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BRAND LOYALTY FOR FREQUENTLY-BOUGHT GOODS

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ABSTRACT

Studying brand and category purchasing patterns in near-steady state markets produces generalisable and predictable results. Brand loyalty is broadly defined as an ongoing propensity to purchase the brand.

The main theoretical basis for this approach is the NBD-Dirichlet model of choice in competitive situations. The empirical evidence, and also the model predictions, show that competing brands differ little in their levels of loyalty. Any differences that do occur are mostly related to market share.

This thesis extends and critically probes the Dirichlet approach. The aim is to:

- (a) identify and model generalisable discrepancies,
- (b) refine existing measures of brand loyalty to produce additional ones,
- (c) test the new measures across several product categories in different countries,
- (d) test if a number of loyalty-based measures are linked.

Analyses of individual household level panel data have led to a number of substantive findings:

- 1. Over a year, repeat-purchase loyalty erodes by an average of 15%.
- 2. Erosion of brand loyalty differs little by weight of purchase.
- 3. Erosion is lower for brand leaders.
- 4. About one-third of a brand's buyers have that brand as their favourite.
- 5. A favourite brand is bought twice as often as the average brand, and accounts for just over half of its buyers' category requirements and two-thirds of the brand's sales.
- 6. The purchase distributions for favourite brand buyers are much the same for light and heavy category buyers.
- 7. Heavy brand buyers give a significantly higher share, than predicted, of their category purchases to the brand.

- 8. High share-of-category purchase is a weak predictor of a brand's repeatpurchase erosion.
- 9. At the individual level, behavioural and attitudinal loyalty-related measures show very little correlation.
- 10. Price-related promotions are used by existing customers of the brand; promotions do not make customers more loyal.
- 11. Competitive brands do not segment the market. This is consistent with the lack of segmentation variables in the Dirichlet.

The implications of these findings are discussed.

CONTENTS

1. INTRODUCTION	11
1.1 The Importance of Brand Loyalty	12
1.2 Problems of Definition	14
1.3 Different Concepts and Measures of Brand Loyalty	17
1.4 A Behavioural Approach Based on Propensity to Purchase	19
1.5 Empirical Relationships and Theory: The Dirichlet Model	21
1.6 Focus of the Thesis	23
1.6.1 Types of Product Studied	23
1.6.2 Loyalty in Stationary Markets	24
1.6.3 The Main Aims of The Thesis	26
1.7 Structure of the Thesis	27
2. CONCEPTS AND MEAURES OF BRAND LOYALTY	29
2.1 Common Patterns of Buyer Behaviour in Competitive Markets	30
2.1.1 Single-Brand Purchasing	32
2.1.2 Multi-Brand Purchasing	35
2.2 A Theoretical Model of Brand Choice: The NBD-Dirichlet	41
2.2.1 Conditions Under Which the NBD-Dirichlet Model Applies	42
2.2.2 Single Brand Purchasing and Dirichlet Predictions	44
2.2.3 Multibrand Purchasing and Dirichlet Predictions	46
2.2.4 Implications of the General Fit of the Model	48
2.2.5 Dirichlet Model Assumptions	50
2.3 The Dirichlet vs Other Approaches to Brand Loyalty	52
2.3.1 Conceptual Differences: Stationary versus Dynamic Markets	53
2.3.2 Conceptual Differences: Individual vs Brand Share Approach	54
2.3.3 Differences in Assumptions: Learning vs Zero-Order	58
2.3.4 Differences in Input and Output Measures	65
2.3.5 Differences in Weight of Empirical Evidence	67
2.4 Limitations to the Dirichlet	
2.4.1 Systematic Deviations in Model Fit	72
3. RESEARCH AIMS, APPROACH AND OBJECTIVES	
3.1 Desearch Aims	75
J. I NESCAI UN AIIIIS	
3.2 Research Approach	
3.2.1 Empirical-Theoretical-Empirical-Theoretical (ETET) Approach 3.2.2 What the ETET Approach Means in Terms of This Thesis	

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3.3 Research Objectives	78
4. DATA AND RESEARCH METHODOLOGY	84
4.1 Behavioural Measures - Data Requirements	85
4.1.1 Advantages of Household Panel Data over Survey Data	86
4.1.2 Limitations on the Use of Consumer Panel Data	
4.1.3 Types of Data from Consumer Panels	
4.2 Data Acquisition	94
4.3 Panel Data: An Example - UK Detergent	97
4.3.1 Data Manipulation	97
4.4 Factors which Affect the Measurement Process	
4.4.1 Definition of Category Boundaries	
4.4.2 Population to be Considered	
4.4.3 The Unit of Analysis	
4.4.4 The Measurement Period	101
4.5 Simulated Panel Data	
5. LOYALTY TO A SINGLE BRAND OVER TIME	104
5.1 Purchase in Mature Markets	
5.2 Repeat Buying Erosion and New Buyer Growth	106
5.3 Research Objectives	107
5.4 Methodology	
5.4.1 Data	107
5.4.2 Procedure	108
5.4.3 An Example - German Coffee	109
5.5 Main Results Across Nine Datasets	110
5.5.1 The Scale of Erosion	110
5.5.2 The Shape of the Erosion Function	111
5.5.3 Differences by Category	
5.5.4 Erosion and Purchase Weight	
5.5.5 Brand-Order Effect	
5.6 Discussion	
5.6.1 Scale of Effects.	
5.6.2 Factors Underlying Erosion	
5.7 Further Applications	
6. THE IMPORTANCE OF THE FAVOURITE BRAND	
6.1 Multibrand Buying	
6.2 Previous Evidence	120

6.3 SCR for the Average Brand	122
6.4 The Favourite Brand: Research Objectives	122
6.5 Methodology	123
6.5.1 Data	123
6.5.2 Observed Brand Preference Measures	124
6.5.3 Minimum Thresholds	124
6.5.4 Predictions from Simulated Data	125
6.6 An Example: Bold Laundry Detergent (UK)	126
6.6.1 Brand Performance Measures for All Buyers of Bold	126
6.6.2 Brand Performance Measures: Bold is the Favourite Brand	127
6.6.3 Levels of Brand Loyalty for Bold	129
6.7 UK Detergent - Observed Values and Dirichlet Norms	131
6.7.1 Brand Performance Measures for All Buyers	131
6.7.2 Brand Performance Measures for the Favourite Brand	132
6.7.3 Dirichlet Norms for UK Detergent	134
6.8 Empirical Findings Across All Datasets: Favourite Brands	136
6.8.1 Main Findings	136
6.8.2 Variation Across Brands: The Effect of Market Share	137
6.9 Heavy Category Buyers	140
6.9.1 Heavy Category Buyers: Variation Across Brands	142
6.10 SCR by Weight of Brand Purchase	143
6.10.1 SCR by Purchase Weight: Variation Across Brands	145
6.11 Summary of Findings	146
6.12 Conclusions and Further Research	147
7. REVEALED BRAND PREFERENCE AND CUSTOMER RETENTION.	. 148
7.1 Brand Loyalty - One Concept, Different Measures?	. 149
7.2 Methodology	150
7.2.1 Data	150
7.2.2 Purchase Histories	152
7.2.3 Segmentation in a Base Period by Preference Level	154
7.2.4 Calculation of Repeat-Purchase Erosion	155
7.2.5 An Example: German Coffee	156
7.3 Results	. 157
7.3.1 Repeat Purchase and Erosion Over Time by Preference Segment	159
7.3.2 Sensitivity of Results to Preference Break-Points	. 159
7.3.3 The Effect of Brand Order	160
7.4 Discussion	. 161
7.4.1 Most Preferred Versus Other Brands Bought	161
7.4.2 Results for US detergent	. 162

7.4.3 Methodological Issues	162
7.5 Implications for Loyalty Research1	164
8. RELATED PATTERNS OF PURCHASING 1	165
8.1 Store Loyalty1	166
8.2 The After-Effects of Price-Related Consumer Promotions1	167
8.3 Market Segmentation for Competitive Brands	169
8.4 Line Extensions	174
8.5 Attitudes and Behaviour	176
8.6 Summary	180
9. IMPLICATIONS	181
9.1 Different Purchase Paradigms - Habit vs Cognition	182
9.2.1 Substantive Findings Which Reinforce the Dirichlet Approach	185 185 187
9.3 Directions for Future Research	188
APPENDIX 1: THE NBD-DIRICHLET MODEL	190
REFERENCES	199

TABLES

Table 1.	Concepts and Measures of Brand Loyalty	,17
Table 2.	Single Brand Purchasing: UK Laundry Detergent	,33
Table 3.	Multibrand Purchasing: UK Laundry Detergent	.37
Table 4.	Conditions Under Which Dirichlet-Type Markets Have Been Found	,39
Table 5.	Single Brand Purchasing: NBD-Dirichlet Predictions	.44

Table 6.	Multibrand Purchasing: Dirichlet Predictions	.46
Table 7.	Repeat-Purchase and Erosion: German Ground Coffee	109
Table 8.	Quarterly Repeat-Purchase Rates for Nine Datasets	110
Table 9.	Repeat and New Purchase Over One Year	111
Table 10	Erosion, Purchase Frequency and Market Concentration	112

Table 11.	Repeat-Purchase by Light, Medium and Heavy Brand Buyers	113
Table 12.	Brand Performance Measures: All Buyers, Bold Detergent,	126
Table 13.	Brand Performance Measures: Favourite Buyers, Bold Detergent	128
Table 14.	Preference Levels: Favourite Buyers, Bold Detergent,	129
Table 15.	Brand Performance Measures: All Buyers, UK Laundry Detergent	131

Table 16.	Brand Performance Measures: Favourite Buyers, UK Laundry Detergent
Table 17.	Observed versus Predicted Values: All Brand Buyers, UK Laundry Detergent 134
Table 18.	Observed versus Predicted Values: Favourite Brands, UK Laundry Detergent135
Table 19.	All Brands Versus Favourite Brands: Ten Datasets
Table 20.	All Brands Versus Favourite Brands: Ten Categories, By Brand Order

Table 21.	Favourite Buyers of the Brand, by Preference Segment	139
Table 22.	All Brands Versus Favourite Brands: Ten Datasets, Heavy Category Buyers	141
Table 23.	Brand Performance Measures: By Brand Order - Heavy Category Buyers	142
Table 24.	Observed and Predicted SCR by Weight of Brand Purchase	144
Table 25.	Buying of the Brand and Buying Other Brands by Weight of Brand Purchase	145

Table 26.	Observed and Predicted SCR by Weight of Brand Purchase by Brand Order	145
Table 27.	Descriptive Data for the Nine Datasets	153
Table 28.	Repeat-Purchase and Erosion, by Preference Group	156
Table 29.	Erosion for Different Levels of Preference	158
Table 30 .	Repeat Purchase and Erosion Over Time, by Preference Level	159

Table 31.	Decline in Retention for Different Levels of Preference by Brand Order16	0
Table 32.	Average Brand Profile Deviations and MADs, for 23 Categories17	2
Table 33.	Comparison of Behavioural and Attitudinal Loyalty-Related Measures17	8
Table 34.	Correlation Between SCR _f and SAMEB, ATTLOY Measures	9

FIGURES

Figure 1.	UK Laundry Detergent: Weekly Sales of Leading Four Brands
Figure 2.	UK Laundry Detergent: Quarterly Market Shares of Leading Four Brands25
Figure 3.	Organisation of the Thesis

1. INTRODUCTION

Summary

This Chapter introduces the topic of brand loyalty, the research issues, the different possible research approaches, and the approach which is adopted in this thesis.

Brand loyalty is an important issue to marketing managers because the long-term success of a brand, especially in frequently-bought markets, usually depends on repeat purchase. With the proliferation of product offerings and channels, the brand manager's stated aim is to maintain, or if possible, increase customer loyalty.

Brand loyalty has long been studied as an individual consumer characteristic, however this approach has produced few systematic results to advance our general understanding of consumer behaviour in established competitive markets. An approach which has produced generalisable and predictable results is to study aggregate brand and category purchasing patterns in steady state markets, and to define brand loyalty as an ongoing propensity to purchase the brand. This implies that consumers do not differ in their "loyalty", but only in their tendency to repeatbuy. This view of loyalty requires no special "commitment" to the brand.

The theoretical basis for this approach is the NBD-Dirichlet model of choice in competitive situations. The empirical evidence, and predictions using the NBD-Dirichlet model, show that competing brands differ little in the levels of loyalty they "enjoy", and that any differences are related to market share. This approach, in its treatment of both consumers and brands, differs from how loyalty is generally regarded (i.e. as highly variable across consumers and brands), by both practitioners and academics.

