	Once			5+			Abs. Variance		Growth in
		O	T	(O-T)/O	O	T	(T-O)/O	Once	5+	B
Bread	12	26	**23**	13%	51	**51**	1%	3	0	3%
Crackers	22	35	**28**	21%	35	**42**	17%	7	7	37%
Deo Fem	23	41	**28**	32%	26	**42**	39%	13	16	53%
Butter	24	33	**24**	28%	39	**50**	23%	9	11	40%
Ground Coffee	24	53	**34**	37%	19	**37**	48%	19	18	208%
Margarine	24	23	**19**	16%	52	**57**	9%	4	5	9%
Analgesics	29	45	**30**	34%	25	**41**	39%	15	16	84%
Soap	30	47	**31**	33%	21	**36**	41%	16	15	81%
Shampoo	33	37	**26**	28%	35	**46**	23%	11	11	67%
Biscuits	34	34	**26**	23%	35	**46**	24%	8	11	21%
Deo Male	35	44	**28**	37%	26	**42**	38%	16	16	37%
Conditioner	35	54	**39**	27%	16	**28**	44%	15	12	146%
Instant Coffee	40	33	**22**	35%	39	**53**	27%	11	14	27%
Still Water	45	50	**31**	38%	18	**41**	55%	19	22	178%
Vitamins	50	53	**32**	39%	21	**38**	44%	21	17	148%
Average	*31*	*41*	*28*	*29%*	*31*	*43*	*31%*	*12*	*13*	*76%*
Correl with ERPL				*0.68*			*0.62*	*0.67*	*0.67*	*0.41*

10.11 Summary

In this chapter results have been presented which further address the requirements of the fourth research objective in describing variances from long term behavioural norms. Additional results then answered the final research objective, in describing the predictive fit of the Dirichlet to long term data. This dissertation has shown that:

1. The fit of the Dirichlet to market structure in successive short-run periods over six years remains good in all categories supporting further long term use.

2. However, when estimated on cumulative data, model fittings generally deteriorated in comparison to short term calibration. The underlying causes, including brand dynamics, were varied and confounding, so clear generalisations were hard to define.

3. The model parameters from the best-fittings showed that even in near-stationary data underlying cumulative purchase propensities change considerably. Parameter K, rather than being invariant increased with time, and S increased systematically and substantially. For K the change signified a slightly flatter but higher gamma distribution of probability densities than expected but changes in S were dramatic and signified a substantial increase in switching for every brand.

4. From a final set of Dirichlet fittings using the six-month estimation to derive a six-year steady state prediction, the main pattern observed was that over six years households exhibited far lower brand loyalty than even Dirichlet theory predicted. Purchase frequency was only half expectation and SCR 44% lower.

5. The average penetration of buyers of any brand who bought it over five times in six years is about a third below the benchmark, a deficit matched by an increase in the penetration of once-only buyers.

6. The increased brand switching thus described is closely correlated with, and largely explains the leaky bucket effect. In aggregate period-to-period data the effects of shifting individual-level propensities are marginal (and in fact have long been observed as slight unexplained variances) and their impact only becomes clear in the changes to long-run buying patterns in cumulative data.

7. These changes although systematic vary in extent by category.

In normal management periods variances from the steady state are marginal, and only become clearly visible when many more buyers and purchases can be observed. By examining cumulative data it has been possible to identify more of the behaviour of more of the households in the sample. Variances then emerged to explain the real nature of consumer loyalty which is concealed from period to period. In six months or even a year these variances are not important enough in any category to affect the fit while near-stationarity means that they are perhaps not important in terms of maintaining brand performance. Only over time can the real picture be seen, and here expectations must be lowered. Buyers are and remain ***category*** buyers, and brands are really substitutable.

In the next chapter the research findings are discussed, in order to define the contributions made to knowledge. The implications for practitioners are drawn before the limitations of the study are described, along with suggestions for further research.

CHAPTER 11: THE CONTRIBUTION TO KNOWLEDGE

In this chapter the results presented are discussed in order to define the contribution to knowledge made by this research. That contribution includes the extension of several important empirical generalisations and regularities of repeat-purchase to a strategic context and a strengthening of Dirichlet theory in elaborating several unexplained variances from its predictions. Managerial and other implications are proposed, and the limitations of this study are discussed, with recommendations for future research in several new areas.

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11.1 Introduction

The main argument of this dissertation is that established behavioural norms of aggregate consumer purchase in competitive FMCG categories remain largely stationary in successive standard management periods. This means that competitive market structure and brand performance remain predictable from the short-term to the longer-term based on a stochastic interpretation of the heterogeneous purchase propensities in the population. This is not to say that the purchasing behaviour of individual households won't change over time. It does. When observed cumulatively, it changes substantially but incrementally, particularly in regard to brand choice, yet the resulting flux from estimated underlying propensities does not trend towards customer equity outcomes, but is systematically constrained by Double Jeopardy. Markets therefore remain Dirichlet.

The evolution in individual-level behaviour probably accounts for most of the known variances in aggregate-level fit although these variances are so slight from quarter to quarter as to be of little practical significance. In long enough accumulations of data they bring about deterioration in fit, but because behaviours evolve gradually and at different rates in different categories this is not yet predictable. The thesis proposes that while adjustments might be made to the Dirichlet, there would be little gain. The big story is that it is far harder for marketers to influence and change consumer behaviour than is generally believed; levels of behavioural loyalty are not observed to improve for one particular brand over time, but rather to decline dramatically, systematically and inevitably, one switch at a time for all brands and yet still leave aggregate buying in equilibrium.

Many marketing managers hold the widely accepted view that growth is best achieved through consumer loyalty (Day, 2002), and so precious resources are invested in loyalty schemes designed to prevent such brand switching and increase purchase frequency. The objective is a cumulative, persistent and positive change in individual behaviour towards the marketed brand, to enhance the asset value of its consumer-base and generate additional sales, profits and growth (Kotler *et al*, 2008).

Much evidence against such loyalty-based *"anything goes"* marketing already exists (East *et.al.*, 2006; Ehrenberg, 2004; Sharp, 2010) especially in FMCG categories, leading Ehrenberg (2001) to describe differentiation, added value, and brand share growth as "romantic" rather than realistic objectives. Given the stream of competitive marketing initiatives over time it seems only reasonable to question an assumption of steady brand choice, especially since over many continuing replications of approximately good fit for the Dirichlet, several systematic deviations have regularly been reported. These include a slight but cumulative over-prediction of repeat purchase rates (Scriven and Bound, 2004), the erosion of repeat purchase loyalty (East and Hammond, 1997), the variance discrepancy, a flatter than expected category NBD (Ehrenberg, 1988), and cases of "excess" and "deficit" loyalty (e.g. Khan *et al*., 1988).

Each of these deviations from the steady state implies a shift in purchase propensities, however minor, yet with the exception of ERPL (18 months in East *et al*, 1997) and the market share premium (two years in Pares et al., 2012) their long-term evolution has been little studied. Further research was prompted since Dirichlet theory depends entirely upon its two underlying assumptions of stationarity and non-partitioning. For these to hold for longer than a year or two, consumer purchase propensities must remain largely stable, or bring about a deterioration in the predictive reliability of the model.

11.2 Summary of findings

A long-term panel of continuous reporters was established, from which aggregate household purchasing patterns could be observed in 18 categories over 26 quarters. The extent of stationarity found in this data from quarter to quarter was described in Chapter Eight. In Chapter Nine, known deviations from patterns of

stability observed in the data were reported first in successive quarters, and then in cumulative results in order to identify and differentiate trending and stable effects. Finally, in Chapter Ten three different approaches to model estimation were tested; first, period-to-period fittings, second, a re-estimation to six-year cumulative buying and finally a steady-state projection from the short to the long-term.

The main findings are summarised below, and the contributions to knowledge from this thesis established, before their implications are discussed in detail. The chapter then concludes by defining the limitations of the research and areas for further investigation as a result of these contributions.

11.2.1 Summary of findings from successive periods of quarterly data

1   Near-stationarity in patterns of repeat purchasing behaviour from period to period was replicated over a few quarters and found to be persistent long-term.

2   Trends, defined as an increase or decrease of more than six absolute share points in as many years, occurred for less than 5% of brands but were observed to remain constrained by Double Jeopardy, supporting the assumption of non-partitioning.

3   Persistent brand share dynamics were associated with declining category penetrations and largely with external environmental forces. No evidence of loyalty-based growth was found whatsoever, other than that associated with penetration.

11.2.2 Summary of findings concerning observed variances with time

In successive quarterly periods it was found that:

1.   A persistent market share premium existed for 40% of the leading brands in the dataset, but showed little or no trend between equal periods, or any clear relationship with brand growth.

2.   In contrast, the erosion of repeat purchase loyalty was seen to trend over time reaching an average loss of 35% of repeat buyers, although the leaky bucket was also topped up so that aggregate repeat measures remained stable.

3.   The erosion of repeat purchase was found to be related to brand growth and decline. Growing brands benefited from a small retention bonus as penetration lifted; declining brands eroded their repeat buyers rather faster than average.

4. As observed purchases increased with time, substantial differences in purchase frequency between bigger and smaller brands emerged, yet these remained largely predictable in the extended DJ slope. Variances between observed and predicted measures became more extreme with longer periods of observation indicating incremental non-stationarity.

11.2.3 Summary of findings from Dirichlet fittings

1. The long-term predictive reliability of the Dirichlet was established. Using Driesener's nine tests, a continuing stability in goodness of fit to short-term observed data in successive and non-adjacent periods was found in all categories, extending to six years.

2. By contrast, a deteriorating fit was found to cumulative data aggregations. When re-estimated to six-year cumulative observations, results were poor in half the fittings and deemed unacceptable in one third of cases.

3. Category purchase propensities are described in the model's parameters. If steady, the gamma distribution varies predictably with T. A comparison of parameter values in acceptable fittings from the first two fitting procedures revealed generalising but unexpected changes. While M maintained a linear increase with time, average values of K increased 40%, while average A rose to only about 75% of its theoretical value. K had previously been thought to remain time-invariant.

4. Brand choice propensities evolved even more dramatically. Parameter S increased its value two and a half times, and average household repertoire doubled between six months and six years. Despite these variances, it was noted again that market shares in both time periods remained the same.

5. Cumulative buying behaviour was benchmarked against projected steady-state Dirichlet norms and new generalisations emerged. Though brand shares remained constant in observed and theoretical measures, and B & W were closely predicted, long-term buying was characterised by;

    *   Dramatic increases in brand switching beyond expectation
    *   Far higher penetrations and lower purchase frequencies than anticipated
    *   Close prediction of category-buying rates by brand buyers, but substantial over-prediction of SCR for all brands.

Long-term purchasing behaviour was thus identified to be anything but a steady-state extension of the short-term observations and instead reflected rather different patterns, which nevertheless conformed to the propensities described in the altered parameters of the Dirichlet. These findings led to the following contributions to knowledge.

11.3 Contributions to knowledge.

The study was conducted following the principles of marketing science, observing known patterns in data under a new and almost untested condition of long-run continuous household purchasing. On that basis, the thesis makes six important contributions.

11.3.1 First Contribution: Ongoing propensities are not entirely stable

The first and most important contribution is that individual-level buying is not as stable as Dirichlet theory assumes. Incremental variances from the steady state at the household level eventually bring about a deterioration to long-term model use, which occurs somewhere between a year and six years of cumulative buying.

The exact location is likely to vary by category. Some cumulative fittings continued to be acceptable at twenty-four quarters, but after extensive analysis, no single generalising cause for poor long-term fit could be identified. It is clear that different product categories are bought by more or fewer households at very different rates. Much happens over six years in the various marketing environments surrounding those categories, and a great deal of money is spent in the microenvironment to influence consumer behaviour. While competitive equilibrium appears to constrain the persistent effects of most marketing investments, shocks to the means of stationary performance measures may be more longer-lasting, or their cumulative effects more extreme from one market to another, as Pauwels, Hanssens and Sidarth (2002) have identified. Thus cumulative change in individual purchasing is likely to trend at different rates influenced by a wide range of deterministic variables. Evidence for this exists in the widely differing rates of erosion observed across categories.

This is an encouraging if slightly inconclusive result. The idea of entirely stationary buying propensities, even over a quarter, seemed intuitively unrealistic, and

yet there are few if any published cases, with the exception of Sharp and Driesener (2000), where the Dirichlet has not described market structure well. Rather more conclusively however, while non-stationarity was observed in evolving brand choice propensities it remained limited by Double Jeopardy and constrained by competition, so that no segmentation developed, and stationarity in market share was largely maintained. On this basis Dirichlet theory was supported.

11.3.2 Second Contribution. No growth from customer equity

The two main assumptions of Dirichlet theory, stationarity and non-partitioning must be expected to remain largely inviolate in successive management periods, revealing four real constraints on the role of marketing in altering category structure.

First, brands rarely grow; a mere 5% of the observed sample increased share by more than the equivalent of one point a year. The norm is for long-term stationary or near-stationary performance. Second, observed growth was not due to differentiated loyalty. Buying remained both polygamous and largely habitual in dynamic cases, so of the few exceptions reported, half improved their position by maintaining penetration in declining categories. Third, while erosion was observed to run at a lower rate for growing brands indicating better than average retention, the measure was confounded by baseline growth in the number of customers attracted to the brand in successive periods. A more precise reading of this effect would be obtained through a comparison with a steady-state norm, but this is a matter for further research. In any case, the penetration bonus from a slowing of erosion is marginal and unlikely to account for brand growth in itself. Fourth, category equilibrium was also observed to be more readily disturbed through corporate-level actions and environmental flux that *forced* behavioural change, rather than by any marketing investment designed to influence consumer attitude. Examples included brand portfolio balancing in butter, soap and margarine categories and retailer category management decisions in wrapped bread. Even where a successful functional innovation was observed to change behaviour, (clearly a marketing intervention) it had little persistent effect on brand choice.

Brand performance, even in flux, was observed to follow the expected behavioural norms. There was little evidence found for market segmentation or the predicted effects of differentiation. The systematic extension and replication of so

many empirical generalisations of repeat buying to a time period at least three times the length previously observed must add considerably to our knowledge of, and expectations from, consumer behaviour in repertoire markets. If, as Barwise (1995) suggests, a measure of a good empirical generalisation is its usefulness, then this contribution makes several very good empgens even better, and this is discussed along with other managerial implications from the findings in section 11.4.