The aim of this thesis is to extend and critically probe the Dirichlet approach in order to broaden our understanding of brand loyalty.

1.1 The Importance of Brand Loyalty

The concept of consumer loyalty to branded products is one of the most frequent themes in the marketing press; trade magazines regularly run surveys on consumer or customer¹ loyalty; firms appear to worry that brand loyalty is declining. The following headlines are typical:

"Shopping Statistics Underline Lack of Loyalty"

Marketing Week, 1995.

"Why Consumers are No Longer Faithful to their Favorite Brands"

Forbes, 1991.

"Brand Loyalty Marketing Key to Enduring Growth"

Advertising Age, 1994.

The reason for managerial interest in brand loyalty is clear: the success of a brand, especially in frequently-purchased consumer goods markets, depends not so much on the "one-off" purchaser, but on two aspects of repeat-buying; the number of buyers who regularly make repeat purchases of the brand and the number of buyers who devote a large part of their category spending to the brand. Trade articles such as those quoted above, suggest that managers should focus their promotional strategy on, first, keeping heavy repeat-buyers, and second, on persuading some of their less-frequent customers to become "more loyal".

¹ I use customer and consumer as interchangeable. Strictly speaking a customer is the person who makes the purchase and a consumer is the person who uses or consumes the product. Most of the research described here is in the area of household products, where it is likely that the main shopper for the household makes purchases on behalf of a number of other people. I expand on this problem of buyers versus users in Chapter 4, Section 4.1.2. It should also be noted that in the retail trade a brand manufacturer would refer to the retailer stocking his products as a customer and to the end user as a consumer.

Indeed, long-term loyalty has now become the focus of a management philosophy (Reichheld, 1993, 1996) embracing not only consumers but also staff and investors. Reichheld claims that the most successful companies often show a high(er) level of customer and staff retention, which he relates to profitability. This type of managerial thinking can be seen in practice in the increasing use of loyalty schemes or 'customer continuity programmes'. 'Frequent-flyer' airline programmes have been wellestablished since the 1980s but now packaged goods companies and retailers are showing renewed interest in establishing "relationships" with their customers, as noted by Uncles (1994);

"Major schemes are being launched constantly, often with the same sort of 'fanfare' that was once reserved for new product launches, store openings, new advertising campaigns or high profile promotional offers"

Two other reasons why the study and measurement of loyalty are valued by managers are, first, many companies wish to target their advertising on particular groups of brand users (or non-users), and classifying buyers according to the loyalty they show or feel towards a brand is a common practice (e.g. Rossiter and Percy 1996). McQueen (1992) reports on a study by Leo Burnett² where customers are divided into five segments dependent upon their price sensitivity. One of the segments, those who concentrate most of their purchases on just one brand, are termed "Loyals", the other segments display various switching strategies (I return to the details of this study in Section 1.2).

Secondly, there are supply-side issues which managers feel may affect consumer loyalty; the growth of store brands (in the 1970s); the trend to fewer brand lines being offered in supermarkets (in the 1980s); the introduction of new delivery channels such as discount warehouses or online shopping (in the 1990s). In the face of such real and

² Leo Burnett is a large international advertising agency.

perceived threats, managers increasingly are turning to various types of loyalty schemes in the hope of retaining their customers' patronage.

What precisely does the brand or store manager hope to achieve with their loyalty scheme? Presumably they wish to increase, or at least maintain, customer loyalty. How do they measure the success (or failure) of loyalty initiatives? More fundamentally, what is brand loyalty? Marketing academics, drawing on differing research traditions - economic, psychological, mathematical - have struggled with this last question for as long as they have studied Marketing. The definitions and measures of brand loyalty are various and often conflicting, as indeed are the conclusions and managerial implications based on research in this area. As I note in Section 1.2 below, and describe in more detail in Chapter 2, the approach I follow has produced results which are both generalisable and predictable. In building on this approach, I do not directly measure the success or failure of particular loyalty schemes, but I suggest ways in which customer loyalty more generally can be measured and evaluated.

1.2 Problems of Definition

In the academic field, brand loyalty has been a continuing concern and was raised over seventy years ago in the first issue of Harvard Business Review where Copeland (1923) used the term 'brand insistence' to describe the exclusive purchase of a single brand over time, which these days would be termed 'sole'(or 100%) brand loyalty.

A popular statement of belief amongst academics (and marketers) is that:

"A set of customers with brand loyalty reduces the marketing costs of doing business."

Aaker (1991, p46).

But is this really so? Let us return to the brand loyalty/price sensitivity study conducted by Leo Burnett (McQueen 1992). This was an extensive analysis of the sales patterns over a year of over 50 brands in seven categories, with the data coming from an Information Resources Inc. (IRI) consumer panel. The study was aimed at determining which aspects of consumers' buying behaviour were affected when sales of a brand rose (as a result of price promotions). For example, was it the number of buyers (penetration of the brand), or the number of times existing buyers bought (purchase frequency), and did this behaviour differ across the five loyalty segments (as defined by McQueen)?

McQueen found that in some categories, price promotions 'caused' the brand penetration to increase for some consumer segments and not for other segments; for other categories promotions affected the same segments in the opposite way; and for yet others, there was no discernible pattern of effects. The explanation, by McQueen, for these findings, was that some promotions were designed to increase purchase rates, some to increase trial, and that others were perhaps badly designed and so did not achieve their goal.

This example illustrates some of the common assumptions that appear to underlie much of the reported research into brand loyalty. Put baldly, these assumptions are:

- a) Brand loyalty is a well-understood concept.
- b) Markets are in an almost constant dynamic state of flux with consumers reevaluating their brand choice at every purchase.
- c) Brand loyalty is a brand characteristic with different brands having different and variable levels of loyalty.
- d) Brand loyalty is the direct result of actions by manufacturers/retailers, and therefore can be readily altered.
- e) Consumers can be divided into meaningful segments according to their response to promotions or advertising.

15

In this thesis I take issue with such (often implicit) assertions and suggest a simpler, more predictable and more generalisable approach to the study of brand loyalty. This approach has implications for how managers should consider brand loyalty, and for the types of managerial strategy which can (and cannot) affect (i) brand loyalty and (ii) sales.

Before we can begin to discuss the desirability of brand loyalty, or even whether brand loyalty can be altered (the most common *raison d'être* of loyalty schemes), we need to define clearly what brand loyalty is and how we measure it. The concept of brand loyalty has not been uniquely defined and has been used in a variety of senses, many of which are inconsistent with each other. Many measures have drawn on more than one idea of loyalty, and indeed a single concept of loyalty may be measured in many ways; Jacoby and Chestnut (1978) noted 53 different measures of loyalty which they relate to three different ways of defining brand loyalty (a behavioural definition, an attitudinal definition, and a combined behavioural-attitudinal definition). It is also rare (but see Ehrenberg 1972/1988³ for a clear exception to this) for researchers to relate different measures to each other, to check on the reliability of measures over time, to use more than one measure in the same study, or to look for patterns of brand loyalty across different categories.

We should also bear in mind that loyalty and allegiance are terms used in the description of human relationships and are only metaphors when applied to the purchase of products. There is a danger that this terminology imports inappropriate meanings when applied to the purchase of everyday goods (especially as loyalty in everyday human relationships can mean many different things to different people). In particular, the emotional involvement that characterises human relationships may be irrelevant to utilitarian purchases in frequently-bought grocery markets.

³ I refer many times to Ehrenberg (1972/1988). This is the book *Repeat Buying: Facts, Theory and Applications*, which was first issued in 1972, and updated to include the Dirichlet Model in 1988. I refer to both editions because it is useful to be aware of the historical significance of the earlier work.

1.3 Different Concepts and Measures of Brand Loyalty

We can broadly separate out a number of different research traditions which have been used in the study of brand loyalty. Historically, researchers have studied brand loyalty as:

- a) An individual consumer characteristic.
- b) An aggregate brand or product characteristic.

Within each of these traditions, loyalty can be ascribed to: (i) attitudes, (ii) behaviour, with corresponding differences in the lists of possible causes.

A summary of the types of measures of brand loyalty which have been used in these different approaches is shown in Table 1 below. This Table presents a very simplistic view of loyalty research, in practice there have been both elaborate subsidiary and combined approaches; the different approaches are discussed more fully in Chapter 2.

Table 1: Concepts and Measures of Drand Loyarty								
CONCEPTS	Attitudinal	Behavioural						
	MEASURES							
Individual consumer-oriented	A i. general consumer beliefs ii. loyalty proneness	C i. sequence of purchases ii. proportion of purchases						
Brand or product oriented	B i. preferences, commitment ii stated purchase intentions	D i. brand-dependent measures ii. market share-related measures						

Table 1. Concepts and Measures of Brand Loyalty

Adapted from Mellens, Dekimpe and Steenkamp (1996, Table 2)

Central to research which views loyalty from an *attitudinal* viewpoint is the assumption that consumer beliefs and feelings are *antecedents* to purchase.

Consequently such research is designed to understand why the consumer has (positive or negative) attitudes towards the brand, and the main focus of interest in this field of research is the cognitive and affective processes which underlie consumer purchasing behaviour. This attitudinal approach to brand loyalty tends to focus on the reasons behind the *individual* consumer's loyalty; loyalty here is thought of as:

- a) Based on general beliefs that the consumer might have about a brand, e.g. "Ariel detergent has biological ingredients", or on loyalty-proneness as an individual consumer trait, e.g. "I always buy the same brand of toothpaste" or "I never buy private label".⁴ (Table 1, cell A)
- b) The consumer's preference or stated purchase intentions towards a particular brand",⁵ e.g. "I would only ever buy a Ford car", "I was happy with Ariel and will purchase it again next time". (Table 1, cell B)

In contrast to this, in behavioural research, the focus is on the purchase itself, since a central assumption of many researchers is that it is this purchasing behaviour - the experience with the brand - which gives rise to attitudes about the brand, and so influences commitment, preferences, and a propensity to repurchase. For the branch of behavioural research followed in this thesis, we argue that the evidence points to attitudes being of secondary importance because they are, in the main, the *consequence* of behaviour.⁶

⁴ It should be noted that a high degree of loyalty-proneness need not imply high brand loyalty. Rather it implies the *same level of individual loyalty across different categories*. For instance, a customer might choose to shop around for offers in all categories they buy, in which case they would be termed high in loyalty-proneness, i.e. their loyalty level is the same (low) whatever product they buy (in this example, this particular type of loyalty-proneness is termed deal-proneness).

⁵ Intention is founded in the set of beliefs and values (attitudes) which a consumer has about a brand; this has been termed brand "image". Brand image can be important to a manufacturer when it stabilises or directs consumers' behaviour, e.g. the Ratner image, (and subsequent sales level) was affected negatively when (in 1990) Gerald Ratner described some of his firm's products as "crap".
⁶ The association between brand attitude and purchase has been well-established (Barwise and Ehrenberg 1985; Bird, Channon and Ehrenberg 1970; Franzen 1994), and evidence on the causal priority favours the view that behaviour mostly comes before attitude, i.e. consumers adjust their attitude as a result of their behaviour (Castleberry and Ehrenberg 1990; Castleberry *et al.* 1994).

Much early behavioural research into loyalty focused on the individual consumer's sequence of purchases or proportion of purchase to their most preferred brand as the unit of measurement (Brown 1953; Cunningham 1956, 1961; Tucker 1964). This research established that consumers have consistent preferences (a favourite and second favourite brand), but was descriptive rather than theoretical or predictive in its approach (Table 1, cell C).

In more recent behavioural research, loyalty has been regarded as a brand characteristic, but needing individual level data to calculate a brand loyalty index for each individual, for each brand, on every purchase occasion (e.g. Guadagni and Little 1983). The aim of this approach is to model the available marketing mix data (on price, promotions, etc.) and so predict the market shares of each competing brand (cell Di).

I argue in Chapter 2, that neither the individual consumer nor the brand modelling approaches, (while of intuitive appeal to both the brand manager and the psychologist), appear, (from the published evidence) to have produced findings which have advanced our general understanding of brand loyalty in competitive markets. An approach which has produced generalisable and predictable results is the study of *aggregate* brand and category purchasing patterns and the definition of brand loyalty as an ongoing propensity to purchase the brand, related to a brand's market share - cell Dii in Table 1 (Ehrenberg 1972/1988; Ehrenberg 1993). The next Section amplifies this approach.