11.3.3 Third Contribution. The long-term predictive reliability of the Dirichlet.

A third contribution to knowledge has been made in extending the use of the Dirichlet to model both successive and non-adjacent short-run periods successfully over the entire six-year span of this dataset. Its long-run predictive ability has not been seen before to quite this extent. While the observed results described an astonishing stability in aggregate level brand buying, the model closely describes the detail of this over the longer term, again with clear implications for additional uses in strategic marketing management.

These findings do not imply long-term continuous loyalty. Sales from one period to the next remain stable, but stability is supported by sales to different households in the population, many of which buy only occasionally. The fact that only a third of any brands' buyers repeat-purchase from one quarter to another has always told this story succinctly, while the question of the real nature of the category or brand's light and non-buyers in any period has long been a vexed one (Chatfield and Goodhardt, 1973; Herniter, 1971; Morrison and Schmittlein, 1981).

In the cumulative data, when all purchases by all households are observable over six years a great deal of light buying is visible, and substantial deviations between observed and predicted behaviour become apparent. From period to period the effects of variances such as ERPL are slight but regular, so that they have themselves become empirical generalisations (East *et al.*, 1997; Ehrenberg, 1988; Ehrenberg *et al.*, 2004).

The typical approach to Dirichlet modelling is to establish an approximate fit to many sets of data rather than the best fit to one (Uncles *et al.*, 2002), and knowledge of regular deviations in the context of quarterly or annual aggregate performance helps to identify exceptions in brand performance within a period when they occur. This thesis has added to that knowledge in describing the sources of certain regular deviations, which may help in future interpretations of observed data.

The important point is that since the model has been found to describe short-run aggregate category structure quite well in a strategic time frame, it is hard to argue that it requires any adjustment in order to perform a forecasting or predictive function, a question discussed in section 11.5.

11.3.4 Fourth Contribution. FMCG marketing is largely transactional

The fourth contribution to knowledge is the finding of a very dramatic and systematic drop in loyalty, far beyond even the Dirichlet predictions of polygamous brand choice. Over six years, average household repertoire size was found to double, indicating a substantial increase in brand switching; all loyalty measures were observed to weaken, including a halving of expected SCR and a significant growth in the penetration of once-only buyers, especially for smaller brands. The decrease in loyalty is systematic because it trends consistently downwards but in maintaining a Double Jeopardy characteristic, smaller brands suffer rather more in being bought much less. It was observed that almost two thirds of the buyers of the smallest brands bought them *just once* in six years.

The description of these brands as "smaller" is perhaps misleading. They are often well known and well established, having been available in many cases for decades (Carr's water biscuits, Kerrygold butter, Timotei shampoo and Allinson's bread are all examples) making this finding even more surprising. For small brands, and for their competitors with many more buyers, there is against theoretical predictions, an average 50% increase in the penetration of once-only buyers in six years, and a consequent reduction in the proportion of households that repeat-buy. There were no exceptions found. The sales importance of single transactions is thus greatly more significant for all brands than previously thought, but the implications for brand management differ with brand size, as the fifth contribution will elucidate. These findings suggest that any idea of the value of future loyalty to a brand's customer base is even further *"out of kilter"* with the equity literature than Ehrenberg suggested in 2004 (p.1317).

11.3.5 Fifth Contribution. A (new) strategic view of Double Jeopardy

The increasingly large differences in purchase frequency observed between bigger and smaller brands in the long-term data is no evidence at all for successful

retention marketing. The Double Jeopardy relationship is maintained, as the cumulative volume of observed purchases increases, but it changes in its nature.

In the dataset, average brand penetration is 4% quarterly and doubles to reach 9% in six months. The average brand penetration growth curve over time is not however linear, but comes to an asymptote, rising to only 30% of the population after six years. When there are no further new customers for a brand to reach easily, future cumulative sales increases rely rather more on purchase frequency, which therefore begins to rise rapidly over time. This acceleration is rarely seen in short-term data, which is truncated and thus observed at a point where the slope is generally flatter and all brands have similar loyalty (Habel *et al.*, 2005).

The increasing variation in purchase frequency between large and small competing brands observed in the cumulative data remained constrained by a DJ relationship as the range of penetrations grew wider. Small brands can still gain more customers, whereas large brands have limited opportunity to do so – most category buyers have already bought them, and will probably therefore do so again if their long-run category purchase rate remains unchanged, which it largely appears to.

This confirms the strategic marketing literature in suggesting that brand leaders will only grow *with* the total category, by bringing in new buyers (Doyle & Stern, 2006). It also supports the view in Anschuetz, (2002) and Sharp (2010) that in order to grow small brands must (and still can) find new buyers inside the category, and that DJ-increases in purchase frequency will then follow. But it adds a new strategic view to this literature, supporting Habel and Rungie (2005), in suggesting that for the biggest brands there is a value in loyalty marketing. For managers of leading brands it will be easier to maintain cumulative sales performance through purchase frequency, and almost impossible to do so through penetration. Their future sales must largely be to repeating customers. So for the biggest brands, loyalty is unlikely to grow market share, but it is absolutely vital in maintaining sales levels into the future.

While the DJ relationship appears to hold approximately as expected, widening deviations at its extremes over time suggest cumulative and incremental changes in individual-level behaviour. These start to be explained by the final contribution.

11.3.6 Sixth Contribution. Changing propensities and Dirichlet parameters

The final contribution concerns the assessment of purchase propensities in the population. Variances were observed between the Dirichlet parameters when estimated on long-run and short-run periods of the same dataset, indicating changes in underlying purchase probabilities. There are two variances with separate characteristics and implications. The first concerns the shape of category purchase incidence. The effects of higher K and lower A on the gamma distribution suggests that underlying the constant observed B and M, there are far fewer households likely to be "hard-core non-buyers", many fewer who are likely to buy the category only once, but a higher and more homogeneous likelihood of buying the product rather more often spread across the remaining population. Once this adjusted distribution is activated, brand buying is of a very different nature. The volume of light *category* buyers assumed from the short-term distribution turn out to be largely one-off *brand switchers* described in the dramatic increases in parameter S. A slightly higher category purchase frequency across buying households supports large numbers of these once-only brand switches over time, which increases all brand penetrations but depresses frequencies of brand purchase to far below the predicted levels.

Because these additional switches occur continuously, in each period the variances with aggregate data are only slight (higher *b* and lower *w*). It is probable, although it has not been tested in this study, that the flatter than projected gamma distribution is a closer representation of the steady long-run distribution of purchase propensities in the population, while changes in S probably occur over time, reflected in the incremental switching described in ERPL. The rate of change therefore varies widely from category to category.

The resulting churn in buyers nevertheless supports aggregate stationarity. It might be assumed that such a volume of "unpredicted" brand choices could lead to partitioning and loyalty based segmentation if marketing was as persuasive as some literature suggests, but since the variances remain governed by Double Jeopardy, they are distributed over the brands and over time, according to brand size. Cumulative Dirichlet fittings were rejected not because of a systematic bias – the correlations and CD tests were generally accepted, and showed the continuing existence of a DJ relationship - but because of brand-level variances, which were sometimes extreme. This is a fundamental contribution to knowledge because it implies that Dirichlet buying behaviour remains inviolate.

A curious feature of ERPL churn is the seemingly automatic topping up of the leaky bucket. From period to period although a consumer who bought in the original period erodes away, that purchaser is replaced to maintain stationarity. This *must* happen if buying is to remain in equilibrium, a characteristic described in the Law of Detailed Balances proposed in Kalwani and Morrison (1977). The law describes the balanced switching relationship *expected* in equilibrium systems, and captures the switching in stationary markets between any pair of brands, as;

$$E[\ N_{(s,\ h)}\ ] = E[\ N_{(h,\ s)}\ ]$$

That is, the expected number of buyers switching from *s* to *h* is equal to the expected number of buyers switching from *h* to *s* in a period.

Given the observed cumulative repertoire growth, in each quarter, a few buyers of *s* predicted to repeat from Q1 do not, but switch instead to *h*. This unexpected choice will thus increase the cumulative purchase frequency of *h*, and its cumulative penetration (if they have not previously bought it); the Law of Detailed Balances says this switch must also happen in reverse so in the quarter, repeat purchase erodes for **both** *h* & *s*, although their respective quarterly penetration, frequency & share will remain steady. This law holds between every pair of brands in the stationary category in the quarter and so any erosion must always be replaced simply as a consequence of equilibrium.

As well as equilibrium in erosion, this law also accounts for its Double Jeopardy characteristic. Large brands have many more buyers than smaller brands, but the same number of switches accounts for a lower proportion of the large brand's consumers and will have a bigger impact on the smaller brand.

The extreme observations of a natural monopoly effect demonstrated that the buyers of small brands are largely heavier category buyers, and this effect increases with cumulative category purchase incidence. Stern and Hammond (2004) suggest a link between purchase incidence and loyalty, and this is supported here in the increasing variance between the observed and theoretical DJ slope, but it has been demonstrated that it does not violate near-stationarity in brand performance. Individual-level behaviour does not however remain stationary, cumulatively drifting away from the model's original steady-state assumptions, and very likely accounting

for many other established variances in Dirichlet theory than ERPL. The variances are discussed in more detail in section 11.7, but in the next section, implications for practitioners from these contributions are laid out, which suggest no support for the concept of customer equity and a necessary reinterpretation of brand equity.

11.4 Implications for management

How much influence does marketing really exert? Managers have been told that they can change consumer behaviour permanently in favour of the brands they run. They regularly produce and execute marketing plans that promise brand-share growth[3], and often justify major expenditure on the basis of future increases in purchase loyalty. Marketing is sometimes credited with making people do things they don't want to[4]. On the other hand, substantial empirical evidence presented by marketing scientists suggests that consumer behaviour is habitual and falls into such regular, stable patterns and follows such established laws that it is entirely predictable. If consumer behaviour is so habitual that it can't be changed, then what's the point of marketing anyway?

The empirical evidence presented here leads to the conclusion that over time it is far harder for marketers to influence consumer behaviour than is generally believed. Far from improving performance on the usual loyalty metrics for some brands, a systematic deterioration in performance was observed over time for *all* brands. In addition, only a very few brands were found to achieve what is a common annual growth objective. The findings imply that most brand strategies are over optimistic, and most FMCG brand valuations, already according to Ambler (2002) of questionable significance, potentially misleading. It has been shown that individual consumer behaviour can and does change over time, but that it is not driven into segments or attitudinal partitions, remaining by and large entirely predictable.

A more realistic objective for marketers must be brand share maintenance, but these findings suggest that this takes two forms in the long-run view. For small brands

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[3] At a recent Ehrenberg Bass Institute seminar, over fifty European marketing managers with responsibility for many leading household-name brands were asked if their annual brand plans promised market share growth. The response was unanimous – they did. A second question asked how many had organised end of year promotions to meet their targets. Although not unanimous, a majority agreed that they had done so in the past.
[4] Marketers are often accused of behaving unethically. A UK think-tank considered the profession to be the *éminence grise* behind so many social ills that it recently recommended a complete ban on advertising (Gannon & Lawson, 2010).

the emphasis must continue to be on building penetration. In practice this means acquiring large numbers of one-off switchers from bigger competitors, which requires creativity and innovation in all aspects of the marketing mix, in order to be noticed, to achieve a sale and to deliver better than expected category quality (Barwise, 2004) in order to be considered again at some point in the future. Sustained brand share growth while desirable is exceptional, since immutable competitive forces will keep consumers switching between growing repertoires of equally acceptable alternatives.

For bigger brands, the emphasis must also be on sales: but here, since most of the brand's customers have already been reached at least once (albeit perhaps a year or more ago, those sales will now be repeat purchases and so brand marketing for category leaders must be designed to increase purchase frequency. It cannot be expected that increasing purchase frequency will lead to growth. At the limits of its penetration the brand will only hang on to its share by selling more to its existing buyers. A continual process of competitive brand improvement is therefore necessary here too, just in order to stand still. The strategy literature confirms that it is usually the role of market leaders to set the pace on innovation, but any differentiation other than brand size is impossible to sustain in practice, as the persistent competitive equilibrium described here indicates.

Findings from this research also demonstrate the potential of retention marketing under one limited condition – for large brands in declining categories. A last man standing strategy was observed to lead to relative share increases for almost half the non-stationary brands considered, merely from maintaining habitual purchase.

Further cases of growth were driven by a de-commoditisation retailer policy towards categories, cutting back on private label to allow share and profit increases from brands. Once such a decision is made, it opens the way for astute marketers to compete to take the advantage, but the opportunity is created externally. In other cases, decline and growth was driven entirely by changes of brand ownership. For marketers to achieve brand growth on their own terms means taking large risks, spending beyond current market share (Jones, 1990) in order to destabilise the entire category structure. It is questionable whether this is sustainable or profitable.

Findings presented here have shown that there is no evidence whatsoever for the proposed cumulative effects of customer equity. The observed decline in loyalty over extended periods is an undisputable and important empirical finding. In conjunction with increases in penetration, even though buying behaviour becomes

more, rather than less heterogeneous between large and small brands, two customer equity principles are challenged. First, heavy category buyers are the least loyal, and therefore an unlikely lever for customer equity. Second, although growing brands retained customers better than average, their customers continued to buy only what the Double Jeopardy relationship predicted and therefore no more than might be expected.

Brand management can therefore best be described as maintaining the size rather than the "quality" of the customer base over successive reference periods. Given the wide variance in purchase propensities across the population, this is more akin to herding very large numbers of cats than giving occasional treats to a small number of unquestioningly loyal dogs. Dogs are already demonstrably faithful, and will not wander far. But the size of the brand (and thus its equity) depends upon the marketer maintaining the number of cats corralled in each period. Cats are independent, and having been fed will inevitably wander off seeking some fresh excitement, perhaps far away. The cats might even be accused of being opportunistic, but since they cannot by nature be retained, the cat-herd must replace them, by enticing other cats that happen to be close by, many of which have visited before at some point in the past. So with marketers: without a full complement of buyers in each period, the brand will inevitably decline and therefore its equity depends less on its loyalty (which cannot be improved), than on its ability to attract a steady number of different buyers in each period.

The largest global marketing organisations often talk in their annual reports of owning market-leading brands wherever in the world they compete (e.g. Unilever, 2010 p.8). There are therefore no second prizes. One reason for this competitive stance is the extremely skewed distribution of brand sizes. In this dataset (Table 14) for example two-thirds of the named brands hold market shares of just five points or less. These brands are therefore competing against ninety five per cent of the market for each sale, so any brand of this size must struggle hard to stand still, let alone increase its share. As for the market-leading brands, we should continue to think of them as big rather than strong (Ehrenberg, 1993), and the likelihood is that they will remain big so long as their managers can maintain the number of buyers they are able to attract back from competitors in each period, to replace those that inevitably wander off. The implication of this at the corporate level is that in established categories brand acquisition is almost the only route to growth.

11.5 Implications for Dirichlet Theory

The Dirichlet predicts medium term market structure well, but the fit to observed data deteriorates as the period extends beyond a year of cumulative purchasing because brand choice propensities evolve beyond the probability distributions specified. Purchase incidence, which also evolves, is less unstable, and consequently category level buying is often well predicted from the short term, even to six years. The main variances observed were at the brand level, and yet they did not disturb competitive structure. Over time the number of brands entering the household repertoire increases cumulatively beyond the initial short-term estimation, but the important point is that these extra switches do not go in one direction, as Kotler, Keller and Aaker frequently suggest they will, to segment the market. They are instead distributed across the available choices as Dirichlet theory says they must be. Given this, a stationary mean purchase frequency can only be maintained if the distribution of buying heterogeneity is somewhat different from the initial estimation, suggested by the re-estimated K and A parameters in observed cumulative data. Thus it appears that the underlying theory largely holds in that the zero-order assumptions are maintained. Categories therefore remain un-segmented to the extent that DJ allows. Stationarity is violated not at the sales or market share level, but insofar as the breadth of household brand choice continues to expand over time and beyond expectation. In the short term these extra switches are marginal and account for the regular variances observed from theoretical output that have always suggested that the fit is usually approximate, the claim normally made for model fit. There are various more limited and less parsimonious versions of the Dirichlet (Ehrenberg *et al*., 2004) that might give a better fit to long term data. According to East *et al*., (2008) at least some of the variances in calibrating the NBD and in the DJ approximation relate to the true penetration of non-buyers in the population. From cumulative data this might be more accurately assessed, but the point is that none of the findings in this study have challenged the underlying assumptions of the theory.

11.6 Implications for further uses of the Dirichlet

The Dirichlet has applications in marketing decision making, in understanding brands and consumer behaviour, and in evaluating stationary and dynamic

performance (Ehrenberg, 1988 p. 244). Until now these uses have been generally restricted to the consideration of management periods restricted to the short term. The findings in this thesis confirm stability in market structure over the long-term, opening the way for uses of the model in the development of marketing strategy rather more than marketing tactics. Examples might include:

Brand valuation based on aggregate sales rather than on differential loyalty

"What-if" brand portfolio scenarios

Competitor analysis, including private label

Category management strategies

Long-term brand performance evaluation

The development of realistic marketing objectives

Forecasting and budgeting in management periods

However, the Dirichlet is not yet a suitable model for predicting continuous and long-run market structure beyond a few quarters and analysis of its theoretical output must now be conducted in the light of new knowledge of cumulatively declining loyalty.

11.7 Research Limitations

A primary limitation of the research is the constraint on the number of replications conducted. The study only considered 18 FMCG categories in the UK, and excluded the three most dynamic from some analyses. Research has not yet been extended to services or to subscription markets or to other geographical regions, or to further categories. Continuous purchasing data in its current form is presently only available over 26 quarters. Further replications in periods approaching ten years, a term commonly associated with the length of a business cycle (Yip, *et al.,* 2008), would strengthen empirical findings if and when longer datasets became available.

A second limitation is that only the largest competing brands in any category were observed individually. The mean market concentration of these brands across the 18 datasets was 44%, while private-label and all smaller brands were included in category structure analysis as "Other", but not considered in isolation. Further research into the long-run evolution of private-label buying is now called for to

establish whether it is in any way immune to the long-term churn seen for even major brands. Some evidence points to the fact that Private Labels are growing in strength (e.g. Hoch *et al*., 2002), although in other respects PL buying is known to follow much the same patterns as that for the named brands discussed in this thesis, even between retailers (Dawes and Nenycz-Thiel, 2012).

This research has made it clear that small-share brands play an important role in consumers' variety seeking propensities, and this finding may have implications for brand portfolio management, for example in deciding which competing brands are most attractive for acquisition. A third limitation of the study is that purchase duplication analysis was not explicitly conducted over differing time periods. This was considered unnecessary at this stage since variances to the DJ slopes adequately identified evolving cases of loyalty-based segmentation. Future studies might therefore examine purchase duplication over the long term, and particularly with regard to smaller brands, to define generalisations that might aid brand acquisition decisions.

A fourth limitation is in the consideration of the effects of powerful macroeconomic forces on market equilibrium. The relationships, benchmarks and norms discussed in this thesis have been found to hold in short to medium term runs of data in observations conducted since the late 1950's. They have therefore continued to replicate over many economic cycles. The datasets used in the present research ended in 2007, just before the global financial crisis (GFC), so no comparison of the effects (if any) of recession on market structure was possible. The six-year window of analysis considered here sits at the end of a sixteen-year period of such prolonged stability that it was taken by some to be the end of "boom and bust" economics in the UK (BBC News Online, 2008).

Subsequent to 2008, some literature has asserted the death of loyalty at the hands of the downturn. Piercy, Cravens, and Lane (2010) have suggested that one effect of the GFC has been the emergence of a 'smart shopper' prepared to look harder at value, and prepared also to defer purchase. Raggio and Leone (2009, p. 85) have cited the successful US launch of the Hyundai Genesis as evidence that many households are being forced to re-evaluate familiar brands, switching to those *'that surpass . . . performance thresholds at a value price'*. Tellis and Tellis (2009) have reported results on the sensitivities of brand versus private-label shares, and indicated increased switching to 'better' value alternatives during economic slowdown. The

evidence remains inconclusive, and further research would be helpful in elaborating how strong habitual purchasing patterns remain in the face of general economic tightening.

A fifth limitation of this study lies in the smoothing technique adopted. By aggregating data into an average quarter for each year, the measures arrived at more clearly described a long term mean, but peaks and troughs of seasonality and promotion were removed from the analysis. These peaks and troughs are themselves a subject of great interest to marketers. For example, which peaks are cyclical and therefore predictable? In such peaks, are sales increases due to penetration or purchase frequency? Given the long-term data, it might now be possible to conduct more extensive CTA studies, first to disentangle the bias present in ERPL, and then to dissect the buying components of the peaks. CTA is potentially a very powerful tool, and new work has already begun in buyer-flow dynamics (Trinh, Wright and Driesener, 2011). Findings in this thesis may now present a new way to increase the potential of the technique.

Finally, the research is by its nature descriptive. It has shown for the first time that it is possible to describe the continuous aggregated purchasing characteristics of stable, declining and growing brands in a strategic time frame, and that from those findings, market structure remains predictable over the long-run. The exceptions and variances leading to the contributions presented here were identified and understood using these established behavioural norms, and in particular the model. This in turn has added and strengthened Dirichlet theory. No attempt has been made to explain why any brand has more or fewer buyers than another brand or than it had itself before, or what, in such dynamic cases, influenced buying behaviour. In short, although this study has made several contributions to knowledge, as Ehrenberg noted (1997), it offers no prescription for brand growth - yet.

11.8 Further research directions

Further research is also called for specifically to investigate the known Dirichlet variances in the light of the findings presented. The result of a flatter heterogeneity, higher category purchasing and increased switching reflect the nature of several of these. One question left open here concerns the speed at which

repertoires grow and its relationship with cumulative brand or category penetration growth. Findings here would help to explain why some fittings of the model to cumulative market structures were more successful than others. There appears to be no clear systematic explanation for this at present. While the rate of repertoire growth is a partial explanation in some fittings and brand share turbulence affects others, in further cases where B & W have been very poorly predicted from short term data, the model was close-fitting when estimated to the six year results. Were the model able to reliably predict long-term market structure it would become an important and easily used tool for brand valuation. Answers here would also help predict and link ERPL with the repeat deviation identified by Scriven and Bound (2004). The question of why there is variability in the rate of erosion between categories is interesting for practitioners, but more research is needed to understand the underlying factors, with implications for the levels of marketing expenditure required to overcome inherently higher switching propensities in certain markets.

The variance discrepancy and a flatter than expected NBD (Ehrenberg *et al.*, 2004) both relate to the adjusted K and A parameters which foreshadow purchase frequencies that are higher but more homogeneous across medium-weight buyers. Further studies here might investigate different estimations of K; the method of means and zeros could bias the classification of once-only brand switchers as light category buyers, thus leading to the deviation, while the true proportion of zero-buyers in a category is clearer from its long-run data.

Further research into excess loyalty and change of pace brands is also desirable. Fader & Schmittlein suggest that the market share premium is due to a distribution effect and this might well suggest why smaller brands remain small, in that they are not as widely distributed. This research has suggested that overall category buying is heavier than expected, but that there are a great deal more once-only buyers than anticipated due to cumulative switches. The penetrations of smaller brands are disproportionately swollen with such buyers and this has the effect of lowering their expected average purchase frequency while raising penetration. In short, they are nudged to the right and below the DJ curve. As for the biggest brands, they may suffer excess loyalty since they have proportionately fewer once-only buyers, a heavier than expected purchase frequency and the benefit of approaching the penetration saturation point, all of which would tend to push them above a flat DJ

slope. There are many suppositions here and further questions since excess loyalty is not a universal condition, but insights from these findings suggest a new direction.

Further investigation of the Dirichlet parameters is also now possible to strengthen existing benchmarks of category buying, and extend knowledge of their uses. It is now clear that both S and K change over time, causing some substantial variances between observed and expected measures of buying behaviour. But there may well be regularities in the cumulative effects that have not been identified here, which would lead to new variables to incorporate into long-run Dirichlet modelling. Some initial work retro-fitting long-run S parameters to estimate short-run data produced quite unsatisfactory results but there is far more to do, since it later emerged that changes in K & A were interdependent, and that change in S is probably incremental.

The long-term data set has an important characteristic in its dual nature as both an aggregate and household level purchasing record. Further work is now possible in linking these two dimensions to understand better how repertoires grow over time, and to extend work on identifying the nature of buyers returning to create promotional spikes and seasonal buying, based on the recency of last purchase.

Finally, modelling the patterns of buyer dynamics from period to period using conditional trend analysis is a fruitful area of research, since results have been only partially conclusive to date. The technique has many potential uses in evaluating brand performance, and in predicting the outcomes of marketing investment. Using the long-term dataset to identify more accurately the one-off category buyers and switchers, and define a more accurate gamma distribution may may eradicate some bias which has hitherto confounded extensions and generalisations of the technique.

11.9 Conclusion

The aim of this study was to investigate long–run repeat-buying in Dirichlet markets by testing the temporal extent of established empirical generalisations and the robustness of theory under a new condition of extended continuous category purchasing. Dirichlet markets are stationary and unsegmented. These two requirements, whilst antithetical to a great deal of marketing thought, underpin the zero-order assumptions of the model and have been observed to persist in most

established categories over a year or so. They have seldom been replicated or extended much beyond this. This thesis therefore makes six contributions to marketing knowledge, having shown through substantial differentiated replications and extensions that:

1. Ongoing consumer purchasing propensities are not entirely fixed over the long term. Brand switching rates and average repertoire size increase faster than the Dirichlet accounts for over time, but the zero-order brand choice assumption is supported in steady-state buying since additional switching remains governed by competitor penetrations and therefore no segmentation emerges.

2. Persistent brand growth should be considered as exceptional, and certainly not driven by loyalty. Where brand shares increased (or decreased), buying patterns simply reflected brand size rather than emerging customer equity effects.

3. Dirichlet predictions are robust for short-run reference periods, and remain good on this basis over the long term. In these familiar fitting periods the effects of the additional customer churn were marginal but may account for many of the frequently noted variances such as ERPL, the variance discrepancy and the repeat deviation. Cumulative fittings deteriorated unpredictably with the length of reference period.

4. Declining cumulative loyalty means FMCG marketing is transactional not relational. To maintain share, marketers must ensure that their brands remain both a great example of the category, and highly salient at the point of purchase. Declining brands were observed to be losing large numbers of light buyers suggesting one or both of these factors were missing.

5. The DJ relationship takes a new and seldom observed form as cumulative penetration rises. The differences in purchase frequency between large and small competing brands become extreme. For large brands, increasingly scarce "new" buyers limit market share growth; maintenance relies on the observed increases in *w*. For smaller brands larger than expected numbers of switching buyers buy just once, suppressing purchase frequency but boosting penetration.

6. Finally, useful insight was developed about underlying purchase propensities using the model parameters, an emerging approach to Dirichlet modeling.

Substantial new empirical evidence presented in this thesis adds to the understanding of one of the most discussed ideas in marketing, the concept of brand loyalty. It strengthens existing knowledge of the severe limitations of loyalty-based marketing and points practitioners in a more fruitful direction, the importance of simply selling a product to more people on more occasions. The idea that brand share can be routinely "grown" has not been supported. A few brands have been seen to add share, but largely through a last man standing strategy in declining markets, or through extraordinary and potentially unprofitable expenditure. Managers of FMCG brands would thus do well to hone skills in transaction rather than relationship marketing in order to maintain share. The fact that long-run loyalty hardly exists for smaller (but still very well known) brands makes this point dramatically.