1.4 A Behavioural Approach Based on Propensity to Purchase

When managers talk about 'building brand loyalty', they imply that it is possible to *change* the way shoppers perceive (and purchase) their brand; hence the brand manager's aim is often to make her/his brand more resistant to change, to protect the brand from competitive action or new entrants. However, as Ehrenberg and Uncles

(1997) document, how often people buy a product, and what brands they buy, appear (from analyses of large samples of data from many different product fields) to be largely habitual, with individual behaviour aggregating to measures of brand performance which follow regular law-like patterns.

This approach is based on the NBD-Dirichlet model of purchase incidence and brand choice in established, competitive markets (Goodhardt, Ehrenberg and Chatfield 1984). The finding that most markets behave in a predictable "Dirichlet" manner, has led to the conclusion that:

- a) Loyalty (the propensity to purchase) at the individual consumer level has multiple causes, but, in aggregate, produces a common effect at the brand level, which is captured by many different measures.
- b) Competing brands differ little in the levels of loyalty they 'enjoy'.

Using the NBD-Dirichlet model, a range of brand output measures, including several loyalty ones, can all be predicted solely from the market share of each brand⁷ (Ehrenberg 1988; Uncles, Hammond, Ehrenberg and Davies 1994; Uncles, Ehrenberg and Hammond 1995).

The different approaches to defining brand loyalty, the differing input and output measures that each approach requires and findings based on each approach are discussed in more detail in Chapter 2. In Section 1.5 below, I introduce the approach followed in this thesis.

⁷ Apart from this one brand-specific input, the Dirichlet model also requires as input, information on the penetration and purchase frequency of the total product field and a specified length for the analysis period (e.g. 4 weeks or 52 weeks). The different input and output measures and assumptions underlying the Dirichlet are described in Chapter 2, Section 2.3.4. A detailed description of the model is given in Appendix 1.

1.5 Empirical Relationships and Theory: The Dirichlet Model

Generalisable empirical research findings have a strong link with theory, and the research presented here is grounded in well-tested theory - the NBD-Dirichlet model of choice behaviour in competitive market situations (Ehrenberg 1972/88; Ehrenberg and Uncles 1997; Goodhardt, Ehrenberg and Chatfield 1984).

Alternative approaches to loyalty research, based on attitudes or individual consumer measures, have suggested that brand loyalty is a multi-faceted phenomenon with a variety of relevant measures, no one of which adequately provides an overall explanation. In contrast, empirical evidence from Ehrenberg and his co-workers has demonstrated that brand loyalty can be adequately explained as consumers' ongoing propensities to purchase the brand, and that these propensities are reflected solely in the market share of that brand.

The NBD-Dirichlet model⁸ provides theory which supports the empirical evidence for brand loyalty as a propensity to (re)purchase. The Dirichlet requires each brand's market share as its only brand-related input while nevertheless allowing for heterogeneity of consumers in both brand and category buying. The model provides a range of outputs covering multibrand-buying, sole-brand buying and repeat-buying. The parsimony of data requirements for the Dirichlet, along with the wide range of choice situations for which it is applicable makes it extremely attractive as a descriptive/predictive model.⁹

⁸ The NBD-Dirichlet model is often referred to (in this thesis and elsewhere) simply as "the Dirichlet".

⁹ Ehrenberg and Uncles (1997) report the range of conditions under which Dirichlet-type patterns have been found to occur. These include 30 food and drink products (including private labels), 20 personal care products, OTC medicines, gasoline, motor cars, store chains, and TV programs. These examples come from different countries and different years from 1950 to 1996.

My aim in this research is to extend and critically probe the application of the Dirichlet, rather than developing new theory in the area of brand loyalty. For instance, if we take one measure of brand loyalty, repeat purchase, it has been demonstrated that the Dirichlet model generally provides an extremely good prediction of the percentage of consumers who repeat purchase from one period to the next (Uncles *et al.* 1994; Ehrenberg and Uncles 1997). For example, of those buyers who purchase Persil, the leading brand of UK laundry detergent, at least once during a 13-week period, 69% of them will purchase Persil again in the next 13-week period; the model predicts that the Persil repeat-purchase rate, based on a market share of 27%, should be 71% (a close fit).

However, there is also limited evidence (Ehrenberg 1972/1988) that, over longer periods of time (e.g. predicting from period 1 to period 4), the model fit for repeat purchase is not so close. But there have been no studies which document the extent of this deviation and whether it is systematic. In this thesis, I investigate the erosion of brand loyalty over the medium- to- long-term, with the aim of establishing if repeat-purchase erosion is a general phenomenon, displaying systematic deviations from Dirichlet predictions. This empirical study is detailed in Chapter 5.

Another extension is to consider how loyalty is displayed to the different brands in a multibrand buying situation. Sole brand loyalty (loyalty to one brand only in a product category) over a reasonable time period (a year or so) is uncommon in the area of frequently purchased grocery products; consumers usually have a repertoire or portfolio of around three brands which they buy regularly (Collins 1971; Ehrenberg 1972/1988). But, as established by Cunningham (1956, 1961), consumers typically have consistent preferences within this portfolio, i.e. a most preferred or 'favourite' brand, a second favourite, etc.

22

The empirical work of Ehrenberg and his co-workers, has not covered favourite brands; the Dirichlet has no explicit formula to predict what percentage of a consumer's portfolio goes to their favourite brand. One of the questions I consider in this thesis is how loyalty is manifest to the favourite brand and to the lesser brands in a consumer's portfolio, and whether loyalty to favourite brands is predictable (i.e. can be related in a systematic way to variables which are in turn predicted by the Dirichlet). This study is described in Chapter 6.

Such research involves the development of new measures of loyalty, relating these new measures to existing ones and to market share, and, in the case of the favourite brands measure, devising a method of generating Dirichlet predictions (using simulated data) in order to test the predictability and generalisability of the results.

1.6 Focus of the Thesis

This thesis concentrates on loyalty to *brands*, specifically in the field of frequentlybought goods, such as grocery products. The research is relevant to other areas of consumer purchasing behaviour: the study of store loyalty; the long-term effect of consumer promotions; the measurement of brand segmentation; and the evaluation of line extensions (i.e. using an existing brand name for a new product or product line). Related research by the author in these areas will be discussed in Chapter 8. The wider implications of this research and how it relates to contemporary consumer behaviour studies are assessed in Chapter 9.

1.6.1 Types of Product Studied

I am concerned with categories of products which are bought regularly by most of the population, for example, products such as detergent, toothpaste or coffee. The empirical analyses are conducted mainly on data for these types of products from four countries; the UK, USA, Germany and Japan. The data come from commercial long-running consumer panels, where consumers record every purchase in many categories,

23

sometimes over many years.¹⁰ This enables loyalty to be studied over different time periods, up to three years in some cases.

1.6.2 Loyalty in Stationary Markets

In this thesis I do not directly assess the effectiveness of loyalty schemes (in the sense of comparing before and after results), nor do I directly examine other marketing mix factors which cause (or are expected to cause) dynamic changes to the market. Rather I examine the way competing brands are purchased in defined, mature and near steady-state or 'stationary' markets (which applies to most grocery markets, most of the time). A stationary market is defined as one in which (over the time period being analysed, typically a year) the total market size is more-or-less constant, with the market shares of competing brands varying by only small amounts, with little or no systematic sales trend for individual brands. Figures 1 and 2 illustrate stationarity.

Figure 1. UK Laundry Detergent: Weekly Sales of Leading Four Brands 4,600 households on panel, 1989, data from TN AGB consumer panel



¹⁰ The purchasing data for individual consumers can be collected either electronically at the point of sale, or from consumer-completed weekly diaries. The different methods employed for the data used in this research are described in more detail in Chapter 4.

Figure 1 shows weekly sales data from the TN AGB consumer panel for the leading four brands in the UK laundry detergent market in 1989. As we see from Figure 1, weekly sales for individual brands fluctuate considerably. However, these fluctuations are most likely caused by short-term promotions which boost the shares of one brand at the expense of another. Total sales for the four brands vary much less (except over the Christmas, Easter and August bank holiday periods, where there is a general dip in detergent sales). Such short-term fluctuations average out over the longer term, so that Persil's share of the UK detergent market for each quarter (13-week period) in 1989 is: 28%, 28%, 27%, 24% (see Figure 2), giving it an average annual market share of 27%. As we see from Figure 2, over the year as a whole, the market is near-stationary with perhaps small systematic trends for individual brands (Persil lost almost 4 percentage share points during 1989, other smaller brands - store brands and Radion, a new entrant - not detailed here, gained share).

Figure 2. UK Laundry Detergent: Quarterly Market Shares of Leading Four Brands 4,600 households on panel, 1989, data from TN AGB consumer panel



The Dirichlet model predicts brand choice when the market is near-stationary, unsegmented and non-partitioned. The model does not imply or predict that the market will be stationary, unsegmented, or non-partitioned, but in most frequentlypurchased markets, the steady-state situation is by far the most common. A comprehensive understanding of stationary markets enables us to establish benchmarks which can then be used to interpret non-stationary or dynamic situations. In Chapter 8, I briefly consider how the Dirichlet model and my findings relate to dynamic situations (e.g. price promotions and new market entrants), and to partitioned and segmented markets.

1.6.3 The Main Aims of The Thesis

The main aims are to:

- 1. Discuss the various concepts and measures of brand loyalty with a focus on,
 - a) consumer behaviour,
 - b) generalisable, empirical research findings and the theory, the NBD-Dirichlet model, which supports and describes them.
- 2. Identify gaps in our existing knowledge about how brand loyalty operates, for instance,
 - a) whether (and how) purchase of an individual brand erodes over time,
 - b) how loyalty is manifest to the most frequently-bought (favourite or primary) and lesser-preferred or secondary brands,
 - c) the links between different behavioural measures.
- 3. From 2. and based on previous evidence and theory, as shown in 1., draw up broad propositions or hypotheses and research questions.
- 4. Test these propositions through a series of empirical analyses.
- 5. Relate the results to previous academic work in the area of brand loyalty and discuss the managerial implications of the findings, with particular reference to promotions, brand segmentation, and loyalty schemes.

1.7 Structure of the Thesis

The thesis is organised as shown in Figure 3. In Chapter 2, the different concepts of brand loyalty and their related measures are discussed. I focus on a descriptive and predictive model of purchase incidence and brand choice in competitive markets, the NBD-Dirichlet model. The structure of the NBD-Dirichlet model is described. Other conceptual approaches to the study of brand loyalty are discussed in terms of the differences in their assumptions and input/output measures compared to the Dirichlet. Unresolved questions concerning our knowledge about brand loyalty are discussed.

In Chapter 3, I present my research approach. A number of research questions relating to the unresolved areas of brand loyalty, identified in Chapter 2, are raised. Research objectives and broad hypotheses are suggested. In Chapter 4, I detail my research methodology, the data collection and manipulation problems, and briefly outline three empirical studies that I have conducted which are aimed at answering the research questions raised in Chapter 3. The main thrust of the thesis is empirical and, in Chapters 5 to 7, I detail findings from these three empirical studies. In Chapter 8 other related studies by the author in the areas of store loyalty, brand segmentation, price promotions, line extensions and behavioural versus attitudinal loyalty are described. In Chapter 9 I discuss the implications of the main findings for both managers and marketing researchers. The limitations of this work and suggestions for further research are also discussed.

Appendix 1 describes the Dirichlet model. A full bibliography of all previous published work referred to in this thesis is provided in the Reference Section.

Figure 3. Organisation of the Thesis

Theoretical Background to the Thesis

Chapter 2: Concepts and Measures; common patterns of buyer behaviour; The NBD-Dirichlet model; differences between the Dirichlet and other approaches to brand loyalty; limitations to the Dirichlet.

Research Approach

Chapter 3: Research Aims, Approach and Objectives

Chapter 4: Data and Research Methodology; data requirements; data acquisition; factors affecting the measurement process; simulated data.

Three Empirical Studies

- Chapter 5: Loyalty to a Single Brand Over Time; repeat-buying erosion.
- Chapter 6: The Importance of the Favourite Brand; revealed brand preference for the favourite brand; heavy category buyers; heavy brands buyers.
- Chapter 7: Revealed Brand Preference and Customer Retention; the relationship between two loyalty-related measures.

Related Patterns of Purchasing

Chapter 8: Related Patterns of Purchasing; store loyalty; the after-effects of price-related promotions; market segmentation for competitive brands; line extensions; attitudes and behaviour.

Implications for Managers and Marketing Researchers

Chapter 9: Implications; different purchase paradigms; substantive findings; directions for future research.

<u>Appendix 1</u> The Dirichlet Model

References

2. CONCEPTS AND MEAURES OF BRAND LOYALTY

Summary

In this Chapter, I focus on brand loyalty as an ongoing propensity to purchase the brand. The theoretical basis for this view is the NBD-Dirichlet model of choice in competitive situations. Common patterns of buying behaviour and a number of different brand loyalty measures are described. The assumptions underlying the Dirichlet model and the empirical evidence which support its predictive ability are discussed.