The implications for market-asset based brand-valuation, long-term customer and brand equity strategies and retention marketing are profound. In FMCG categories existing purchase propensies trend consistently and inevitably downwards over time. The erosion cannot be stemmed. Brand equity depends not on the ability of managers to increase the number of heavy buyers the brand has, but in attracting *enough* buyers in the period to replace those that switch to competitors. The bigger the brand the more expensive this becomes because bigger brands have more buyers, and share them with more competing brands. For the biggest brands, penetration thus saturates sooner because the brand reaches more category buyers more quickly. Purchase frequency then becomes more important in increasing cumulative sales to maintain share, but this does not reflect greater loyalty. It is a statistical fact governed by Double Jeopardy. For smaller brands survival means maintaining penetration to stay in distribution, and managers must therefore find creative ways to attract more buyers of bigger competitors to switch occasionally. They already perform better at this than short-term predictions anticipate, but for a small brand, share can only grow if the rate of attraction can be increased over the rate of erosion, and that is expensive.

Finally, the Dirichlet itself was used to describe and explain these variances, and in doing so its underlying theory has been extended and strengthened to encompass long-term buying. Further areas for research were also defined and knowledge of Dirichlet markets can now be built upon the contributions made here.

REFERENCES

Aaker, David A. (1991) *Managing Brand Equity*. New York: The Free Press

Aaker, David A. (1996) Measuring Brand Equity Across Products and Markets. California Management Review 38(3) 102-120.

Aaker, David A. (2002). *Building strong brands*. London: Simon and Schuster.

Aaker, D. and Keller, K.L. (1990) Consumer evaluations of brand extensions. *Journal of Marketing* 54(1), 27-41.

Aaker, D., and McLoughlin, D. (2007). *Strategic market management*. Chichester: John Wiley.

Agarwal, M.K., and Rao, V.R. (1996) An Empirical Comparison of Consumer Based Measures of Brand Equity. *Marketing Letters*, 7(3) 237-247

Ailawadi, K.L., Lehmann D.R., and Neslin S.A. (2001), Market Response to a Major Policy Change in the Marketing Mix: Learning from Procter & Gamble's Value Pricing Strategy, *Journal of Marketing*, 65 (1) 44-61

Ailawadi, K. L., Neslin, S.A., and Lehmann, D.R., (2003) Revenue Premium as an Outcome Measure of Brand Equity. *Journal of Marketing* 67(4) 1-17.

Ajzen, I. and Fishbein,M. (1980) *Understanding attitudes and predicting Social Behaviour*. Englewood Cliffs: Prentice Hall

Ambler, Tim (1995) Brand equity as a relational concept. *Journal of Brand Management*, 2(6) 386-397.

Ambler, Tim (2002) Comment: Customer lifetime values – credible, or utterly incredible. *Journal of Targeting, Measurement and Analysis for Marketing*. 10(3) 201-2.

Ambler, Tim (2003) *Marketing and the Bottom Line*. 2nd ed. Harlow: Pearson Education

Anderson, Paul F. (1983) Marketing, Scientific Progress, and Scientific Method. *Journal of Marketing*. Vol. 47 (Fall, 1983). 18-31

Anschuetz, N. (2002). Why a brand's most valuable customer is the next one it adds. *Journal of Advertising Research*, *42*(1), 15-21.

Armstrong, J. Scott (1998) Management science: what does it have to do with management or science? *Marketing Bulletin*. May 1998, Vol. 9. 1-15.

Baldinger, A., Blair, E., and Echambadi, R. (2002). Why brands grow, *Journal of Advertising Research*, 42(1), 7-14.

Baldinger, Allan, and Rubinson, Joel (1997) The Jeopardy in Double Jeopardy. *Journal of Advertising Research*, (November-December 1997), 37-49.

Baldinger, Allan L., and Rubinson, Joel (1996) Brand Loyalty: The Link Between Attitude and Behaviour. *Journal of Advertising Research*, 36(6) 22-34.

Banelis, M (2008) *Understanding Consumers' Repertoire Sizes*. PhD Dissertation submitted at the Ehrenberg Bass Institute of Marketing Science, University of South Australia.

Barnard, N. R., and Ehrenberg, A. S. C. (1990). What is the Relevant Time-Period? *The Royal Statistical Society News & Notes*, 17(2).

Barnard, N. R., and Ehrenberg, A. S. C. (1997). Advertising: Strongly Persuasive or Nudging? *Journal of Advertising Research*, 37(Jan/ Feb), 21-28.

Barwise, T. Patrick (1995), Good Empirical Generalisations, *Marketing Science*, 14, 3, Part 2, G29-G35.

Barwise, P. T., and Ehrenberg, A. S. C. (1987). The Liking and Viewing of Regular TV Series. *Journal of Consumer Research*, 14(1), 63-70.

Barwise, P and Meehan, S., (2004), *Simply Better*. *Winning & Keeping Customers by Delivering What Matters Most*. Boston; Harvard Business School Press.

Bass, Frank M. (1995) Empirical Generalizations and Marketing Science: A Personal View *Marketing Science*, Vol. 14, No. 3, Part 2 of 2: Special Issue on Empirical Generalizations in Marketing (1995), pp. G6-G19

Bass, Frank M., Jeuland, A., and Wright, G. (1976), Equilibrium Stochastic Choice and Market Penetration Theories: Derivations and Comparisons, *Management Science*, 22 (June), 1051-63.

Bass, Frank M., Pessemier, Edgar A., and Lehmann, Donald R. (1972). An Experimental Study of Relationships Between Attitudes, Brand Preference and Choice. *Behavioural Science*. Volume 17, 1972.

Bass, Frank and Pilon, Thomas, L. (1980) A Stochastic Brand Choice Framework for Econometric Modeling of Time Series Market Share Behavior. *Journal of Marketing* Research. XVII (November 1980) 486-97.

BBC News (2008) *Recession fear as economy shrinks*. Friday 24th October 2008. Available at http://news.bbc.co.uk/1/hi/business/7686552.stm Accessed 11th January 2012

Bennett, Dag (2010). Don't try to manage loyalty. *Proceedings of the 9th International Marketing Trends Congress,* Venice.

Bennett, D., Ehrenberg, A., & Goodhardt, G. (2000). Two-purchase analysis of brand loyalty among petrol buyers. Paper presented at the *Australian and New Zealand Marketing Academy Conference*, Griffith University, Queensland, Australia.

Bennett, D., & Graham, C. (2010) Is loyalty driving growth for the brand in front? A two-purchase analysis of car category dynamics in Thailand. *Journal of Strategic Marketing*, **18**, 7, 573-585.

Bennett, D., & Graham C. (2011) The Long and the Short of it; patterns of consumer behaviour are predictable, and can inform both tactical and strategic marketing planning. *Proceedings of the 10th International Marketing Trends Congress*, Paris.

Bhattacharya, C.B. (1997), Is your brand's loyalty too much, too little or just right? Explaining deviations from the Dirichlet norm. *International Journal of Research in Marketing,* 14 421-43

Blackstone, EH (2004) Let the data speak for themselves? Seminars in Thoracic and Cardiovascular Surgery. *Pediatric Cardiac Surgery Annual*. 2004;7:192-8.

Bland, J.M. and Altman, D.G. (1994) Statistics Notes: Some examples of regression towards the mean. *BMJ* 1994; 309:780

Blattberg, Robert C., and Deighton John, (1996) Manage Marketing by the Customer Equity Test. *Harvard Business Review*. July-August, 1966. 136-144

Blattberg, Robert, Getz, Gary, and Jacquelyn S. Thomas (2001), *Customer Equity: Building and Managing Relationships as Valuable Assets*. Boston: Harvard Business School Press.

Bogomolova, Svetlana (2010) Life after Death? Analyzing post-defection consumer brand equity. *Journal of Business Research*, 63 (2010) 1135-1141

Bogomolova, Svetlana, and Romaniuk, Jenni (2009) Brand defection in a business-to-business financial service. *Journal of Business Research*. 62 (2009) 291-296

Bound, John (2009) The S-Parameter in the Dirichlet-NBD model; A simple interpretation. *The Journal of Empirical Generalisations in Marketing Science*. 12 (3) 1-7

Bound, J. A., and Ehrenberg, A. S. C. (1997). Private Label Purchasing. *Admap*, 32(7), 17-19.

Brito, P., and Hammond, K. (2007) Strategic Versus Tactical Nature of Sales Promotions. *Journal of Marketing Communications*, 13(2) 131-148.

Bronnenberg, Bart J., Kruger, M., and Mela, C. (2008) Database paper: The IRI marketing data set. *Marketing Science*, 27(4) 745-748

Bronnenberg, Bart, Mahajahan V., and Vanhonacker, W. (2000) The Emergence of Market Structure in New Repeat-Purchase Categories: The Interplay of Market Share and Retailer Distribution. *Journal of Marketing Research* Vol. XXXVII (February 2000) 16-31

Brown, G.H. (1953) Brand Loyalty. *Advertising Age*, 24, 28-35.

Buzzell, Robert, Gale, Bradley, and Sultan, Ralph (1975) Market Share: A key to profitability. *Harvard Business Review*, Jan-Feb 1975, pp 97-106

Caves, R.E. and Porter, M.E. (1978) Market Structure, Oligopoly and Stability of Market Shares. *Journal of Industrial Economics*. XXVI, No.4 (June 1978) 289-313.

Charlton, P. and Ehrenberg, A.S.C. (1976) An Experiment in Brand Choice. *Journal of Marketing Research* XIII (May 1976), 152-60.

Chatfield, Christopher (1989) *The Analysis of Time Series. An Introduction*. 4th ed London: Chapman & Hall.

Chatfield, C., and Goodhardt, G.J. (1973) A Consumer Purchasing Model with Erlang Interpurchase Time. *Journal of the American Statistical Association*, Vol. 68, No. 334, 828-835.

Christensen, Clayton M., (1997) *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business School Press.

Christensen, Clayton, M., Kaufman Stephen P., and Shih, Willy C., (2008) Innovation Killers. How Financial Tools Destroy Your Capacity to Do New Things. *Harvard Business Review*, January 2008, 98-105.

Christodoulides, George, and deChernatony, Leslie (2010) Consumer-Based Brand Equity Conceptualisation and Measurement. *International Journal of Marketing Research*. 52(1) 43-66.

Cobb-Walgren, Cathy J., Ruble, Cynthia A., and Donthu, Naveen (1995) Brand Equity, Brand Preference and Purchase Intent. *Journal of Advertising* 24(3) 25-40.

Colombo, R.A., and Jiang W. (2002), Brand Repertoires in Dirichlet Markets, *Proceedings of the Australian and New Zealand Marketing Academy Conference, 2002*, Deakin University, Melbourne Australia.

Cook Jr., Victor J. and Mindak, William A. (1984) A Search for constants: The "heavy user" revisited! *Journal of Consumer Marketing*, 1984, Vol. 1 Issue 4, p79-81

Cunningham R.M. (1956) Brand Loyalty – what, where, how much? *Harvard Business Review*, 34 (Jan/Feb), 116-128

John A. Czepiel, (1992) *Competitive Marketing Strategy*. Englewood Cliffs, N.J.: Prentice-Hall.

Dall'Olmo Riley, F., Ehrenberg, A.S.C., Castleberry,S.B., Barwise, T.P., and Barnard N.R. (1997) The variability of attitudinal repeat-rates. *International Journal of Research in Marketing*, 14(5), 437-450.

Davis, Scott and Dunn, Michael (2002) *Building the Brand-Driven Business: Operationalize Your Brand to Drive Profitable Growth*. San Francisco; Josey Bass.

Dawes, J. and Nenycz-Thiel, M. (2011) Analyzing Intensity of Private Label Competition across Retailers. *Journal of Business Research* 64 (2011).

Day, G (2002) Marketing and the CEO's Growth Imperative. (accessed July 20th 2011) Available at: http://marketing.wharton.upenn.edu/documents/research/Marketing_and_the_ceo_growth_imperative.pdf

Dekimpe, M and Hanssens D. (1995a) The Persistence of Marketing Effects on Sales. *Marketing Science*. 14(1), 1-21

Dekimpe, M. and Hanssens, D. (1995b) Empirical generalizations about market evolution and stationarity. *Marketing Science* 14(3, part 2), G109-G121.

Dekimpe, M., and Hanssens, D. (2000) Time-series models in marketing: past, present and future. *International Journal of Research in Marketing* 17, (2000) 183-193.

Doole, Isobel, and Lowe, Robin (2012) *International Marketing Strategy*. 6th ed. Andover: Cengage Learning EMEA

Dowling, G (2004) *The Art & Science of Marketing*, Oxford: Oxford University Press

Dowling, Grahame R., and Uncles, Mark (1997) Do Customer Loyalty Programs Really Work? *Sloan Management Review*. Summer, 1997. 71-82.

Doyle, P and Stern, P. (2006), *Marketing Management and Strategy*.4th ed. Harlow: Prentice Hall.

Driesener, C., (2005) *Empirical Generalisations in the Parameter Values of the NBD-Dirichlet Model*. PhD Dissertation submitted at the Ehrenberg Bass Institute of Marketing Science, University of South Australia.

Driesener, C. and Meyer-Warden, L., (2011). Has Brand Loyalty Declined? A Longitudinal Analysis. *Proceedings of the 40th European Marketing Academy Conference*, 2011, Ljubliana, Slovenia.

Driesener, C., Rungie, C., Habel, C., and Allsop, J. (2003) The Three Legs of Dirichlet Tables. *Proceedings of the Australian and New Zealand Marketing Academy Conference*, 2003, Adelaide, University of South Australia.

Dyson, Paul, Farr, Andy, and Hollis, Nigel (1996) Understanding, Measuring and Using Brand Equity. *Journal of Advertising Research*. 36(6) 9-21.

East, Robert, Gendall, Philip, Hammond, Kathy, and Lomax, Wendy (2005) Consumer Loyalty: Singular, Additive or Interactive? *Australasian Marketing Journal* 13(2) 10-26

East, Robert, Grandcolas, Ursula, Dall'Olmo Riley, Francesca and Lomax, Wendy (2012) Reasons for switching service providers. *Australasian Marketing Journal*, 20(2), 164-170.

East, R., and Hammond, K., (1996) The erosion of repeat purchase loyalty. *Marketing Letters* 7(2) 163-171.

East, Robert, Hammond, Kathy, Harris, Patricia and Lomax, Wendy (2000) First-store loyalty and retention. *Journal of Marketing Management*, 16(4), 307-325.

East, Robert, Hammond, Kathy, and Gendall, Philip (2006) Fact & Fallacy in Retention Marketing. *Journal of Marketing Management*, 22, 5-23.