I compare the Dirichlet with other approaches to brand loyalty in terms of differences in (i) the conceptual focus, (ii) underlying assumptions, (iii) input and output measures, (iv) empirical evidence.

Limitations to the Dirichlet and systematic deviations from the model predictions are discussed.

2.1 Common Patterns of Buyer Behaviour in Competitive Markets

Divided Loyalty

The empirical evidence has shown that, where customers buy a product frequently and have choice in the brands they can buy, they tend (over several purchases of the product) to show divided loyalty or to be multibrand loyal (Brown 1953; Cunningham 1956; Ehrenberg 1959; Ehrenberg and Goodhardt 1970; Collins 1971; Ehrenberg 1972/1988; Uncles, Hammond, Ehrenberg and Davis 1994; Ehrenberg and Uncles 1997). This means that for each product a consumer generally has a small portfolio of brands, perhaps one of which is bought more often than the others. This pattern and other aspects of brand loyalty are revealed by studying brand performance measures, e.g. how many buyers a brand has, how often they buy the brand, how often they buy other brands, etc.¹¹

Different Measures Reveal Similar Patterns

A second regular pattern is that different measures of brand performance tend to reveal the same brand loyalty patterns. This applies not only to measures based on the same concept but to measures based on different concepts or techniques (e.g. revealed purchasing behaviour, purchase intentions or consumer attitudes all show similar loyalty patterns). For example, Uncles *et al.* (1994) calculated average purchase frequency and share of category requirements (a measure of split or divided loyalty) for over 300 brands across 34 US grocery product categories. They found that both measures gave results which showed that competitive brands generally showed similar levels of brand loyalty;¹² smaller brands had somewhat lower values than larger

¹¹ Such brand performance measures and the stability of the patterns they reveal have been known by market research companies and some manufacturers and retailers for as long as panel data have been available, however, apart from the research referenced in this paragraph, few academic authors discuss the implications that such regular patterns might have for research into brand loyalty. ¹² Share of category requirements has average purchase frequency as one of its inputs (see Section

2.1.2), so we would expect these two measures to be closely correlated.

brands; both measures were well-predicted by the NBD-Dirichlet model - which we come back to in Section 2.2.

Castleberry *et al.* (1994) and Dall'Olmo Riley *et al.* (1997) investigated consumer *attitudes* over time to brands of US and UK groceries, and also to US fast food chains and television news programmes. They also found that attitudinal loyalty for directly competitive brands was very similar, with smaller brands having somewhat lower values.

The Effect of Market Share

The third pattern, foreshadowed by the two above, is that most measures relate to market share - large share brands score higher on almost all brand loyalty measures than small share brands - this is well demonstrated in the studies by Ehrenberg (1972/1988); Castleberry *et al.* (1994); Ehrenberg, Goodhardt and Barwise (1990); Ehrenberg, Uncles and Hammond (1995); and Dall'Olmo Riley *et al.* (1997).

This market share effect was termed "Double Jeopardy" by McPhee (1963) who noted that less popular items suffered in two ways; they are known or consumed by fewer people and those who do know them like them less.¹³ McPhee demonstrated that theoretically double jeopardy or "DJ" is a statistical selection effect that occurs whenever competitive items (of assumed equal merit) differ in their popularity (e.g. in terms of their patronage or market shares).

As Dall'Olmo Riley *et al.* (1997) notes, it is not that brands with a lower degree of "liking" have less loyal or committed customers, but the fewer users of the small brand are likely to also be users of the larger brand. Ehrenberg, Goodhardt and Barwise (1990) showed that in behavioural terms the DJ effect means that, in

¹³ McPhee (1963) studied the popularity of competitive items such as different comic strips and radio presenters. An early researcher who looked at the application of Double Jeopardy to Marketing was Martin (1973), however he did not relate the observed effect to market share or to theory (as the Dirichlet does).

comparison with higher share brands, lower share brands are bought less frequently by their fewer buyers. As described in Section 2.2.2. the DJ trend is well predicted by the Dirichlet model.

We now illustrate these common patterns of buyer behaviour with reference to one product category - UK laundry detergent. Section 2.1.1 describes loyalty measures for *individual* brands. In section 2.1.2 we consider loyalty patterns for measures which look at consumer purchasing in a *portfolio* (divided loyalty) situation. Examples of common consumer purchasing patterns relating to revealed purchasing behaviour, the main focus of this thesis, are given in Tables 2 and 3 below¹⁴. Comparisons between empirical findings and Dirichlet predictions are shown in Tables 5 and 6.

2.1.1 Single-Brand Purchasing

In Table 2, a range of brand performance measures is given for one of the datasets analysed extensively in this thesis - UK laundry detergent. These measures all relate to the purchasing of a single brand over time.

The brand performance measures in Table 2 are shown as columns, with each row representing the results for the different brands in this market. The first column details seven of the leading brands in the market. Sainsbury detergent is included here; it has a 3% market share, despite being available only in Sainsbury stores. Brand performance measures for store brands are generally very similar to those for manufacturer brands, but there are some small systematic sub-patterns (e.g. the limited retail distribution means that store brands have lower penetration rates and hence marginally higher buying frequencies than predicted (Ellis and Uncles 1991)). There is a long 'tail' of very small brands, these have been aggregated and appear as 'Other'. The next column gives the market share for each brand. These shares sum

¹⁴ Similar patterns also appear extensively throughout the empirical Chapters (Chapters 5 to 7) of the thesis.

to 100%, and the rows of the Table are organised so that the market leader, Persil, with a share of 27%, is shown in the first brand row, the next largest brand in the next row, etc. The first row of data gives findings for any brand bought (and so represents average category purchasing).

	%share	% buying		av N. purchases		% buying r times a year			qtly repeat rates**	
		4 weeks*	year	4-weeks*	year	r=l	r=2-4	r=5+	% repeat	av. purch
Any brand	100	56	90	1.8	14.4	6	14	80	91	4.4
Persil	27	18	52	2.8	6.8	25	31	45	69	3.3
Ariel	20	13	43	2.7	6.0	28	32	39	67	3.2
Daz	11	8	29	2.5	5.0	34	32	34	58	3.0
Bold	9	6	24	2.4	4.6	39	34	28	58	3.1
Surf	7	5	23	2.3	4.0	43	31	26	51	3.0
Wisk	4	3	13	2.3	4.5	36	32	32	53	2.7
Sainsbury	3	2	9	2.3	4.5	37	35	29	57	2.6
Other	19	13	48	2.4	5.1	_ 30	36	34	65	3.0
Av. Brand	13	9	30	2.5	5.1	34	33	33	60	3.0

 Table 2. Single Brand Purchasing: UK Laundry Detergent

 (1989, 52 weeks, 4,600 panellists)

Source: calculated from raw data provided by Taylor Nelson AGB.

* average of 13 4-week periods,** average of 3 quarterly periods (Q1 to Q2, Q2 to Q3, Q3 to Q4).

The next four column headings are for four single-brand performance measures. The first of these is the percentage of households in the sample who bought each brand during the time period(s) under analysis (in Table 2 this measure is given for the average 4 week period and for a year).¹⁵ The next column gives the number of purchases made by the average buyer of the brand (again for both an average 4-week period and for a year). The third brand performance measure is the percentage of the population buying r times in a year, where r=1 (very light buyers), r=2-4 (medium buyers), r=5+ (heavy buyers). The final measure is the quarter-by-quarter repeat-

¹⁵ Conceptually, findings for one week are important as they capture buying patterns when all households buying make just one purchase of the product. This is because shopping is mostly done on a once-a-week-basis and most grocery items are bought in quantities of one (in some cases more than 1 purchase of a product is made on each shopping occasion, e.g. cat food or perhaps potato crisps or other snacks, but these are known and rare exceptions). Therefore in one week the result for the average number of purchases measure simplifies to 1 and the findings for all measures are essentially driven by the penetration or percentage buying.

buying rate (the percentage of buyers of the brand in one quarter who continue to buy this brand in the following quarter). As the data here are for 52 weeks, this quarterly repeat buying rate is the average of three rates (quarter 1 to quarter 2, quarter 2 to quarter 3, and quarter 3 to quarter 4).

From Table 2 we see that:

- The Percentage Buying. The percentage of the population buying any brand of detergent in an average four-week period is 56%, this rises to 90% in a year. The percentage of the population buying a particular brand (the brand penetration) is much lower and varies considerably across brands. The percentage of the population buying Persil (the market leader) in an average 4-week period is 18%, this falls to 3% for Wisk, the smallest manufacturer brand here. In the same way as for the purchase of any brand of detergent, the percentage of people buying individual brands is much greater in a year than it is for four weeks. In a year the penetration of Persil rises to 52% of the population, while the penetration of Wisk increases to 13%. This variation in the percentage of the population buying a particular brand is related to the market share of that brand. The correlation between the annual brand penetration and market share of a brand in Table 2 is extremely high (r=0.98).
- 2. Average Number of Purchases. The average number of purchases made in a 4-week period is very similar for each brand. As is the average number of purchases made in a year. On average, consumers make 2.5 purchases in four weeks and 5.1 purchases in a year, of each brand they buy. There is a slight downward trend with market share, so Persil buyers make 6.8 purchases of Persil in a year, whereas Wisk buyers make 4.5 purchases of Wisk in a year. As discussed above this downward trend in purchase frequencies is known as 'Double Jeopardy'. The Double Jeopardy phenomenon or 'law' is that smaller brands not only have fewer buyers, but those who do buy them do so slightly less often than buyers of larger brands (McPhee 1963; Ehrenberg, Goodhardt and Barwise 1990)

- Percentage Buying r Times in a Year. Most customers of a brand buy it very infrequently. On average, 34% of brand buyers buy that brand only once in a year.
 33% buy between 2 and 4 times, and, on average, 33% of brand buyers buy the brand 5 or more times in a year. This is for a category where the average frequency of buying any brand is 14.4 times a year.
- 4. Quarterly Repeat Rate. On average, 60% of those buying a brand in one quarter buy it again in the next. Again there is a small Double Jeopardy trend with market share, so for Persil the quarterly repeat rate is 69%, for Wisk it is 53%. The repeat rate tends to be as low as 60% because, as we have already noted, as many as 34% of average brand buyers buy the brand only once in a year (and so cannot buy it every quarter).
- 5. Exceptions From the Overall Pattern. Although all the buyer performance measures in Table 2 show a trend with market share, there are some discrepancies for individual brands. The annual purchase frequency for Surf, at 4.0, is much lower than that for Wisk and Sainsbury detergent, which are smaller brands. Surf has an excess of once-only buyers, a deficit of heavy (r=5+ in a year) buyers, and, at 51%, a lower repeat-buying rate than any of its competitors. We continue to track Surf through other measures, to further determine the nature, and perhaps cause, of its low level of loyalty.

2.1.2 Multi-Brand Purchasing

What is the evidence which suggests that most customers are multibrand loyal? In Table 3, we look at measures of loyalty which show the effects of multibrand buying. Again the category is UK laundry detergent, with the same brands detailed as in Table 2. The first measure concerns the percentage of a brand's customers who are exclusively or 100% loyal to that brand in a year, plus their average purchase frequency. The second measure, share of category requirements (SCR), tells us the percentage of customers' detergent requirements accounted for by each brand. SCR is calculated as the mean rate of purchase of the brand divided by the mean rate of purchase of the category for brand buyers.¹⁶ The final measure shows the percentage of brand buyers who also buy other brands (duplication of purchase between brands).

From Table 3 we see that:

 100% Loyal Buyers. Few customers of a brand are exclusively (100%) loyal to that one brand in a year. Those who are tend to be light buyers of the product. For instance, 18% of Persil buyers and 4% of Wisk buyers are 100% loyal in a year. The average rate of buying any brand of laundry detergent is 14.4 times in a year, however customers who buy one brand exclusively on average buy that brand (and hence the category) only half as often (6.9 times). Customers who buy Persil exclusively buy it at a higher annual rate (9.1 times) than buyers who purchase Wisk exclusively (6.3 times).¹⁷ Again Surf appears to have a different pattern of purchase than other brands - the average annual purchase rate for buyers who bought Surf exclusively is particularly low at 3.5 times a year.

¹⁶ SCR can also be calculated at the individual household level (and then is often weighted by purchase quantity). However, many researchers calculate individual SCR based on a limited number of category purchases (rather than over a specified time period) (e.g. Lattin and Bucklin 1989; Krishnamurthi and Raj 1991; Deighton, Henderson and Neslin 1994). Also this individual SCR approach ignores the relationship between mean rates of purchase of the brand, penetration of the brand, and other loyalty measures which depend on a time dimension.

¹⁷ This higher purchase frequency for 100% loyal buyers of higher share brands is not (in the mathematical sense) a DJ effect, i.e. it cannot be inferred from the Dirichlet. This pattern is particularly obvious for UK detergent, however it has not generally been documented. It is similar in effect to what Fader and Schmittlein (1993) termed "Triple Jeopardy" - unusually high behavioural loyalty for high-share brands.
	100% log	al buyers	SCR	% ann. brand buyers who also bought other brands										
	% brand	av. purch	%	Persil	Ariel	Daz	Bold	Surf	Wisk	Sainsb'y				
	buyers	freq.								-				
Any brand	100	14.4	100											
Persil	18	9.1	41	-	47	32	27	27	15	9				
Ariel	111	8.6	34	57	-	39	32	30	17	9				
Daz	7	6.5	27	57	57	-	36	41	19	9				
Bold	10	8.7	25	57	57	42	-	33	18	8				
Surf	5	3.5	21	59	54	50	34	-	19	10				
Wisk	4	6.3	24	61	57	43	34	35	-	12				
Sainsbury	6	6.0	27	52	46	29	22	27	18	-				
Other brands	8	6.1	30	59	49	37	29	33	18	13				
Av. brand	9	6.9	29	57	52	39	30	32	18	10				

 Table 3. Multibrand Purchasing: UK Laundry Detergent

 (1989, 52 weeks, 4,600 panellists)

Source: raw data provided by TN AGB

- Share of Category Requirements. The share of category requirements satisfied by a brand (SCR) is, on average, only 29%. Therefore customers of any particular brand buy other brands in total more than they buy the brand itself. SCR varies from 41% for Persil down to 21% for Surf. This average SCR measure of about 30%, also tells us that, on average, customers of laundry detergent have about three brands in their portfolio.
- 2. Duplication of Purchase. Given that most customers of a brand buy other brands as well, which other brands they buy is (in aggregate) related to the market share of the other brands. For example, from the final section of Table 3, we see that Persil is bought, on average, by 57% of buyers of the other brands. Wisk is bought, on average, by only 18% of buyers of other brands. The figures in each column are however, again very similar. This shows that buyers of one particular brand are rarely more or less likely than average to buy a particular other brand, i.e. for this market there is little market partitioning.
- 3. *Exceptions From the Overall Pattern*. There are some slight but noticeable deviations. Again Surf is an outlier with a very low average purchase frequency for sole buyers (3.5) and a much lower than average SCR score (21%). If we look

37

at duplication of purchase, Surf buyers are more likely than other brand buyers to buy Daz and vice versa; Wisk buyers are more likely than average to buy Persil (but Persil buyers are no more likely than average to buy Wisk).

We can speculate briefly here on possible reasons for these deviations. According to every measure, Surf has the lowest "loyalty" (i.e. re-purchase rate) of all UK detergent brands detailed here. One reason could be that Surf, as a small brand, is not always available. But then we would expect Wisk to suffer in a similar manner. Surf is priced lower than average; perhaps when other (normally premium-priced brands) are promoted Surf suffers by comparison. Both Daz and Surf are sold as low-priced detergents, this could account for the higher than average purchase duplication between the two brands. Wisk is a new liquid detergent formulation developed by the makers of Persil (Unilever). Perhaps the higher than average rate of buying Persil by Wisk buyers is because Unilever may have been leveraging its Persil consumer base (through coupons or other forms of cross advertising) to try Wisk.

One important point to note is that these deviations are only noticeable because the overall background patterns show systematic trends and regularities with market share. The brand performance patterns shown in Tables 2 and 3 are called 'Dirichlet-type' because they are closely predictable from the NBD-Dirichlet model. Such patterns have been found for a large number of different packaged goods products and also for a range of other products and services, under varying conditions (Ehrenberg and Uncles 1997). A list of known Dirichlet-type markets is shown in Table 4.

Ehrenberg and Uncles (1997, Table A4) summarise such patterns across twelve typical markets. They find that:

Table 4. Conditions Under Which Dirichlet-Type Markets Have Been Found
50 food, drink, personal care and household cleaning products
OTC medicines, pharmaceutical prescriptions
Motor cars, gasolene, aviation fuel
Large and small brands, private labels, different price bands
Different pack sizes, flavours, and other product sub-types
Store chains, individual stores, shopping trips, and brands within store chains
Television programme viewing and channel viewing
For Britain, USA, Japan, Germany, from 1950-1996
Near steady-state markets, and more dynamic markets
Household and individual purchases
Consumer attitudes

Adapted from Ehrenberg and Uncles (1997), Table 2

- Of the buyers of a typical brand in a year, almost all (around 88%) are multibrand buyers, i.e. on average only 12% buy one brand only (the average solebrand figure for UK detergent in Table 3 is even less than this - 9%).
- For the average buyer of a brand, that brand accounts for around 25% of a buyer's annual category requirements (average SCR = 29% in Table 3).
- Behavioural measures of brand loyalty are well-correlated (e.g. from Tables 2 and 3, for repeat-buying and share of category requirements measures, r=0.93).
- 4) Smaller brands not only have fewer buyers than larger brands, but buyers of smaller brands buy the brand slightly less often than do buyers of bigger brands, the 'Double-Jeopardy' effect).
- 5) Similar-sized brands show much the same level of loyalty (Daz and Bold, with market shares of 11% and 9% respectively, both have repeat-buying rates of 58% and SCR values of 27% and 25% respectively).
- 6) The Double-Jeopardy effect means that smaller brands 'enjoy' less loyalty than larger ones (Persil, the market leader with a share of 18%, has a repeat-buying

rate of 69% and a SCR value of 41%, the corresponding figures for Wisk, less than a one-sixth of Persil's size, are 53% and 24%).

7) Although individual buyers may be light or heavy category buyers, and might be 100% loyal to one brand or buy a different brand on each shopping occasion, most markets studied have been shown to be unsegmented and unpartitioned. (Hammond, Ehrenberg and Goodhardt 1996).¹⁸

A further important point to note is that major exceptions from the general patterns are uncommon. It is not the case that a potential explanation for deviations from the norm is that "there are always exceptions in any market - it depends on individual brand advertising/promotions, etc". The more interesting observation is that observations are routinely predictable. These regularities are even more noticeable when compared with model predictions.

In Section 2.2 below I introduce the Dirichlet model and review how the brand performance measures introduced in this Section are predicted by the Dirichlet. In Section 2.3 the assumptions which underlie the Dirichlet approach to brand loyalty are compared with other marketing approaches. In Section 2.4 I discuss deviations from the Dirichlet and the scope for further empirical research.

¹⁸ This study, referred to in more detail in Chapter 8, finds that, across over 20 markets, there is little or no segmentation; the consumer profiles of competing brands are very similar.

2.2 A Theoretical Model of Brand Choice: The NBD-Dirichlet

Andrew Ehrenberg and his co-workers have developed a series of theories represented by stochastic models which describe, explain and predict consumer buying behaviour in competitive (i.e. where there is choice), and reasonably frequentlypurchased markets, under certain conditions. The earliest model was the NBD/LSD theory of repeat-buying (Ehrenberg 1959, 1968, 1972; Chatfield, Ehrenberg and Goodhardt 1966; Chatfield and Goodhardt 1975) which defined common market structures by analysing purchasing behaviour on a brand-by-brand basis. The Dirichlet model extends this theory to cover multibrand buying and was developed in tandem with the discovery and documentation of regular empirical patterns of buying behaviour across increasingly diverse markets (Goodhardt and Ehrenberg 1967; Chatfield and Goodhardt 1975; Ehrenberg 1972/1988; Bass, Jeuland and Wright 1976; Goodhardt, Ehrenberg and Chatfield 1984).

The Dirichlet model specifies probabilistically how many purchases a consumer makes in a particular time period and which brand they buy on each purchase occasion. As Ehrenberg, Goodhardt and Barwise (1990) noted, the Dirichlet reflects that:

"when a purchase is made and which brand is chosen generally appear very irregular and can be thought of as occurring 'as if at random' with specified probabilities, even though individual consumers have their varying and probably deterministic reasons for doing what they do." Ehrenberg, Goodhardt and Barwise (1990, p. 86).

By extension, the Dirichlet demonstrates that the concept of brand loyalty can best be thought of as the propensity, by consumers, to (re) purchase.

The conditions under which the Dirichlet theory strictly applies are when the market is: near-stationary, unsegmented and non-partitioned. These terms are briefly described below. In practice, as Ehrenberg and Uncles (1997) show, Dirichlet predictions can be very close to observed values even when these conditions are relaxed.¹⁹

2.2.1 Conditions Under Which the NBD-Dirichlet Model Applies

Stationary Markets

A stationary or near-stationary market is one where there is an absence, in the medium term,²⁰ of marked fluctuations or trends in the aggregate sales of the brands being analysed. However, at the individual level, even in stationary markets, consumers can (and do) show considerable variety in their choice of brands and in their incidence and weight of purchase. In the short term, marketing inputs, such as price and advertising, may vary dramatically, but as long as the overall sales or penetration change over the medium term by no more than a small amount (e.g. 2 or 3 percent) the model has been shown to provide a close fit with observed data. Most competitive markets, especially frequently bought ones, can be thought of as near-stationary in the medium term. Seasonal markets are systematically non-stationary in the medium term, but generally stationary on a year-by-year basis.

Unsegmented Markets

An unsegmented market means that the buyers of each brand cannot be differentiated according to any external criteria, e.g. the same proportion of young or old, rich or poor, light or heavy buyers, etc., will purchase each brand. An empirical investigation

¹⁹ When we say here (and elsewhere in this and other chapters) that Dirichlet predictions are generally very close to observed values, or that the model is a good fit, we are implying no systematic bias in the predictions and between-brands correlations for predicted and observed individual brand loyalty measures within a category of r = 0.7 to 0.9. Uncles et al. (1994) quote correlations, averaged across 34 product categories, of r= 0.77 for a measure of the number of purchases per buyer, and r = 0.76 for a share of category requirements measure. Ehrenberg and Uncles (1997), quote correlations across a number of measures of r= 0.9.

²⁰ For the purchases of grocery products, we can think of the short term as one to four weeks, the medium term as more than four weeks to a year, and the long term as more than a year, though such a classification depends partly on purchase frequency and purchase cycle.

Chapter 2

by Hammond, Ehrenberg and Goodhardt (1996) of market segmentation for competing brands is described in Chapter 8. One finding from this study is that there is a segmented market for ready-to-eat breakfast cereal - if you have children in the family you are more than twice as likely to buy brands of cereals which are aimed (in their advertising and packaging) at children. But this example stands out because such brand segmentation is relatively uncommon. Segmented markets are very rarely found for similar and directly competing brands

Non-partitioned Markets

A non-partitioned market is one in which all brands compete with each other. Almost all brands in the UK detergent market in 1985 were of a packeted powder formulation, and the market was essentially non-partitioned. By 1989, it could be partitioned into brands which were liquid in formulation and brands which were powdered. This is a weak form of market partitioning, since both liquid and powdered brands could still be used for the same purpose in the same washing machines, all brands still competed to a large extent with each other, and we could (and have) still used the Dirichlet model to describe this market.

A more partitioned market is that for leaded and unleaded petrol - cars usually use (and their drivers usually buy) either one type of petrol or the other. Also, ground and instant coffee are sub-markets of the coffee market, the two different types of coffee tend to be used either by somewhat different groups of buyers, or under different usage situations, and would usually be modelled separately.

All the above conditions can be relaxed with varying implications for model fit. The fit of the Dirichlet is now described for one market - UK laundry detergent. In assessing the fit of the Dirichlet, we should bear in mind that the aim here is not to produce a "specifically best fit" (i.e. a model which gives the closest statistical fit to a specific set of data), but to have confidence that the model is a "generally good fit" across a wide range of situations (i.e. it provides a benchmark or norm).

2.2.2 Single Brand Purchasing and Dirichlet Predictions

In Table 5, the results from Table 2 on single brand purchasing are compared with Dirichlet model predictions for the same measures. These predictions (the model output, denoted T for theoretical values), are derived from just the bracketed () inputs. The inputs are the percentage of the population who buy at least once in a given time period (penetration) and frequency of purchase for all named brands, plus the percentage buying and the average purchase frequency for the category.²¹ The model input data must apply to a specific time period; in Tables 5 and 6 the data are for a year. The predictions can be for time periods of different length.