East, Robert, Wright, Malcolm and Colombo, Richard (2004) The Association between Penetration and Frequency. *Proceedings of the Australian and New Zealand Marketing Academy Conference*, *2004*, Victoria University of Wellington.

East, Robert, Wright, Malcolm and Vanhuele, Marc (2008) *Consumer Behaviour*. *Applications in Marketing*. London: Sage.

Eggleston, Sheila (2000) The Grocer Focus on Hot Beverages. *The Grocer*, 9th September 2000. Available at: http://www.thegrocer.co.uk/topics/the-grocer-focus-on-hot-beverages/62615.article Accessed September 20th, 2012.

Ehrenberg, A. S. C. (1959). The Pattern of Consumer Purchases. *Applied Statistics* 8(1), 26-41.

Ehrenberg, A. S. C. (1972). *Repeat Buying: Theory and Applications*, North Holland: Amsterdam-London.

Ehrenberg, A.S.C. (1982) *A Primer in Data Reduction*. Chichester; Wiley.

Ehrenberg, A. (1988). *Repeat buying*, (2nd ed.). London: Charles Griffin.

Ehrenberg A. (1993) If you're so strong, why aren't you bigger? *Admap*, 28(1) 13-14

Ehrenberg, A.S.C. (1995) Empirical Generalisations, Theory and Method. *Marketing Science*, 14(3), Part 2 of 2, G20-G28

Ehrenberg, A. S. C. (1997a). In Search of Holy Grails: Two Comments. *Journal of Advertising Research*, 37(Jan/Feb), 9-12.

Ehrenberg, Andrew (1997b) Description and Prescription. *Journal of Advertising Research*. (November-December) 17-22.

Ehrenberg, A. S. C. (2001). Marketing: Romantic or Realist? Setting unrealistic goals gives marketing a bad rap. *Marketing Research*, 13(2), 40-42.

Ehrenberg, Andrew (2002) Two Kinds of Research. *Marketing Research*, (November 2002) 37-38.

Ehrenberg, A. S. C. (2004) My Research in Marketing: How it Happened. *Marketing Research*, (Winter) 36-41.

Ehrenberg A., Barnard, N., and Scriven J. (1997). Differentiation or Salience. *Journal of Advertising Research*, 37(6), 7-14.

Ehrenberg, A., and Goodhardt, G. (1970). A model of multibrand buying. *Journal of Marketing Research*, Vol VII (1), 77-84.

Ehrenberg, Andrew, and Goodhardt, Gerald. (2001) New Brands: Near Instant Loyalty. *Journal of Targeting, Measurement and Analysis for Marketing*, 10(1) 9-16.

Ehrenberg, A., and Goodhardt, G. (2002) Double Jeopardy revisited, again. *Marketing Research*. 14 (1) ,40.

Ehrenberg, A., Goodhardt, G., and Barwise, P. (1990). Double Jeopardy revisited, *Journal of Marketing*, *54*(3), 82-91.

Ehrenberg, A., Hammond, K., and Goodhardt G. (1994). The after-effects of price related consumer promotions. *Journal of Advertising Research*, 34(4), 11-21.

Ehrenberg, A. S. C., and Scriven, J. (1997). Polygamous Brand Loyalty. Marketing Learning 1, *The R&D Initiative*, South Bank University, London.

Ehrenberg, A. S. C., Uncles, M., Carrie, D., and Scriven, J. (2000). "*Armed to the Teeth - An Exercise in Understanding Buyer Behaviour - Part A and Answers to Part A.*" South Bank University, London.

Ehrenberg, A., Uncles, M., and Goodhardt, G. (2004). Understanding brand performance measures: using Dirichlet benchmarks, *Journal of Business Research*, *57*, 1307-1325.

Gordon, M.J., and Rosenthal, J.S. (2003) Capitalism's growth imperative. *Cambridge Journal of Economics*. 2003. 27, 25-48.

Gould, S.J. and Eldredge, N. (1977) Punctuated equilibria: the tempo and mode of evolution reconsidered. *Paleobiology* 3(2), 115-151.

Fader, P.S., Hardie, B.G.S. and Jerath, K, (2007) Estimating CLV using aggregated data: The Tuscan Lifestyles Case revisited. *Journal of Interactive Marketing*. 21(3) 55-71.

Fader, P.S., Hardie, B.G.S. and Lee, K.L. (2005) RFM and CLV: Using Iso-Value Curves for Customer Base Analysis. *Journal of Marketing Research* XLII (November 2005) 415-430.

Fader, P. and Schmittlein, D. (1993) Excess Behavioural Loyalty for High-Share Brands: Deviations from the Dirichlet Model for Repeat Purchasing**.** *Journal of Marketing Research***,** Vol. XXX (Nov. 93), 478-93.

Farquhar, Peter H., (1989) Managing Brand Equity. *Marketing Research*, 1(3) 24-33.

Foster, Richard and Kaplan, Sarah (2001) *Creative Destruction*. New York: Random House.

Foxall, G.R., Oliveira-Castro, J.M., James, V.K., and Schrezenmaier, T.C. (2007) Consumer behaviour analysis and consumer brand choice, *Management Online Review* (MORE) Durham University Research Online Available at: http://www.morexpertise.com/download.php?id=69 Accessed September 18th 2012.

Frank, Ronald E., Massy, William F., and Boyd, Harper W. (1967) Correlates of Grocery Product Consumption Rates. *Journal of Marketing Research*, Vol IV (May 1967) 184-90.

Franses, Philip Hans, Srinivasan, Shuba and Boswijk, Peter (2001) Testing for Unit Roots in Market Shares. *Marketing Letters*, 12(4), 351-364.

Gannon, Zoe and Lawson, Neal (2010) The Advertising Effect. How do we get the balance of advertising right? Available at Compass Online: www.compassonline.org.uk/publications/ (accessed May 3rd 2010)

Gigerenzer, Gerd, (2001) The Adaptive Toolbox. In *Bounded Rationality*. Eds., Gigerenzer, G. and Selten, R. Cambridge, Mass.: MIT Press

Golder, Peter (2000) Historical Method in Marketing Research with New Evidence on Long-Term Market Share Stability. *Journal of Marketing Research*. Vol. XVII (May). 156-172

Golder, Peter N., and Tellis, Gerard J., (1993) Pioneer Advantage: Marketing Logic or Marketing Legend. *Journal of Marketing Research* Vol. XXX (May 1993), 158-70

Goodhardt, G. J. and A. S. C. Ehrenberg (1967). Conditional Trend Analysis: A Breakdown by Initial Purchasing Level. *Journal of Marketing Research* Vol.IV (May 1967), 155-161.

Goodhardt, G., Ehrenberg, A., and Chatfield, C. (1984). The Dirichlet: a comprehensive model of buying behaviour. *Journal of the Statistical Society*, **A**, *147*, 621-655.

Graham, C.D.A. (2009) What's the Point of Marketing Anyway? New Findings on the Prevalence, Temporal Extent and Implications of Long-Term Market Share Equilibrium. *Journal of Marketing Management*, 25(9-10), 867-874.

Graham, C., and Danenberg, N. (2011). Swimming with the sharks? Understanding the competitive structure of primary-demand level product-markets. *Proceedings of the Academy of Marketing Annual Conference*, Liverpool University, July 2011.

Graham, C., Scriven, J, and Bennett, D. (2012) Brand Loyalty. *"Plus ca change…?"* New benchmarks from the Parameters of the NBD-Dirichlet. *Proceedings of the 11th International Marketing Trends Congress*, Venice.

The Grocer, (2002) Arla and Dairy Crest: major deals shake up the market. *The Grocer*, 2nd November 2002. Available at: http://www.thegrocer.co.uk/fmcg/the-sensational-tie-up-between-arla-and-fonterra-brought-lur/81374.article# Accessed September 20th 2012.

Guadigni, Peter and Little (1983) A Logit Model of Brand Choice Calibrated on Scanner Data. *Marketing Science*. 2(3) 203-238.

Gupta, S. and Lehmann, D. (2005) *Managing Customers as Investments. The Strategic Value of Customers in the Long Run*. Upper Saddle River, NJ: Wharton School Publishing.

Gupta, Sunil, Lehmann, Donald R., and Stuart, Jennifer Ames (2004) Valuing Customers. *Journal of Marketing Research*, XLI (February 2004) 7-18.

Habel, Cullen, and Rungie, Cam (2005) Representing Excess Loyalty On The Double Jeopardy Line. *Proceedings of the Australian and New Zealand Marketing Academy Conference 2005*, Fremantle, WA.

Haley, Russel I., (1968) Benefit Segmentation: A Decision-Oriented Research Tool. *Journal of Marketing*, Vol. 32, No. 3. (Jul., 1968), pp. 30-35.

Hammond, K., Ehrenberg, A., and Goodhardt, G. (1996) "Market Segmentation for Competitive Brands." *European Journal of Marketing* 30(12), 39–49.

Herniter, Jerome. (1971). A Probabilistic Market Model of Purchase Timing and Brand Selection. *Management Science*, 18(4) Part II, 102-113

Hoch, Stephen J., Montgomery, Alan L., and Park, Young-Hoon, (2002) Why Private Labels Show Long-Term Market Share Evolution. *Tepper School of Business*. Paper 333. Available at: http://repository.cmu.edu/tepper/333 Accessed September 14th 2012.

Hoeffler, Steve and Keller, Kevin Lane (2002) Building Brand Equity Through Corporate Societal Marketing. *Journal of Public Policy & Marketing*. 21(1) 78-89.

Hollis, Nigel (2008) *The Global Brand: How to Create and Develop Lasting Brand Value in the World Market*. New York: Palgrave Macmillan.

Hotelling, Harold (1929) Stability in Competition. *The Economic Journal*. Vol. 39 No.153 (March1929) 41-57.

References

Howard, J.A., and Sheth, J. (1969) *Theory of Buyer Behavior*. New York: Wiley.

Hoyer, W.D., (1984) An Examination of Consumer Decision Making for a Common Repeat Purchase Product, *Journal of Consumer Research* 11(3), 822-829.

Ind, Nicholas and Bjerke, Rune (2007) The concept of participatory market orientation: An organization-wide approach to enhancing brand equity. *Journal of Brand Management*. 15(2) 135-145

Interbrand, (2011) Best Global Brands 2011. Available at: http://issuu.com/interbrand/docs/bestglobalbrands2011-interbrand/7?mode=a_p Accessed September 18th 2012.

Jacobson, Robert and Aaker, David (1985) Is Market Share All That It's Cracked Up To Be? *Journal of Marketing*, Vol. 49 (Fall 1985), 11-22

Jacoby. J., and Chestnut R.W. (1978) *Brand Loyalty: Measurement and Management*. New York: Wiley.

Jain, Dipak and Singh, Siddhartha S. (2002) Customer Lifetime Research in Marketing: A Review and Future Directions. *Journal of Interactive Marketing* 16(2) 34-46.

Jeuland, Abel P., (1979) Brand choice Inertia as One Aspect of the Notion of Brand Loyalty. *Management Science*. 25(7) 671-682

Johnson, T., (1984) The myth of declining brand loyalty. *Journal of Advertising Research*. 24(1) 9-17.

Jones, John Philip, (1990) Ad Spending: Maintaining Market Share. *Harvard Business Review*, Jan/Feb90, 68(1), 38-42,

Jones, John Philip (2004) A Counter Attack from the Ivory Tower. *International Journal of Advertising*, 23(4) 523-526,

Jung, S., Gruca, T. and Lopo, R (2010) Excess Loyalty in CPG Markets: A Comprehensive Examination, *Journal of Empirical Generalisations in Marketing Science*, Vol 13, 1.

Kahn, B. E., Kalwani, M. U. and Morrison, D. G. (1986a). "Measuring Variety-Seeking and Reinforcement Behaviors Using Panel Data." *Journal of Marketing Research* 23(May): 89-100.

Kahn, Barbara E., Kalwani, M., and Morrison, D. (1988) Niching Versus Change of Pace Brands: Using Purchase Frequencies and Penetration Rates to Infer Brand Positionings. *Journal of Marketing Research* XXV (Nov. 1988) 384-90.

Kahn, B.E., Morrison, D.G. and Wright, G.P. (1986) Aggregating Individual Purchases to the Household Level. *Marketing Science*, 5(3), 260-268.

Kalwani, M.U. and Morrison, D.G. (1977) A Parsimonious Description of the Hendry System. *Management Science*, 23(January), 467-477

Kapferer, J.N., (2005) The roots of brand loyalty decline. An international comparison. *IVEY Business Journal Online*, March/April. 1-6.

Kau, K.A., and Ehrenberg, A.S.C.(1984) Patterns of Store Choice. *Journal of Marketing Research*, Vol. XXI (November 1984) 399-409

Kau, K. A., Uncles, M., Ehrenberg, A., and Barnard, N. (1998). Competitive Brand-Choice and Store-Choice among Japanese Consumers. *Journal of Product & Brand Management*, 7(6), 481-494.

Kearns, Zane (2002) *Dirichlet xls*. Version: VB 20 May 2002. Marketing Bulletin, Palmerston North: Massey University. Available at:
http://www.marketing-bulletin.massey.ac.nz/V20/Dirichlet%20VB.xls

Keller, Kevin Lane (1993) "Conceptualizing, Measuring and Managing Customer-Based Brand Equity". *Journal of Marketing*, 57(1), 1-22.

Keller, Kevin Lane (2008) *Strategic Brand Management. Building, Measuring and Managing Brand Equity*. 3rd ed. Upper Saddle River, NJ; Pearson Education

Keller, Kevin Lane and Lehmann, Donald R. (2003) How Do Brands Create Value? *Marketing Management*, (May/June 2003), 26-31

Keller, Kevin Lane, and Lehmann, Donald R. (2006) Brands and Branding. Research Findings and Future Priorities. *Marketing Science*, 25(6) 740-59.

Kennedy, R., and Ehrenberg, A. (2001). There is *no* brand segmentation. *Marketing Research*, **13**(1), 4-7.

Kennedy, R., and McColl, B., (2012) Brand Growth at Mars, Inc. *Journal of Advertising Research*, 52(2), 270-276.