	%share	% buying				av N. purchases				% bı	uying	qtly repeat rates					
		4 weeks		year		4-weeks		year		r=1		r=5+		% repeat		av. purch	
		0	Т	0	Τ	0	Т	0	Т	0	Т	0	T	0	Т	0	Т
Any brand	100	56	48	(90)	90	1.8	2.1	(14.4)	14.4	6	8	80	72	91	87	4.4	4.5
Persil	27	18	17	(52)	55	1.5	1.5	(6.8)	6.3	25	25	45	41	69	71	3.3	3.3
Ariel	20	13	13	(43)	45	1.5	1.5	(6.0)	5.7	28	29	39	37	67	69	3.2	3.3
Daz	11	8	8	(29)	29	1.4	1.4	(5.0)	4.9	34	34	34	32	58	65	3.0	3.0
Bold	9	6	6	(24)	24	1.4	1.4	(4.6)	4.7	39	35	28	30	58	65	3.1	3.0
Surf	7	5	5	(23)	20	1.4	1.4	(4.0)	4.6	43	36	26	29	51	63	3.0	2.8
Wisk	4	3	3	(13)	13	1.4	1.4	(4.5)	4.4	36	38	32	28	53	62	2.7	2.9
Sainsbury	3	2	2	(9)	9	1.4	1.4	(4.5)	4.3	37	3 9	29	27	57	62	2.6	2.8
Other	19	13	13	48	44	1.4	1.5	5.1	5.6	30	30	34	36	65	67	3.0	3.0
Av. Brand	13	9	9	30	30	1.4	1.4	5.1	5.1	34	33	33	32	60	65	3.0	3.0

 Table 5. Single Brand Purchasing: NBD-Dirichlet Predictions

 (UK laundry detergent, 1989, annual data, 4,600 panellists)

Source: calculated from raw data supplied by TN AGB

O=observed values, T=theoretical values derived from the model

From Table 5, we see that the model predictions are close to the observed values for almost all measures. The closeness of the fit of the model can be gauged from the average brand row in Table 5. The only systematic deviations occur for the percentage repeat-buying, where the model consistently over-predicts by several percentage points the actual figures for all brands (on average, 60% observed versus

²¹ The predictions for the quarter-to-quarter repeat-buying rates (Table 5, last group of columns) are based on the NBD model, which uses the observed values for the penetration and purchase frequency of each brand as inputs. The NBD provides a slightly better fit for repeat-buying than the Dirichlet, which uses the predicted values of each brand's purchase frequency as inputs.

65% predicted). The correlations for the observed versus predicted values for each measure are: annual percentage buying (r=0.99); average number of purchases bought (r=0.92); percentage of brand buyers making one purchase of the brand in a year (r=0.85); percentage making 5+ purchases in a year (r=0.90); quarterly repeat-rate (r=0.93); average purchase frequency of repeat-buyers (r=0.81).

Two points of note are, first, that the model fit is close not only for all manufacturer brands, but also for the Sainsbury brand of detergent. From previous research (Uncles and Ellis 1989), we might expect the model to over-predict the penetration of private label or store brands (because of their limited distribution), and correspondingly under-predict their purchase frequency. In this example, the Sainsbury detergent brand (perhaps because Sainsbury has such wide distribution) performs as expected for a brand with 3% of the market.

Secondly, the model fit is close for "Other brands". An important property of the Dirichlet is that any number of individual brands can be combined to form a "super brand", the model then predicts successfully for a brand with the aggregate market share of the superbrand. This additive property of the Dirichlet is expanded on in Appendix 1.

The only noticeable individual brand discrepancy again concerns Surf. The actual average number of purchases made in a year by Surf buyers (4.0), is somewhat lower than the predicted figure (4.6), and this discrepancy is carried through to the percentage buying figures, where there is an excess of buyers making one purchase in the year (43% versus 36% predicted). To a lesser extent the predictions for the quarterly repeat rate also suggest that Surf is atypical (51% actual, 63% predicted).²²

²² As mentioned above, all the quarterly repeat-rates here are lower than predicted.

2.2.3 Multibrand Purchasing and Dirichlet Predictions

We now look at the fit of the model for the multibrand buying performance measures introduced in Table 3. If we look first at the overall fit of the model as shown by the average brand row in Table 6, we see that the Dirichlet predictions are generally close. One major exception is the annual purchase frequency of 100% loyal buyers (6.9 observed versus 3.5 predicted). Similar deviations from the model (though not usually as large as this) have been observed in other product categories for this measure (Barnard *et al.* 1997; Ehrenberg and Uncles 1997). Interestingly, for this measure, the deviation for Surf is much smaller than average (3.5 observed versus 3.1 predicted). Overall, the correlations between predicted and observed values are once again very high.²³

	100	% lo g	yal buy	/ers_	SC	CR	% annual brand buyers who also bought other brands											
	% brand		av. purch		%		Persil		Bold		Surf		Wisk		Sainsbury			
	O	T	0	T	0	Т	0	Т	0	T	0	Т	0	T	0	Т		
Any brand	100	100	14.4	14.4	100	100								_				
Persil	18	10	9.1	4.4	41	37	-	-	27	26	27	22	15	15	9	10		
Ariel	11	8	8.6	3.9	34	32	57	61	32	26	30	23	17	15	9	10		
Daz	7	6	6.5	3.3	27	27	57	61	36	26	41	23	19	15	9	10		
Bold	10	6	8.7	3.2	25	25	57	61	-	-	33	23	18	15	8	10		
Surf	5	5	3.5	3.1	21	24	59	61	34	27	-	-	19	15	10	10		
Wisk	4	5	6.3	3.0	24	23	61	61	34	27	35	23	-	-	12	10		
Sainsbury	6	5	6.0	2.9	27	22	52	61	22	27	27	23	18	15	-	-		
Other brands	8	8	6.1	3.8	30	31	59	61	29	26	33	23	18	15	13	10		
Av. brand	9	7	6.9	3.5	29	28	57	61	30	26	32	23	18	15	10	10		

Table 6. Multibrand Purchasing: Dirichlet Predictions(UK laundry detergent, 1989, annual data, 4,600 panellists)

source: calculated from raw data supplied by TN AGB

O=observed values, T=theoretical values, derived from the model

²³ Correlations between observed and predicted results: for the percentage of 100% loyal buyers r=0.90; for the average purchase frequency of 100% loyal buyers, r=0.60 (the model is partly picking up the trend with market share here, described on page 17); SCR, r=0.92; for the percentage of annual brand buyers who also buy other brands (for all brands in Table 6), r=0.95.

However, if we look at individual brands we can see some important deviations from the model predictions. We noted in Table 3 that the average purchase frequency of 100% loyal buyers showed a clear trend with market share, from 9.1 for Persil down to 6.0 for Sainsbury (and only 3.5 for Surf). The predicted values for this measure are all lower than the observed values, but the model does appear to be picking up the trend (4.4 for Persil down to 2.9 for Sainsbury). This under-prediction of the frequency of average purchase rates by 100% loyal buyers is a consistent finding (see, for example, Ehrenberg and Uncles 1997).

For the share of category requirements measure, the model predictions are generally close, with the model successfully picking up the Double Jeopardy trend - 37% predicted for Persil (41% observed), falling to 23% for Wisk (24% observed).²⁴ If we look at the duplication of purchase of brand buyers (the percentage of annual brand buyers who also buy other brands), the model slightly over-predicts the percentage of other brand buyers who purchase Persil (on average 57% observed, 61% predicted), and under-predicts the percentage of other brand buyers who buy smaller brands. The model consistently under-predicts the percentages of other brand buyers who purchase Surf (on average 32% observed, 23% predicted).

Surf, as already noted appears 'different' from its competitors; it has a much lower annual purchase frequency (about half that of its rivals); accounts for a slightly lower share of its customers category requirements than its competitors; but appears to be bought by a greater percentage of other brand buyers than we would expect. Together with the lower than expected purchase frequency and repeat buying rate amongst brand buyers seen in Table 5, this tells us that the loyalty-related measures

²⁴ For the SCR measure, the Double Jeopardy effect is reinforced by the law of Natural Monopoly (McPhee 1963), which states that larger brands tend to have a greater share of the lighter category buyers, or as Goddard (1977) explains it - more popular brands are bought by people who buy the product class at a lower purchase frequency. This is a small effect (but captured by the Dirichlet) and affects the SCR measure by depressing the denominator (purchases of the category) for larger brands, while DJ increases the numerator (purchases of the brand) for larger brands.

for Surf give much lower results than we would expect for a brand of its size. If this is a unique finding - confined to this particular year, 1989 - it might be that the brand is failing, i.e. the seven percent of detergent buyers in 1989 who buy Surf, buy the brand less than they used to. Or it may be that these results are a 'one-off' perhaps due to non-availability of the brand, a bad publicity campaign, etc. Or it could be that these results are common for a lower-priced brand such as Surf and that Surf maintains its market share year after year despite these low loyalty findings. We can test these suggestions by looking at market share and loyalty figures for Surf for previous and following years.²⁵

Without the model as a benchmark, it wouldn't have been possible to determine that Surf had a lower than expected buying rate, or that all the other brands in this market were performing more-or-less as expected.

2.2.4 Implications of the General Fit of the Model

The NBD-Dirichlet model has been shown to provide a good general fit for all the markets detailed in Table 4. The Dirichlet confirms that the characteristics of a brand can be summarised by its penetration (the proportion of buyers in a particular time period who buy the brand) and buying frequency (how often these buyers purchase the brand). Once this information is known, a range of other brand performance indicators - such as the level of repeat-buying, percentage of 100% loyal buyers and other "loyalty" measures - are routinely predictable. The Dirichlet can also be used for taking brand shares and category buying rates in one period (e.g. a year), and from them predicting a whole range of loyalty measures for other periods of different length (e.g. 4 weeks, 13 weeks or 2 years).

²⁵ Over the four quarters for 1989 the market share for Surf fluctuated considerably from 5.3% in Q1 to 9.0% in Q3. Similar large fluctuations are seen in other years (1985 to 1988). Surf appears to have always had lower results for loyalty measures than we would expect for a brand of its (average) share. We can argue that occasionally Surf's (normally lower than 7%) share is boosted by one-off buyers, perhaps due to promotional activity. However I do not empirically test this.

The main implications of the finding that such a wide range of markets behave in a 'Dirichlet' manner are that:

- (a) If your purpose is to describe patterns of buyer behaviour and make aggregate level predictions, then a focus on the individual consumer is unnecessary.²⁶
- (b) Individual brands do not need to be "identified" in order to predict their repeatbuying and brand-switching properties, since these characteristics are predictable for any brand in any time period, simply from the brand's penetration and buying frequency. This means that we do not need to know the brand manufacturer, advertising spend, promotional strategy or a qualitative account of the brand's "popularity".
- (c) Brands with excessively high or low findings for loyalty-related measures (compared to what should be expected) can easily be identified. The behavioural cause of the low/high loyalty can also be determined, e.g. in the case of Surf the low level of loyalty was mainly due to a lower than average rate of brand buying (by those who bought the brand at least once in the reference period).
- (d) There are a number of more general model discrepancies. These are:
 - (i) the model tends to slightly under-predict the percentage of 100% loyal buyers and also under-predicts how much they buy (as seen in Table 6 and documented by Ehrenberg (1988) and Ehrenberg and Uncles (1997)),
 - (ii) the model tends to over-predict the percentage of repeat-buyers, especially over longer time periods (Fader and Schmittlein 1993; Barnard *et al.* 1997). The evidence from Table 5 lends some support to this and we investigate repeat-buying over longer time periods in Chapter 5.

²⁶ However the model takes account of the revealed behaviour of individual consumers in its distributional assumptions.



These general model discrepancies are discussed further in Section 2.4 and form the basis of further empirical research (Chapters 5 to 7).

2.2.5 Dirichlet Model Assumptions

The underlying assumptions of the Dirichlet model, and the mathematical proofs which support it, are described in more detail in Appendix 1. Below is a summary of the model's assumptions. There are five basic assumptions, the first two cover product category purchase and the next three cover brand choice:

(1) Purchasing of the Product Category over Time

For each consumer, the probability of buying the product category in any particular time period is described by a Poisson distribution; each purchase is independent of precisely when the previous purchase was made (a zero-order process), but a mean rate of buying can be specified. For example, for a household making 10 purchases of the product over a year, we assume that they have a steady probability or purchase propensity of nearly 0.2 a week (10 over 52 weeks).

(2) How Much is Purchased of the Product Category

Consumers can have very different rates of purchase (there will be light, medium and heavy buyers of the product). This heterogeneity can best be described by a Gammatype distribution. This is often a skew 'reverse-J-shaped' distribution with most consumers being very light buyers.