Knox, Simon, and Walker, David (2003). Empirical developments in the measurement of involvement, brand loyalty and their relationship in grocery markets. *Journal of Strategic Marketing*, 11(4), 271-286.

Kotler, Philip, Armstrong, G., Wong, V., and Saunders, J. (2008) *Principles of Marketing* 5th European ed. Harlow: Prentice Hall.

Kumar, V., Lemon, Katherine N., and Parasuraman, A. (2006) Managing Customers for Value. An Overview and Research Agenda. *Journal of Service Research*. 9(2) November 2006, 87-94

Lal, R., and Padmanabhan,, V. (1995) Competitive Response and Equilibria. *Marketing Science* 14(3, Part 2) G101-G108.

Leone, Robert P. and Schultz, Randall L. (1980) A Study of Marketing Generalizations. *Journal of Marketing*, Vol. 44 (Winter 1980) 10-18.

Levitt, T. (1960) Marketing Myopia. *Harvard Business Review*, July-August, p 45-56.

Li, Fang, Cullen Habel and Cam Rungie (2009). "Using Polarisation to Reveal Systematic Deviations in Dirichlet Loyalty Estimation " *Marketing Bulletin* 2009.

Lilien, Gary, Kotler, P. and Moorthy (1992) *Marketing Models*, Upper Saddle River, New Jersey; Prentice Hall.

Lindemann, Jan (2004) Brand Valuation. In *Brands and Branding*. New York: Interbrand. available from: http://www.brandchannel.com/images/papers/financial_value.pdf   accessed September 20th 2012.

Linton, Mike (2009) Why do Chief Marketing Officers Have a Short Shelf Life? Forbes.com. Available at: http://www.forbes.com/2009/05/15/cmo-turnover-dilemma-cmo-network-dilemma.html Accessed September 14th 2012.

Lomax, W. Hammond, K., Clemente, M., and East, R. (1996) New entrants in a mature market: an empirical study of the detergent market. *Journal of Marketing Management*, 12(4), 281-295.

Ma, S. and Buschken, J. (2011) Counting your customers from an "always share" perspective. *Marketing Letters*. Vol. 22 (3) 243-257.

McCabe, J., and Stern, P., (2009) Stochastic modelling and industrial networks - complementary views of organisational behaviour. *Journal of the Academy of Marketing Science*. 37: 204-214.

McCabe, J., Stern, P., and Dacko, S. (2012) The Power of Before and After. How the Dirichlet can Analyze the Sales Impact of a Promotional Activity. *Journal of Advertising Research*, 52(2), 214-224.

McDonald M., and Dunbar, I. (2004) *Market Segmentation*. *How to do it*. *How to profit from it*. Oxford: Elsevier Butterworth-Heinemann.

McPhee,W. (1963). *Formal theories of mass behavior*. New York, NY: The Free Press.

Mela, C. Gupta, S. and Jedidi, K. (1998), Assessing long term promotional influences on market structure. *International Journal of Research in Marketing*, 15, 89-107

Mela, C., Gupta, S., and Lehmann D. (1997) The Long-Term Impact of Promotion and Advertising on Consumer Brand Choice. *Journal of Marketing Research*. 34, May, 248-261.

Mellens, M., Dekimpe, M., and Steenkamp, J-B. (1996) A review of brand-loyalty measures in marketing. *Tijdschrift voor Economie en Management*. 41(4), 507-534.

Miller, S. and Berry, L.(1998) Brand salience versus brand image: two theories of advertising effectiveness. *Journal of Advertising Research*, 38(5), 77-82.

Mintel (2004) Market Drivers. Moving to more modern, convenient product types. *Mintel Oxygen*. Soap, Bath and Shower Products-UK- October 2004

Mintel (2005a) The Supply Structure. Investment from leading brands pays off. *Mintel Oxygen*. Bread - UK- February 2005

Mintel (2005b) The Supply Structure. *Mintel Oxygen*. Yellow Fats - UK - September 2005.

Mintel (2007) Companies and Products. Warburtons. *Mintel Oxygen*. Bread –UK- February 2007.

Moore, Elizabeth, M., Wilkie, William L., and Lutz, Richard J. (2002) Passing the Torch. Intergenerational Influences as a Source of Brand Equity. *Journal of Marketing* 66(2) 17-37

Morgan, R and Hunt (1994), The Commitment-Trust Theory of Relationship Marketing, *Journal of Marketing*, 58, 20-38

Morrison, Donald G. (1968). A Stochastic Interpretation of the Heavy Half. *Journal of Marketing Research*, May68, Vol. V Issue 2, p194-198,

Morrison, Donald G. (1969) Conditional Trend Analysis. A Model that Allows for Non-Users. *Journal of Marketing Research*. VI, (August 1968), 342-346

Morrison, D.G. and Schmittlein, D.C. (1981) Predicting Future Random Events Based on Past Performance. *Management Science*. 27 (September) 1006-23.

Morrison, D.G. and Schmittlein, David (1988) Generalizing the NBD Model for Customer Purchases: What are the Implications and Is It Worth the Effort? *Journal of Business and Economic Statistics*, 6(2) 145.

MSI (2012) *Marketing Science Institute 2012-14 Research Priorities*. Available at: http://www.msi.org/research/index.cfm?id=338#RP2 Accessed 26th February 2012.

Myers, Chris A. (2003) Managing brand equity: a look at the impact of attributes. *Journal of Product & Brand Management*, 12(1) 39-51.

Nelder, John.A (1999) From Statistics to Statistical Science. *Journal of the Royal Statistical Society*, Series D (The Statistician), 48(2) 257-269.

Nelson-Field, K., Riebe E., and Sharp, B (2012) What's not to "Like"? Can a FaceBook Fan Base Give a Brand the Advertising Reach it Needs? *Journal of Advertising Research*, 52(2), 262-269.

Nijs, Vincent, R., Dekimpe, M., Steenkamp J-B., and Hanssens, D. (2001) The Category-Demand Effects of Price Promotions. *Marketing Science*. 20(1), 1-22.

Oliveira-Castro, J., Foxall, G., James, V., Pohl, R., Dias, M., and Chang, S. (2008) Consumer-Based Brand Equity and Brand Performance. *Service Industries Journal* 28(4) 445-461.

Oliver, Richard, L. (1997) *Satisfaction. A Behavioral Perspective on the Consumer*. New York: Irwin McGraw-Hill

Oliver, Richard, L. (1999) Whence Customer Loyalty? *Journal of Marketing*, 63 (Special Issue), 33-44.

O'Regan, Nicholas (2002) Market Share: The conduit to future success? *European Business Review*, 14(4) 2002, 287-293

Pare, Vipul, and Dawes, John (2012) The persistence of excess brand loyalty over multiple years. *Marketing Letters*, July, 2012.

Park, C.S. and Srinivasan, V.A. (1994) Survey-Based Method for Measuring and Understanding Brand Equity and its Extendability. *Journal of Marketing Research*, 31(5) 271-288.

Park, C., MacInnis, D., Priester, J., Eisengerich, A., and Iacobucci, D. (2010) Brand Attachment and Brand Attitude Strength. Conceptual and Empirical Differentiation of Two Critical Brand Equity Drivers. *Journal of Marketing* 74(6) 1-17.

Pauwels, Koen and Hanssens, Dominique M. (2007). Performance Regimes and Marketing Policy Shifts. *Marketing Science*, 26(3), 293-311

Pauwels, Koen, Hanssens, D.M. and Sidarth, S. (2002) The Long-Term Effects of Price Promotions on Category Incidence, Brand Choice and Purchase Quantity. *Journal of Marketing Research*, 34 (November), 421-439.

Pauwels, Koen, Silva-Risso, J., Srinivasan, S, and Hanssens, D (2004) New Products, Sales Promotions and Firm Value: The case of the automobile industry. *Journal of Marketing*, 68 (October 2004), 142-156.

Pickford, Chris and Goodhardt, Gerald, (2000) An Empirical Study of Buying Behaviour in an Industrial Market. *AM 2000 Proceedings, Academy of Marketing Conference, 5-7 July*, University of Derby, Nottingham.

Piercy, N., Cravens, D., and Lane, N. (2010). Marketing out of the recession: recovery is coming, but things will never be the same again. *The Marketing Review*, 10(1) 3-23.

Popper, Karl (1972) *Objective Knowledge*. Oxford; Clarendon Press

Porter, Michael E., (1985) *Competitive Advantage. Creating and Sustaining Superior Performance*. New York: The Free Press

Raggio, Randle, D., and Leone Robert P. (2009) Chasing Brand Value: Fully Leveraging Brand Equity to Maximise Brand Value. *Journal of Brand Management*. 16(4) 248-263.

Rego, Lopo L., Billett, Matthew T., and Morgan, Neil A. (2009) Consumer Based Brand Equity and Firm Risk. *Journal of Marketing*. 73(6) 47-60.

Reichheld, F.F. (1993) Loyalty-Based Management. *Harvard Business Review*, 71(2) 64-73.

Reichheld, Frederick F., (2001) *The Loyalty Effect. The hidden force behind growth, profits and lasting value*. Boston: Harvard Business School Press

Reicheld, F.F., (2003) The one number you need to grow. *Harvard Business Review*. 81(12), 46-54.

Reichheld, F.F. and Sasser, W.E. (1990) Zero defections: quality comes to services. *Harvard Business Review,* 68(5) 105-111.

Reinartz, Werner J., & Kumar, V. (2000) On the Profitability of Long-Life Customers in a Noncontractual Setting: An Empirical Investigation and Implications for Marketing. *Journal of Marketing*. 64 (October 2000) 17-35

Reinartz, W.J., and Kumar, V. (2003) The impact of customer relationship characteristics on profitable lifetime duration. *Journal of Marketing* 67(1) 77-99.

Reynolds, Thomas, and Phillips, Carl B. (2005) In Search of True Brand Equity Metrics: All Market Share Ain't Created Equal. *Journal of Advertising Research,* (June 2005), 171-186.

Ries, Al and Trout, Jack, (2001) *Positioning: The Battle for your Mind*. New York: McGraw-Hill

Romaniuk, Jenni (2003) Brand attributes – "distribution outlets" in the mind. *Journal of Marketing Communications*, 9, 73-92.

Romaniuk, J., Bogomolova, S., and Dall'Olmo Riley, F. (2012) Brand Image and Brand Usage. *Journal of Advertising Research,* 52(2), 243-251.

Romaniuk, Jenni, and Sharp, Byron (2004) Conceptualizing and Measuring Brand Salience. *Marketing Theory.* 4 (4) 327-342

Romaniuk, J. and Wight, S. (2009) The influence of brand usage on responses to advertising awareness measures, *International Journal of Market Research,* vol. 51, no. 2, pp. 203-218.

Romaniuk, Jenni and Wight, Sam (2010) The Stability and Contribution of Heavy Buyers. *Proceedings of the 6th International Conference (2010) - Thought Leaders in Brand Management,* Lugano, Switzerland, p1180-1189.

Rungie, C., and Goodhardt, G. (2004) Calculation of Theoretical Brand Performance Measures from the Parameters of the Dirichlet Model. *Marketing Bulletin*, 2004, **15**, Technical Note 2.

Rust, Roland, Lemon, Katherine N., and Zeithaml, Valarie A., (2004) Return on Marketing: Using Customer Equity to Focus Marketing Strategy. *Journal of Marketing*, 68 (January 2004), 109-127.

Schiffman, Leon, and Kanuk, Leslie (2009) *Consumer Behaviour* 10th ed. Harlow: Prentice Hall.

Schmittlein, D.C., Bemmaor, A.C., and Morrison, D.G. (1985) Why does the NBD work? Robustness in representing product purchases, brand purchases and imperfectly recorded purchases, *Marketing Science*, 4(3) 255-66.

Schultz, Don (2010) The fine line. Brand differentiation and brand loyalty. *Marketing Management*, (Summer, 2010), 8-9

Scriven, J. and Bound, J. (2004). A Discussion of Dirichlet Deviations. *Australian & New Zealand Marketing Academy Conference*, Wellington, New Zealand, School of Marketing and International Business, Victoria University of Wellington.

Scriven, J., and Goodhardt, G. (2012) The Ehrenberg Legacy. *Journal of Advertising Research*, 52(2), 198-202.

Scriven J., and Danenberg, N. (2010). *Understanding how brands compete; a guide to duplication of purchase analysis*. (Ehrenberg-Bass Institute for Marketing Science, report 53 for corporate members). Adelaide, Australia: University of South Australia.

Sharp, Byron (2009) Detroit's real problem: It's customer acquisition, not loyalty. *Marketing Research*, Spring 2009, 26-27.

Sharp, Byron (2010) *How Brands Grow, What Marketers Don't Know.* South Melbourne: Oxford University Press.

Sharp, Byron, and Driesener, Carl (2000) The Dirichlet's Buyer Behaviour Assumptions Really Do Matter. *Proceedings of the Australian and New Zealand Marketing Academy Conference 2000*, Griffith University, Gold Coast Australia.

Sharp, Byron, Riebe, Erica, Dawes, John and Danenberg, Nick (2002) A Marketing Economy of Scale – Big Brands Lose Less of their Customer Base than Small Brands. *Marketing Bulletin* 2002, 13, Research Note 1.

Sharp, Byron and Sharp, Anne (1997) Loyalty programs and their impact on repeat purchase loyalty patterns. *International Journal of Research in Marketing* Vol. 14 Issue 5, p473-486

Sharp, B., Wright, M., Dawes, J., Driesener, C., Meyer-Warden, L., Stochi, L. and Stern, P. (2012) It's a Dirichlet World. Modeling Individuals' Loyalties Reveals How Brands Compete, Grow and Decline. *Journal of Advertising Research*, 52(2) 203-213.

Sharp, B., Wright, M., and Goodhardt, G. (2002). Purchase loyalty is polarized into either repertoire or subscription patterns. *Australasian Marketing Journal*, 10(3) 7-20.

Simms, Jane (2008) Here Today, Gone Tomorrow? *Marketing*. 19th March 2008, p.17

Simon, Carol J., and Sullivan, Mary (1993) The Measurement and Determinants of Brand Equity: A Financial Approach. *Marketing Science* 12(1), 28-52.

Singh, Jaywant, Ehrenberg, Andrew and Goodhardt, Gerald. (2004) Loyalty to product variants: a pilot. *Journal of Customer Behaviour*, 3(2), pp. 123-132

Singh, Jaywant, Ehrenberg, Andrew and Goodhardt, Gerald (2008) Measuring customer loyalty to product variants. *International Journal of Market Research*, 50(4), 513-532.

Singh, J., Scriven, J., Clemente, M., Lomax, W., and Wright, M. (2012) New Brand Extensions. Patterns of Success and Failure. Journal of Advertising Research, 52(2), 234-242.

Skinner, B. F. (1938) *The behavior of organisms: an experimental analysis*. Oxford: Appleton-Century.

Slotegraaf, Rebecca, J., and Pauwels, Koen (2008) The Impact of Brand Equity and Innovation on the Long-Term Effectiveness of Promotions. *Journal of Marketing Research* 45(3) 293-306.

Smith, Wendell (1956) Product differentiation and market segmentation as alternative marketing strategies. *Journal of Marketing* (July 1956), 3-8.

Srinivasan, Shuba and Bass, Frank (2000) Cointegration analysis of brand and category sales: Stationarity and long-run equilibrium in market shares. *Applied Stochastic Models in business and Industry*. 16. 159-177

Srinivasan, S., Lesczczye and Bass (2000), Market share response and competitive interaction: The impact of temporary, evolving and structural changes in prices. *International Journal of Research in Marketing*, 17(4) 281-305

Srinivasan, V. (1979) Network models for estimating brand-specific effects in multi-attribute marketing models. *Management Science*, Vol. 25 11-21.

Stern, P. and Hammond, K. (2004) The Relationship Between Customer Loyalty and Purchase Incidence. *Marketing Letters*. 15(1) 5-19.

Stern, P. (1995) Prescriptions for branded and generic pharmaceuticals. *Journal of Brand Management*. 2(3) 177-183.

Stern, P. and Ehrenberg, A. (2003) Expectations vs Reality. *Marketing Research*, Spring 2003, 40-43.

Tellis, G., and Tellis, K. (2009). Research on advertising in a recession. A critical review and synthesis. *Journal of Advertising Research*, 49(3), 304-327.

Trinh, G., Wright, M. and Driesener, C. (2012), "The dynamic evolution of repeat buying", *The European Marketing Academy Conference 2012*, Ljubljana, Slovenia.

Tversky, Amos & Kahneman, Daniel (1974) Judgment under Uncertainty: Heuristics and Biases. *Science* Vol. 185, 1124-1131

Twedt, Dik Warren. How Important to Marketing Strategy Is the "Heavy User"? *Journal of Marketing*, 28(1) 71-72

Uncles, M., Ehrenberg, A.S.C. and Hammond, K. (1995), Patterns of Buyer Behaviour: Regularities, Models, and Extensions, *Marketing Science*, 14(3) Part 2, G71-G78.

Uncles, Mark D., and Wright, Malcolm (2004) Empirical Generalisation in Marketing. *Australasian Marketing Journal* 12(3) 5-18.

Uncles, M.D., Dowling, G.R., and Hammond, K. (2003) Customer loyalty and customer loyalty programs. *Journal of Consumer Marketing*. 20(4) 294-316

Uncles, M., Kennedy, R., Nenyycz-Thiel, M., Singh, J., and Kwok, S. (2012) In 25 Years, across 50 Categories User Profiles for Directly Competing Brands Seldom Differ. Affirming Andrew Ehrenberg's Principles. *Journal of Advertising Research*. 52(2), 252-261

Unilever (2010) Report of the directors: Our Footprint. *Unilever Annual Report and Accounts*. Available online at: http://www.unilever.com/images/Our_footprint_ambition_and_strategy_AR10_tcm13 -259487.pdf Accessed 18th September 2012.

Van Heerde, Harald, Gupta, S., and Wittink, D., (2003) Is 75% of the Sales Promotion Bump Due to Brand Switching? No, only 33% is. *Journal of Marketing Research* XL (November 2003), 481-491

Van Heerde, Harald, Helsen, K. and Dekimpe, M. (2007) The Impact of a Product-Harm Crisis on Marketing Effectiveness. *Marketing Science* 26(2) 230-245.

Van Heerde, Harald, Mela, Carl F., and Manchanda, Puneet (2004) The Dynamic Effect of Innovation on Market Structure. *Journal of Marketing Research*. XLI (May 2004) 166-183.

Venkatesan, Rajkumar, and V. Kumar (2004), A Customer Lifetime Value Framework for Customer Selection and Resource Allocation Strategy, *Journal of Marketing*, 68(October), 105-125.

Warshaw, Paul R. (1980) Predicting Purchase and Other Behaviors from General and Contextually Specific Intentions. *Journal of Marketing Research* 17(1) 26-33

Webster, F., (1986) Marketing Strategy in a Slow Growth Economy. *California Management Review*. 28(3) 93-105

Welch, Greg (2004), *CMO Tenure: Slowing Down the Revolving Door*. Spencer Stuart Blue Paper, available online at: http://content.spencerstuart.com/sswebsite/pdf/lib/cmo_brochureu1.pdf Accessed 18th September 2012.

Wellan, Dee and Ehrenberg, Andrew(1990) A Case of Seasonal Segmentation. *Marketing Research*, June 1990, 11-13.

Williams, Scott (2007) Gaining and Losing Market Share and Returns: a competitive dynamics model. *Journal of Strategic Marketing*, 15, (May-July 2007) 139-148

Wright, M and Kearns, Z (1998) Progress in Marketing Knowledge, *Journal of Empirical Generalisations in Marketing Science*, 3(1).

Wright, Malcolm and Riebe, Erica (2010),"Double Jeopardy in brand defection", *European Journal of Marketing*, 44(6) 860-873

Wright, Malcolm and Stocchi, Lara (2010) The Temporal Stability of a Stochastic Model. *Proceedings of the 10th Australian and New Zealand Marketing Academy Conference*, University of Canterbury, Christchurch, New Zealand.

Wright, Malcolm and Klÿn, Babs, (1998) Environmental Attitude – Behaviour Correlations in 21 Countries. *Journal of Empirical Generalisations in Marketing Science*. Vol.3, 1998. 42-60.

Wright, Malcolm (1999) *Estimating the NBD-Dirichlet Market Statistics from a Single Shot Survey*. Adelaide, University of South Australia. PhD thesis.

Wright, Malcolm, Sharp, Anne and Sharp, Byron (2002) Market statistics for the Dirichlet model: Using the Juster scale to replace panel data. *International Journal of Research in Marketing*. 19 (2002) 81-90.

Wyner, Gordon (2008) Marketing Effectiveness: Beyond the Short Term. Millward Brown's POV, June 2008. Available at: http://www.wpp.com/wpp/marketing/reportsstudies/beyondtheshortterm.htm Accessed 14th September 2012.

Yip, G, Devinney, T & Johnson, G 2009, 'Measuring long term superior performance', *Long Range Planning*, 42(3) 390-413.

Zeithaml, Valarie A., Rust, Roland T., and Lemon, Katherine N. (2001) Make Customer Profitability the Basis for Service, *California Management Review*, 43 (Summer), 118-42.

Zhang, Jason Q., Dixit, Ashutosh and Friedmann, Roberto (2010) Customer Loyalty and Lifetime Value: An Empirical Investigation of Consumer Packaged Goods. *Journal of Marketing Theory and Practice*. 18(2) 127-139.

APPENDIX A: BRAND SHARE STATIONARITY

Brand	Category	Brand Shares Average Quarter in Period…						VI - I
		I	*II*	*III*	*IV*	*V*	*VI*	
Other Branded	Crackers	10	19	23	24	27	26	**15**
Other	Canned Cat Food	39	37	38	40	42	51	**13**
Felix	Flexipack Catfood	18	18	20	18	23	28	**10**
Other	Canned Dog Food	28	27	31	36	37	37	**9**
Kenco	Instant Coffee	8	9	15	16	16	16	**8**
Flora	Margarine	16	19	22	22	24	25	**8**
Other	Flexipack Catfood	14	13	17	21	20	22	**8**
Country Life	Butter	5	6	7	9	13	13	**8**
Dove	Soap	14	16	17	19	21	22	**8**
Winalot	Canned Dog Food	8	13	13	15	12	15	**7**
Warburtons	Wrapped Bread	8	10	11	12	13	15	**7**
Other	Conditioner	51	49	50	54	55	58	**7**
Other Private	Analgesics	55	56	55	57	59	62	**7**
Lurpak	Butter	19	20	20	23	24	25	6
Hovis	Wrapped Bread	9	11	13	15	16	15	6
Cafe Direct	Ground Coffee	3	4	6	6	7	9	5
Imperial Leather	Soap	16	18	19	20	19	21	5
Other	Shampoo	53	50	52	53	56	57	4
Other	Male Deodorant	48	46	48	49	52	52	4
Galpharm	Analgesics	4	9	8	8	7	8	4
Kingsmill	Wrapped Bread	9	11	11	12	13	13	4
Soft And Gentle (Ddrnts)	Female Deodorant	6	4	5	7	8	9	3
Impulse	Female Deodorant	4	5	6	7	7	7	3
Classic Cat Food	Canned Cat Food	1	3	3	3	3	4	3
Gourmet Gold Cat Food	Canned Cat Food	1	2	3	3	3	4	3
Valupak (Vits)	Vitamins	1	2	2	3	4	4	3
Highland Spring	Still Water	5	5	6	8	8	8	3
Bassetts	Vitamins	2	2	3	4	5	5	3
Rombouts	Ground Coffee	2	3	3	4	4	5	3
Nurofen	Analgesics	4	4	6	7	8	6	3
Brunel	Analgesics	2	1	3	3	3	4	2
Other	Butter	36	38	41	41	37	38	2
Head & Shoulders	Shampoo	8	7	8	9	9	10	2
Herbal Essences	Conditioner	4	5	6	5	6	6	2
Utterly Butterly	Margarine	5	6	7	7	8	7	2
Adidas	Male Deodorant	2	3	3	4	3	4	2
Lavazza	Ground Coffee	2	3	3	3	4	4	2
Bertolli Olivio	Margarine	4	5	5	5	6	6	2
Evian	Still Water	11	10	9	10	12	12	2
Adidas	Female Deodorant	1	2	3	3	3	3	2
Alberto Balsam	Conditioner	2	4	4	5	5	4	2
Hob Nobs	Everyday Biscuits	1	1	1	2	2	3	2
Carrs	Crackers	3	3	3	3	4	4	2
Whiskas Supermeat	Canned Cat Food	4	2	4	6	7	5	1
McVitie	Everyday Biscuits	13	13	14	14	14	14	1

Continued…

		I	*II*	*III*	*IV*	*V*	*VI*	
Head & Shoulders	Conditioner	6	5	5	6	6	7	1
Aqua Pura	Still Water	2	1	2	2	3	3	1
Other	Ground Coffee	49	52	49	48	50	50	1
Herbal Essences	Shampoo	4	6	6	6	6	5	1
Clover	Margarine	6	5	5	6	6	7	1
Timotei	Shampoo	3	4	4	4	3	4	1
Alberto V05	Conditioner	5	4	4	5	5	5	1
Dove	Female Deodorant	6	5	5	7	7	6	1
Taylors	Ground Coffee	5	5	7	5	6	6	1
Kallo	Crackers	2	2	3	3	3	3	1
Vittel	Still Water	2	3	3	3	3	3	1
Crawfords	Everyday Biscuits	1	1	2	3	2	2	1
Percol	Ground Coffee	3	3	4	4	4	4	1
Stork	Margarine	9	9	10	10	10	10	1
Nairns	Crackers	1	1	2	2	2	2	1
Simple	Soap	3	3	4	4	4	4	1
I C B I N B	Margarine	6	6	6	7	7	7	1
Jacobs	Everyday Biscuits	1	1	1	1	1	1	1
Kit-E-Kat CIJ	Canned Cat Food	6	6	7	6	6	7	1
Rathbones	Wrapped Bread	1	1	1	1	1	1	1
Hovis Granary	Wrapped Bread	0	0	0	0	1	1	1
Vaseline	Female Deodorant	3	3	3	3	3	3	0
Lynx	Male Deodorant	15	14	13	13	14	15	0
Mitchum	Female Deodorant	0	0	0	1	1	1	0
Tesco	Instant Coffee	3	3	3	4	4	4	0
Kerrygold	Butter	3	4	3	4	4	4	0
Carte Noire	Instant Coffee	2	2	2	3	2	2	0
Other Branded	Vitamins	57	55	57	57	56	57	0
Nimble	Wrapped Bread	1	1	1	1	1	1	0
President	Butter	0	0	0	1	1	1	0
Pantene	Shampoo	10	11	10	9	10	10	0
Volvic Spring	Still Water	5	6	6	5	6	5	0
Vaseline	Male Deodorant	3	3	3	3	3	3	0
Physio Sport	Male Deodorant	1	2	2	2	1	1	0
Hovis (Jacobs)	Everyday Biscuits	1	0	0	0	0	1	0
Other Private	Vitamins	19	21	20	20	19	19	0
Charlie	Female Deodorant	1	1	1	1	1	1	0
Palmolive	Soap	5	4	4	4	5	5	0
Pogen	Crackers	1	1	1	1	1	1	0
Centrum	Vitamins	1	1	1	1	1	1	0
Chappie	Canned Dog Food	3	4	3	3	3	3	0
Buxton Spring	Still Water	5	4	2	4	4	5	0
Fairy	Soap	3	3	5	5	4	3	0
Spillers	Canned Dog Food	3	3	3	2	3	3	0
Kit-E-Kat	Flexipack Catfood	10	15	19	16	11	10	0
Hovis (Jacobs)	Crackers	1	1	1	1	1	1	0
Haliborange	Vitamins	2	2	1	2	2	1	0
Sunblest	Wrapped Bread	0	0	0	0	0	0	0
Hills	Everyday Biscuits	1	1	1	1	1	1	0
Gillette Series	Male Deodorant	3	3	3	3	3	3	0
Van Der Meulen	Crackers	1	1	1	1	1	1	0