In combination, the Poisson and Gamma distributions give a Negative Binomial Distribution (NBD).

(3) Individual Brand Choice Over Time

For each consumer the propensities to buy different brands are independent of each other and remain steady over time; they follow a multinomial distribution. This implies that there is no systematic purchase feedback, i.e. successive brand choices are independent of which brand was previously bought (a zero-order process, again).

(4) Consumer Heterogeneity in Brand Choice

Consumers differ from each other in their brand choice probabilities, i.e. in which brands they buy and with what propensities. In aggregate, the buying of one brand is uncorrelated with the buying of other brands.²⁷ This results in a distribution of choice probabilities across consumers which follows a smooth multivariate Beta or 'Dirichlet' distribution.

(5) Brand Choice versus Purchase Incidence

The brand choice probabilities of individual consumers are independent of their purchase incidence. This implies that market shares are approximately the same for light, medium and heavy category buyers.

These assumptions have certain limitations or boundaries:

- (a) they hold "over time" which can be taken to mean a period of known length, usually medium term, i.e. four weeks to a year²⁸;
- (b) they hold for competitive markets which are approximately stationary in the medium-term.

²⁷ This relates to Luce's Axiom of the Independence from Irrelevant Alternatives (IIA) (Luce 1959), which states that individual probabilities of choosing one alternative rather than another are independent of each other - so a consumer's probability of buying brand A does not influence her/his probability of buying Brand B or Brand C, etc.

²⁸ The model is not appropriate for describing shopping behaviour in time periods shorter than one week. This is because people tend to have regular (usually weekly) shopping habits and therefore the model overpredicts significantly purchase frequencies in periods of less than a week. However, for activities such as making telephone calls, (which do not rely on a weekly interval), the NBD has also been found to fit satisfactorily (East 1997). For time periods of more than a year there are systematic discrepancies between actual findings and model predictions (see Chapter 5).

We can summarise these assumptions as follows: In aggregate, consumers behave as if they each have mostly steady and on-going propensities to purchase within a small personal portfolio of brands, typically buying one brand more often than the others. Individual purchases appear to occur in an 'as-if-random' manner, with this individual heterogeneous behaviour aggregating to give consistent and predictable patterns.

2.3 The Dirichlet vs Other Approaches to Brand Loyalty

The Dirichlet approach to buying behaviour which defines brand loyalty as *the consumer's tendency to repurchase* is an example of a stochastic representation of loyalty. A stochastic approach means that, in aggregate, the behaviour of consumers can be described by a probabilistic process. There are several other stochastic and/or behavioural approaches to the study of brand loyalty, as well as approaches which view brand loyalty as purely an attitudinal concept or as a combined attitudinal/ behavioural concept. Jacoby and Chestnut in their 1978 landmark book, *"Brand Loyalty Measurement and Management"* listed 53 separate operational definitions of brand loyalty, of which 33 were based on actual or reported behaviour, 12 based solely on statements of preference or intentions, and eight were composite studies involving an integration of behavioural (e.g. the logit model approaches. Since Jacoby and Chestnut (1978), other behavioural (e.g. customer satisfaction) approaches, have been suggested.

The Dirichlet approach to the study of brand loyalty differs from other approaches in terms of: (a) its conceptual background, (b) assumptions, (c) input and output measures, and (d) empirical findings. I now consider these differences with reference to the other main historical and contemporary approaches to this topic.

2.3.1 Conceptual Differences: Stationary versus Dynamic Markets

The main conceptual difference between the Dirichlet approach and other approaches to the study of buying behaviour is that Dirichlet-type modelling describes buyer behaviour in the steady-state,²⁹ whereas most other approaches are designed to capture change, i.e. to focus on the 'dynamic' aspect of consumer behaviour. There are two compelling reasons for adopting a stationary market approach. First, most frequently-purchased markets are in a steady or near-steady state most of the time. This is especially true if we wish to study markets in the medium term (say, four weeks to a year), when most grocery products (with the exception of seasonal offerings), show steady sales and market shares (e.g. as shown for UK detergent in Figure 2).

Second, it is necessary to study stationary (no-change) situations before a theory or model is extended to look at changing (dynamic) situations - we should think of dynamic situations as special cases or exceptions to the base model. In this research I am primarily concerned with stationary or near-stationary mature markets, where the level of category purchase or the relative market shares of the individual brands do not change much in the medium term. What stationary market research does not cover is short term brand share fluctuations (one week compared to the next), which are due largely to one-off price discounts or other promotional activity. Neither is this type of research aimed at predicting the growth of a new entrant into the market.

²⁹ By steady state or stationary we mean no net shifts in brand sales or market shares over the medium to long term (four weeks and longer). As we saw in Figures 1 and 2, there can be considerable weekly fluctuation in individual brand sales or share which is smoothed over if we take a longer period of analysis. The Dirichlet model has also been shown to fit well under a variety of near-steady-state conditions, see Ehrenberg and Uncles (1997). It can also be used to diagnose dynamic situations, such as short-term changes in market share. In such cases, the researcher is able, from a comparison of the model output with the empirical results, to infer the nature of the change, e.g. more people buying versus more purchases per buyer, and whether these extra sales come from consumers who were previously light or heavy buyers of the brand, etc.

However, if you estimate the market share that a new brand is expected to gain once it 'settles down', a model such as the Dirichlet is able to predict a range of loyalty measures for a brand of that expected market share (Ehrenberg 1991).

2.3.2 Conceptual Differences: Individual vs Brand Share Approach

The emphasis of other research approaches on the dynamic or changing nature of markets leads to two further linked conjectures; the focus on brand loyalty as a characteristic of the individual consumer, and the view that brand loyalty is a function of a psychological process. The view that brand loyalty is a function of psychological processes is regarded by many researchers as a necessary precursor to the development of an attitude and hence a level of commitment towards the brand, where a positive attitude or high level of commitment is seen as an essential requirement for brand loyalty to occur. The most-widely used conceptual definition of brand loyalty in the academic literature is that first proposed by Jacoby and Kyner (1973), and elaborated on by Jacoby and Chestnut (1978). Their definition identified brand loyalty as requiring six conditions:

"(1) the biased (i.e. non-random), (2) behavioural response (i.e. purchase), (3) expressed over time, (4) by some decision-making unit, (5) with respect to one or more alternative brands out of a set of such brands, and (6) is a function of a psychological (decision-making, evaluative) process."

Jacoby and Kyner (1973).

As Tarpey (1974) first observed, the first five conditions apply to all repeatpurchasing in competitive markets,³⁰ and, in general, have not been seen as

³⁰ What is ruled out by the Jacoby and Kyner (1973) definition is: (i) totally random purchase behaviour (which would presumably give market shares in strict relationship to a brand's availability), (ii) verbal statements of consumer intent or preference as opposed to actual purchasing

contentious by most marketing researchers. Where this definition differs from the Dirichlet view of brand loyalty, as described in Section 2.2 above, is that brand loyalty should be a function of a psychological process. This focus on psychological processes places an emphasis on the individual consumer whereas the Dirichlet view is that brand loyalty is almost entirely determined by the size of the brand.

Jacoby and Chestnut argued that repeat-purchase behaviour should be divided into two portions, a stochastic portion and a deterministic portion, the latter of which they label "Brand Loyalty". This deterministic element hinged on their condition that brand loyalty is a function of decision-making evaluative processes, i.e.,

"It reflects a purchase decision in which the various brands have been psychologically (perhaps even physically) compared and evaluated on certain internalised criteria, the outcome of this evaluation being that one or more brands was (were) selected....As a result of this decision-making, evaluative process, the individual develops a degree of commitment to the brand(s) in question; he is "loyal"."

Jacoby and Chestnut (1978), p84.

Jacoby and Chestnut did not reinforce their conceptualisation with concrete examples of how such a view of brand loyalty was manifest in the purchase of everyday goods. However, many researchers followed the Jacoby and Chestnut approach; three contemporary research views are presented below.

A similar conceptual approach to that of Jacoby and Chestnut's is that expounded by Engel, Blackwell and Miniard (1995) who identify two decision-making processes which could occur when the buying of a product is repeated over time: (a) repeated problem solving, and (b) habitual decision making. They categorise brand switching

behaviour, and (iii) situations where the decision-maker has access to one brand only and therefore has no choice. None of these three situations will be considered in any detail in this thesis.

due to dissatisfaction, variety-seeking or deal-proneness as involving repeated problem solving, but disaggregate habitual decision making into:

- (i) high brand loyalty (when product involvement is high),
- (ii) inertia (when product involvement is low).

According to Engel, Blackwell and Miniard, brand loyalty reflects a "*motivated and difficult-to-change habit because it is rooted in high involvement*", whereas repeatpurchase which is based on low-involvement or indifference reflects inertia and is unstable. Following Cunningham (1967), they contend that the brand loyal buyer is one who would not consider an alternative brand if the favourite one was unavailable, i.e. brand loyalty is buying one brand *only*, while the shopper who mostly buys the same brand but has low involvement and little commitment to this brand, will switch occasionally if there is an incentive to do so, and is thereby displaying habit based on inertia.

Other contemporary researchers reiterating this view are Dick and Basu (1994) and Mellens, Dekimpe and Steenkamp (1996)

"Customer loyalty is viewed as the strength of the relationship between an individual's relative attitude and repeat patronage... Cognitive, affective, and conative antecedents of relative attitude are identified as contributing to loyalty, along with motivational, perceptual, and behavioral consequences". Dick and Basu (1994), p99.

"From a theoretical point of view, one could argue that the ideal measure [of brand loyalty] should include attitudinal and behavioral components, and should be able to reflect both individual-level and brand-level differences....both individual (e.g. degree of risk aversion) and brand (e.g. their quality) related characteristics may induce differences in brand loyalty" Mellens, Dekimpe and Steenkamp (1996). The psychological processes which traditional consumer behaviour researchers, (e.g. Nicosia 1966; Howard and Sheth 1969; Ajzen and Fishbein 1980; Engel, Blackwell and Miniard 1995), have regarded as necessary for the formation of attitudes are those that relate to information-processing. The information which must be processed in this context involves:

- (a) Brand-related beliefs (cognitive antecedents).
- (b) Feelings or emotions associated with the brand (affective antecedents of which satisfaction is one type).
- (c) Behavioural disposition or intention (conative antecedents).

This focus of interest in the conative, cognitive and affective processes which underlie consumer behaviour, reflects the assumption, central to research which views loyalty from an attitudinal viewpoint, that consumer beliefs are *antecedents* to purchase. In contrast to this, in behavioural research (such as Dirichlet-type modelling), the focus is on the behaviour itself, since a central assumption is that it is the behaviour - the experience with the brand - which gives rise to attitudes about the brand, and so influences commitment, preferences, and a propensity to repurchase. *In behavioural research, attitudes are of secondary importance because they are the consequence of behaviour*.

Consumer Beliefs as Antecedents or Consequences

The marketing literature is divided on the issue of whether attitudes precede or are a consequence of behaviour. The more recent text books on consumer behaviour stress the importance of psychological processes - information search, problem solving, decision making (Assael 1992; Loudon and Della Bitta 1993; Wilkie 1994; Engel, Blackwell and Miniard 1995). However, in repetitive purchasing, there is little consistent *evidence* for attitudes as necessary antecedents of behaviour. In contrast,

there is a strand of research which has consistently provided empirical results which fit the view that attitudes are a consequence of behaviour (Bird and Ehrenberg 1970; Barwise and Ehrenberg 1985; Castleberry and Ehrenberg 1990; Barnard and Ehrenberg 1997b; Dall'Olmo Riley *et al.* 1997).

2.3.3 Differences in Assumptions: Learning vs Zero-Order

The NBD-Dirichlet model has, as one of its core assumptions, that purchase incidence and brand choice can be represented as a stochastic process, i.e. that consumers have habitual propensities or probabilities concerning when and what brand to buy. The model also has as a core assumption that these purchase incidence and brand choice decisions are independent of when the previous purchase was made or what brand was chosen, i.e. both purchase incidence and brand choice are represented by "zeroorder" processes, which involve no learning or feedback. Before looking at other stochastic models which are based on different assumptions, it is useful to discuss the evidence and reasoning for this zero-order assumption. As described by Bass, Givon, Kalwani, Reibstein and Wright (1984),

"Under a condition in which a consumer always purchases a single brand, a switch of brands would imply a change in the behavioural state of the consumer - a change of preference for brands and a change in attitudes. Under a condition, however, in which the sequences of brand choices of consumers look like stochastic processes it is not clear that brand switching occurs because of a change in the behavioral state of the consumer. It is possible, of course, that a switch of brands is the result of a change in the behavioral state induced by external stimuli, such as price and promotional deals, or by internal changes such as "learning" or "satiation". On the other hand, it is also possible that brand switching occurs without a change in the behavioral state of the consumer and is the result of a normal (conscious or unconscious) plan of alternation of brand choice on the part of the consumer." As Bass *et al.* (1984) note, the early behavioural studies of Brown (1953) and Cunningham (1956, 1961) implicitly assumed that brand switching behaviour could be described by a zero-order process. Subsequently, many researchers have felt that learning could be an important factor in consumer decision processes, and so have empirically tested models which were based on higher order processes. The results of such tests are divided and the landmark studies for and against the zero-order process are documented briefly below.