Continued…

		I	*II*	*III*	*IV*	*V*	*VI*	
Birds	Instant Coffee	2	2	2	2	2	1	0
Vosene	Shampoo	3	3	3	3	2	2	0
Panadol	Analgesics	3	3	3	3	2	2	0
Pantene	Conditioner	10	11	10	10	10	10	-1
Healthcrafts	Vitamins	1	1	1	1	1	1	-1
Rightguard	Male Deodorant	7	7	7	7	6	6	-1
Hofels	Vitamins	1	1	1	0	0	0	-1
Redoxon	Vitamins	1	1	1	1	0	0	-1
Other Branded	Everyday Biscuits	11	14	11	11	10	10	-1
Mothers Pride	Wrapped Bread	1	1	1	1	1	1	-1
Allinson	Wrapped Bread	1	1	1	1	1	1	-1
Lyons Maryland	Everyday Biscuits	3	4	4	4	3	3	-1
Nescafe	Instant Coffee	43	44	42	41	41	42	-1
Wallis	Analgesics	1	2	2	3	2	1	-1
Camp	Ground Coffee	4	4	4	4	3	3	-1
Seven Seas	Vitamins	11	11	10	11	11	10	-1
Cesar	Canned Dog Food	3	3	2	1	2	2	-1
Anadin	Analgesics	7	6	6	6	6	6	-1
Butchers	Canned Dog Food	11	13	10	11	11	10	-1
Foxs	Everyday Biscuits	3	3	4	3	3	2	-1
Arrid	Male Deodorant	3	2	3	3	2	2	-1
Elkes Biscuits	Everyday Biscuits	3	4	3	3	3	3	-1
St Ivel Gold	Margarine	6	6	5	4	4	5	-1
Other Private	Everyday Biscuits	61	57	60	58	61	60	-1
Shield	Soap	3	2	3	2	2	2	-1
L Oreal Elvive	Shampoo	7	7	6	7	6	6	-1
Hedex	Analgesics	2	1	1	1	1	1	-1
Whiskas Fine Cuts	Canned Cat Food	9	11	12	13	14	8	-1
Other Branded	Wrapped Bread	5	6	5	5	4	4	-1
Katkins Chunks	Canned Cat Food	5	7	6	5	5	4	-1
Fructis	Shampoo	4	5	4	4	4	3	-1
Fructis	Conditioner	5	5	5	4	4	4	-1
JS Medium Roast	Instant Coffee	2	1	1	1	1	0	-1
Somerfield	Instant Coffee	2	2	1	1	1	0	-1
Mum	Female Deodorant	4	4	3	3	3	2	-1
Brut	Male Deodorant	2	2	1	1	0	0	-1
Vitalite	Margarine	4	4	3	3	3	3	-1
Wash & Go	Shampoo	2	1	1	1	1	1	-2
Jacobs	Crackers	22	21	21	23	21	21	-2
Pearl (Cussons)	Soap	6	6	5	5	5	4	-2
Hollybush	Butter	4	4	3	3	2	2	-2
Other Private	Still Water	51	54	51	50	49	49	-2
McVitie	Crackers	6	5	6	5	4	4	-2
Pal	Canned Dog Food	8	6	7	6	6	6	-2
Pears	Soap	2	2	2	2	0	0	-2
Lux Toiletries	Soap	4	2	1	1	1	2	-2
Other	Instant Coffee	30	28	26	27	28	28	-3
Bounce (Pedigree)	Canned Dog Food	3	3	2	2	2	1	-3
Kenco	Ground Coffee	5	7	5	3	3	2	-3
Mandanol	Analgesics	3	4	3	1	0	0	-3
Sure	Female Deodorant	19	20	19	18	17	16	-3

Continued…

		I	II	III	IV	V	VI	
Maxwell House	Instant Coffee	9	9	8	6	7	6	-3
L Oreal Elvive	Conditioner	8	8	7	6	6	5	-3
Ryvita	Crackers	20	19	17	15	17	17	-3
Lyons	Ground Coffee	9	7	6	8	6	6	-3
Whiskas	Flexipack Catfood	36	30	22	36	38	33	-3
Sanatogen	Vitamins	5	5	3	2	2	1	-3
Sure	Male Deodorant	17	18	17	16	16	14	-4
Whiskas S. Cuts	Canned Cat Food	5	4	3	2	2	1	-4
L Oreal	Conditioner	4	3	3	0	0	0	-4
Arthurs Standard	Canned Cat Food	6	6	3	3	3	2	-4
Organics	Shampoo	7	7	6	5	3	2	-5
Organics	Conditioner	6	7	6	4	2	1	-5
Other Branded	Still Water	19	16	22	18	15	14	-5
Pedigree Chum	Canned Dog Food	27	24	25	21	22	22	-5
Chunky (Friskies)	Canned Dog Food	6	5	3	2	1	1	-5
Sheba	Flexipack Catfood	11	10	10	8	6	6	-5
Other	Soap	44	43	40	38	40	39	-5
Other	Female Deodorant	57	56	55	50	50	51	-6
Anchor	Butter	22	19	19	18	18	16	-6
Douwe Egbert	Ground Coffee	19	11	12	14	13	13	-6
St Ivel	Butter	9	9	5	2	2	1	**-8**
Friskies Pet Care	Flexipack Catfood	11	14	13	2	1	1	**-10**
Other Branded	Analgesics	19	14	12	12	12	9	**-10**
Felix Cat Food	Canned Cat Food	24	23	21	20	17	14	**-10**
Other Private	Crackers	32	26	21	21	20	21	**-11**
Other	Margarine	43	41	37	35	33	31	**-12**
Other Private	Wrapped Bread	63	58	55	51	50	48	**-15**

APPENDIX B: RELATIVE OR ABSOLUTE SHARE?

The question of whether absolute or relative measures of brand share should be adopted was addressed earlier in the discussion, (sections 3.5, 3.6 and 8.8) and the choice of an absolute share measure was justified there in the context of analysing stable category structures. This appendix adds to those arguments in demonstrating that if a relative measure calculated on the brand's own performance were adopted, then far greater variances are observed which simply obfuscate the same end result.

The table below shows the relative quarterly market share changes for each of the brands in the dataset between the first and last years, ordered by their relative rather than absolute increase or decrease in share shown in the last column. It is obvious that this approach results in far higher variance values, more widely spread around their mean (which is 8%) and yet the average quarterly market share in Year One and Year Six (at the base of the Table) remain almost steady at 6%, while the average point change is -0.1. Brand buying remains largely stationary however you look at it.

Where a brand has increased its share, then managers might tend to draw attention to the ***relative*** increase, since this is a more flattering measure, but as discussed earlier, this is to ignore the competitive context of the change. Conversely, where brand share has decreased, the tendency might be to report the absolute measure (at least publicly), but then any comparison with prior increases would be confounded.

These thoughts suggest how the relative share measure might cloud competitive performance. In addition, the table exhibits overall stationarity, but also suggests how brand performance measures taken in isolation might make that equilibrium seem even more unlikely – how can the 76% increase in brand share reported here for Crawford's biscuits be considered stationary?

A comparison of relative brand share change over six years.
147 brands in 18 categories.
(Market share data rounded)

Brands	Average Market Share %		Share Points	Relative Change
	Q1-4	Q22-26	+/-	%
Valupak (Vits)	1	4	3.1	286.0
Mitchum f	0	1	0.5	200.0
Cafe Direct	3	8	5.2	164.3
Rombouts	2	5	2.7	149.3
Country Life	5	12	7.3	147.7
Bassetts	2	5	2.8	142.9
Hob Nobs	1	3	1.6	138.3
Hovis Granary	0	1	0.6	137.5
Timotei c	1	2	1.4	134.5
Adidas f	1	3	1.7	120.0
Kenco I	8	16	8.8	114.7
Adidas	2	4	1.9	113.6
Brunel	2	5	2.4	109.2
Impulse f	4	9	4.6	106.3
President	0	1	0.3	100.0
Winalot	8	15	7.5	98.7
Warburtons	8	16	7.4	89.4
Lavazza	2	5	2.1	84.8
Crawfords	1	2	0.7	76.3
Soft And Gentle (Ddrnts) f	6	10	4.0	69.4
Nurofen	4	6	2.6	68.9
Aqua Pura	2	3	1.3	66.2
Jacobs	1	1	0.6	65.7
Felix(F)	18	29	11.3	64.1
Hovis	9	14	5.3	58.7
Nimble	1	1	0.4	56.0
Nairns	1	2	0.7	55.8
Flora	16	25	8.7	53.0
Rathbones	1	1	0.5	51.4
Dove	14	21	7.2	51.1
Highland Spring	5	8	2.7	49.5
Bertolli Olivio	4	6	1.9	47.5
Carrs	3	4	1.4	46.2
Vittel	2	3	0.9	44.6
Kallo	2	3	0.9	42.2
Kingsmill	9	13	3.7	39.2
Whiskas Supermeat	4	5	1.5	38.6
St Ivel Utterly Butterly	5	7	2.0	37.9
Timotei	3	4	1.1	37.4
Imperial Leather	16	21	5.7	35.8
Lurpak	19	25	5.9	30.5
Dove f	6	7	1.6	29.0
Head & Shoulders	8	10	2.3	28.4
Herbal Essences	4	5	1.0	25.3
Percol	3	4	0.7	24.3
Hovis (Jacobs)	1	1	0.1	22.7

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Continued….	Average Market Share %		Share Points	Relative Change
	Q1-4	Q22-26	+/-	%
Taylors	5	6	1.0	20.6
Carte Noire I	2	2	0.3	16.7
Simple	3	4	0.5	16.2
Evian	11	12	1.7	16.1
Physio Sport	1	1	0.2	15.9
Vaseline f	3	3	0.4	13.9
McVitie	13	14	1.5	11.3
Clover	6	6	0.6	10.8
Tesco I	3	4	0.3	9.3
Kit-E-Kat CIJ	6	7	0.5	8.8
Stork	9	10	0.8	7.9
I C B I N B	6	7	0.5	7.8
Charlie f	1	1	0.1	4.8
Kerrygold	3	3	0.2	4.6
Volvic Spring	5	5	0.2	3.6
Vaseline	3	3	0.1	2.8
Galpharm*	8	8	0.2	2.8
Lynx	15	15	0.2	1.0
Pantene	10	10	0.0	-0.3
Palmolive	5	5	0.0	-0.5
Nescafe I	43	43	-0.3	-0.7
Kit-E-Kat(f)	10	10	-0.1	-1.0
Chappie	3	3	-0.1	-2.3
Buxton Spring	5	5	-0.2	-3.4
Butchers	11	10	-0.8	-6.7
Spillers	3	3	-0.2	-7.1
Seven Seas	11	10	-0.9	-8.3
Rightguard	7	6	-0.6	-9.0
Haliborange	2	2	-0.2	-9.1
Fairy	3	3	-0.3	-9.8
Jacobs	22	20	-2.3	-10.3
Gillette Series	3	3	-0.3	-10.4
Ryvita	20	18	-2.2	-10.9
Anadin	7	6	-0.8	-11.2
Camp	4	3	-0.5	-11.5
Centrum	1	1	-0.1	-12.1
Whiskas(F)	36	32	-4.5	-12.4
Whiskas Fine Cuts	9	8	-1.2	-12.7
Herbal Essences c	6	5	-0.8	-12.9
L Oreal Elvive	7	6	-1.0	-14.3
Lyons Maryland	3	3	-0.6	-17.2
Panadol	3	2	-0.5	-17.6
Pedigree Chum	27	22	-4.8	-17.9
Sure f	19	15	-3.4	-18.4
St Ivel Gold	6	5	-1.1	-19.4
Foxs	3	3	-0.7	-21.5
Sure	17	13	-3.7	-21.7
Alberto V05 c	7	5	-1.5	-22.1
Birds I	2	1	-0.4	-22.7
Katkins Chunks	5	4	-1.2	-24.6
Pal	8	6	-2.1	-25.5

Continued….	Average Market Share %		Share Points	Relative Change
	Q1-4	Q22-26	+/-	%
Vosene	3	2	-0.7	-26.2
Anchor	22	16	-5.9	-26.5
Hills	1	1	-0.3	-27.8
Elkes Biscuits	3	2	-1.0	-28.1
Fructis	4	3	-1.2	-29.2
Maxwell House I	9	6	-3.1	-33.4
Douwe Egbert	19	12	-6.6	-34.6
Arrid	3	2	-0.9	-34.6
Mum f	4	2	-1.3	-34.7
Lyons	9	6	-3.1	-34.8
Pearl (Cussons)	6	4	-2.0	-35.1
Shield	3	2	-1.0	-35.1
Pantene c	12	8	-4.3	-35.1
McVitie	6	4	-2.2	-38.1
Supersoft c	3	2	-1.2	-38.2
Vitalite	4	3	-1.6	-38.7
L Oreal Elvive c	9	5	-3.9	-42.9
Felix Cat Food	24	14	-10.5	-43.2
Mothers Pride	1	1	-0.6	-44.2
Hollybush	4	2	-1.9	-45.1
Healthcrafts	1	1	-0.5	-47.7
Allinson	1	1	-0.7	-48.1
Sheba(f)	11	6	-5.4	-49.3
Fructis c	4	2	-2.3	-53.0
Redoxon	1	0	-0.6	-57.5
Wallis	1	1	-0.9	-57.6
Lux Toiletries	4	2	-2.3	-57.9
Hedex	2	1	-1.1	-61.1
Kenco	5	2	-2.9	-65.0
Wash & Go	2	1	-1.6	-65.3
Sunblest (Allied Bk)	0	0	-0.3	-66.7
Arthurs Standard	6	2	-4.1	-67.4
Hofels	1	0	-0.6	-68.6
Organics c	6	2	-4.6	-71.3
Sanatogen	5	1	-3.5	-72.9
Organics	7	2	-4.8	-73.7
Whiskas Select Cuts	5	1	-3.7	-74.5
Chunky (Friskies)	6	1	-5.0	-84.1
Brut	2	0	-1.5	-84.7
Bounce (Pedigree)	3	1	-3.0	-84.9
Friskies Pet Care(f)	11	1	-9.9	-90.2
St Ivel	9	1	-8.6	-91.3
Mandanol	3	0	-2.8	-96.5
Pears	2	0	-2.4	-100.0
Average	*6*	*6*	*-0.1*	*8.0*