Using market level data and a large sample size (13,519 observations), but only for one product category (orange juice), Kuehn (1958, 1962) rejected the assumption that brand choice was based on a zero-order process. However, Frank (1962), using individual household sequence of purchase data, concluded that for most households (75%) the zero-order model was appropriate.

Later researchers³¹ continued this 'ding-dong' of first proving that one model fitted satisfactorily, only to have other researchers with a new methodology or test 'prove' a year or so later that a contrasting model provided a better fit of the data. Bass *et al.* (1984) suggested that both heterogeneity and nonstationarity tended to 'contaminate' the data so producing results which suggested that the switching process was of a higher order than was actually the case. In order to establish, in a generalisable and well-tested manner, which type of process provided the best fit, across the widest range of data available, Bass *et al.* (1984) used multiple tests on ten different product categories. They also divided consumers into those whose behaviour was stationary and those who displayed nonstationary behaviour.³²

³¹ Other researchers, apart from Kuehn and Frank, who tested the order of the brand choice process include: Massy, Montgomery and Morrison (1970), Wierenga (1974) and Givon and Horsky (1978). ³² Bass *et al.* (1984) tested for individual household level stationarity by dividing each household's purchase sequences into two equal lengths and testing if the pattern of purchases (specifically the share to the favourite brand and the share to all other brands) in one half of the data were significantly different from those in the other half. Depending on the category, between 10% and 44% of families displayed nonstationary behaviour.

Bass *et al.* concluded that, in some cases, a learning process did provide the best description of consumers' purchasing patterns, but also that a majority of families (around 75% of stationary households) showed purchase sequences which were consistent with a zero-order process. They also suggested that non-stationarity could be associated with a change in the favourite brand. A final conclusion which seems very pertinent to the discussion of brand loyalty is:

"One purpose of marketing activity is to make behavior nonstationary in a direction which is favorable to a brand. Another purpose is to prevent behavior from becoming nonstationary in a direction which is not favorable to a brand. Because brand switching is in the natural order of consumer choice behavior, analysis of panel data with respect to the characteristics of those switching to and from a brand on adjacent purchase occasions has not proven to be fruitful."

Bass et al. (1984), p285.

This emphasis on brand switching (or multi-brand buying) as the "the natural order of consumer choice behaviour", and the caution not to use adjacent purchases to assess brand loyalty, would seem to be in close agreement with the use of the NBD-Dirichlet model³³ to predict brand loyalty, and with the views of Ehrenberg on this subject,

"The individual probabilities or propensities to buy brands X, Y, and so on, are the only input in the [Dirichlet] model about brand choice; there are no variables reflecting any other possible market-mix or consumer-related aspect of brand loyalty for a specific brand. In as far as the model gives close predictions of all the various aggregate measures of buying behavior that have been tested (with r's generally of .9 or more across the relevant

³³ In the NBD-Dirichlet fixed time periods not adjacent purchases are used.

conditions), there is little or no room for any significant forms of brand loyalty over and above the consumer's brand choice propensity or probability."³⁴ Ehrenberg (1993), p104-105.

Some researchers have confused random purchasing behaviour with a zero-order process and stated that if brand choice is biased it cannot follow a zero-order process (Mellens, Dekimpe and Steenkamp 1996), or that a zero-order model "assumes that previous brand choices are not remembered and have no effect on future choices" (Givon and Muller 1994). The stochastic (zero-order) process applies when the behaviour of a buyer appears to be unaffected by their last purchase, however, the process is not necessarily independent of previous purchases. In addition, it has been well demonstrated that a zero-order process provides an extremely close approximation to revealed buyer behaviour in the aggregate.

This is not to imply that there are not individual and even strongly-held reasons for buyer behaviour, but rather that there are numerous reasons which occur with an unpredictable frequency so that the process is *as if random* or stochastic (Bass 1974, Bass *et al.* 1984; Ehrenberg 1959, 1972/1988).

The Dirichlet assumes that the aggregate probabilities of purchasing each brand depend on that brand's market share, and will change only as the market share of the brand changes. In contrast, in learning-type models it is assumed that the purchase of a particular brand increases the consumer's probability of buying that brand again next time. Below we look in more detail at learning-type models.

³⁴ We might note here that it could be that individual effects have been cancelled out by the aggregation. However the many different outputs from the model (including predictions for different length time periods) give us confidence that any real deviations are not simply "aggregated away".

Chapter 2

Learned Behaviour and Positive Feedback

In Dirichlet modelling, the probability of purchasing any particular brand is unaffected by the consumer's previous brand purchases, i.e. there is no learning or purchase feedback.³⁵ However, as we saw above (Section 2.3.2), a conceptual approach to brand loyalty which includes an attitudinal component assumes that if consumers buy only Brand A, they must prefer it to alternative offerings, and that when consumers switch from Brand A to Brand B, it must be because they are dissatisfied with Brand A, i.e. switching implies a change in the behavioural state of the consumer. Such switching can be thought of as nonstationary behaviour at the level of the individual. There have been many stochastic approaches to modelling brand loyalty, which while firmly grounded in consumer behaviour rather than attitude measurement, have still been based on a learning approach.

The first proponent of purchase feedback as the dominant process affecting brand choice, was Kuehn (1962)³⁶ who advanced the linear learning model of brand loyalty which describes brand choice as a probabilistic process incorporating the effects of past purchases and the time elapsed between purchases. Apart from the linear learning models of the 60s and 70s, there are other types of stochastic model which also incorporate consumer learning or positive purchase feedback. I now briefly discuss one such type of model - the multinomial logit model, since the approach based on logit modelling forms the basis of a large body of work on market share models, and make extensive use of panel data, in some cases the same datasets as are used in this study.

³⁵ When brands are growing or declining there is learning in the sense that individual probabilities for purchasing the brand are changing (also the market will be non-stationary). For *established* brands in mature markets (which is most fmcg markets, most of the time) any learning effects should already be reflected in the different brands' market shares.

³⁶ Kuehn first advanced the linear learning model in his doctoral thesis (1958), in the 1962 paper he refers to his thesis work and replies to Frank's (1962) comments that Kuehn's earlier assumption of learning was invalid and based on 'spurious contamination' of the data.

Logit Models

Logit models are a type of log-linear model which can be used to examine the relationship between a dichotomous dependent variable (e.g. buying Brand A or not), and one or more independent variables (e.g. the relative price of different brands, percent of each brand's total sales on promotion, brand manufacturer, etc) (Jobber 1994). In the multinomial logit model the probability of choosing one alternative (brand, store, pack size, etc.) from a number of alternatives, is calculated as a function of the attributes of all the alternatives available. As used in marketing, these are stochastic models which implicitly assume brand choice based on the independence from irrelevant alternatives (IIA, Luce 1959, see footnote 27), while allowing the inclusion of marketing mix variables (such as price, promotion, etc.).³⁷

One such type of multinomial logit model, popularised by Guadagni and Little (1983), has been termed a 'Brand Loyalty' model because it incorporates a purchase feedback loop - the brand choice probabilities of a household are weighted by past choice behaviour, with the most recent brand choices carrying the greatest weight, i.e. learning. Fader and Lattin (1993) suggest that the Guadagni and Little loyalty measure captures not only heterogeneity across households (which is also modelled by the Dirichlet), but also variation in consumer purchasing due to nonstationarity (i.e. changes in brand choice over time within each household). This is in contrast to the Dirichlet which assumes that household propensities to purchase each brand do not change over the time period being analysed.

³⁷ The IIA assumption is violated when some products/brands are considered more similar than others (e.g. all liquid detergents or different formulations of the same brand name). Many researchers wishing to circumvent the IIA assumption have done one or more of the following: (a) developed hierarchical or nested logit models, (b) segmented the population into more homogeneous groups, (c) estimated a separate model for each segment, (d) used a multinomial probit model. McFadden (1980, 1986) was one of the first researchers to model brand interactions using a logit model; both McFadden (1980, 1986) and Ben-Akiva and Lerman (1985) discuss in some detail the IIA assumption and its relevance to brand choice.

As Fader and Lattin (1993) observe, the basic Guadagni and Little (1983) measure of brand loyalty, which involves the exponential smoothing of past choice behaviour, cannot distinguish between heterogeneity across households and nonstationarity within household choice. However, as Fader and Lattin also report, the (stationary) Dirichlet model performs as well as the Guadagni and Little loyalty measure in terms of model fit (on one reported set of data), when the Dirichlet model is calibrated as an ordinary multinomial logit model, while the nonstationary Dirichlet-Multinomial (NSDM) model, developed by Fader and Lattin (1993), which allows for nonstationarity within households, produces only a very slightly better model fit compared to the (stationary) Dirichlet.³⁸

Additionally, unlike the Dirichlet model as operationalised in the research of Ehrenberg and his co-workers, and as used in this thesis, the many different logit models which have been developed in Marketing do not produce any loyalty measures as outputs, i.e. in logit modelling loyalty is an input not an output measure. In the next Section we discuss further differences between the Dirichlet and other brand loyalty modelling approaches in terms of the differences in input and output measures.

³⁸ In the nonstationary Dirichlet multinomial (NSDM) model (Fader and Lattin 1993), the nonstationarity is described by a renewal process, where the average brand choice probabilities for households are renewed after a set number of choice occasions. There are a number of conceptual problems with this; first the abrupt change in the probabilities for all brands that a household purchases would seem, intuitively, to be a rare occurrence (in Fader and Lattin's test category, orange juice, the renewal occurred, on average, once every 14 purchases). Second, it is suggested by Fader and Lattin that these renewal events are prompted by the entry or exit of a brand, a price war or a new advertising campaign. However, households can have very different rates of category purchase (ranging from once or twice a year to 50+ times a year), if the choice probabilities for all households are renewed after a set number of purchases, then these household purchases will not be aligned with the same price war or advertising campaign. Other researchers who have attempted to model heterogeneity, non-stationarity and purchase feedback events include: Crouchley, Pickles and Davies (1982); Wrigley and Dunn (1985).

2.3.4 Differences in Input and Output Measures

In Dirichlet modelling, loyalty measures are an *outcome* of the purchasing process, i.e. they reflect a brand's average size in a particular time period. We can contrast this with the attitudinal view, described in Section 2.3.2, that loyalty implies an affective bond between consumer and brand, which in turn, influences the brand choice process, i.e. loyalty is an *input* to the explanatory model. The multinomial logit model, other learning-type models, and discrete choice models have brand loyalty as an input; the main purpose of these models is to estimate the market share of competing brands.³⁹

In Dirichlet modeling, the market shares of competing brands (or the components of market share - brand penetration and purchase frequency) are an input, in fact, the only brand specific input to the model,⁴⁰ while the outputs are a range of loyalty measures for each brand. This parsimony of model input requirements is one of the great advantages of the Dirichlet.

Two further concerns with all measures of brand loyalty are that, first, since they are primarily concerned with past behaviour, they may not be good predictors of future purchasing. An advantage of the assumption in Dirichlet modelling of no systematic feedback from previous purchases (zero-order) means that inputs to the model can be based on data for one particular time period but the outputs can be for periods of different length (without any additional change to the model other than the specification of the required time period). For example, the inputs can be for eight

³⁹ Logit models predict individual choice probabilities which can be aggregated across individuals to obtain predictions of market shares. Given appropriate single source data inputs such models can also be used to estimate price elasticities, advertising response, etc (see, for example Pedrick and Zufryden 1991; Grover and Srinivasan 1992)

⁴⁰ The model requires the market share, or penetration and purchase frequency of each brand, plus the category penetration and average category purchase frequency (see bracketed figures in Table 5), plus a specified time period for the analysis.

week data, and the outputs can be for one week, twelve weeks, a year, or even two years or more.

Second, most loyalty data are collected at the level of the household, rather than the individual. This is particularly true of household panel data on grocery shopping. By analysing household loyalties, individual loyalties may be understated, i.e. the purchaser may not be the correct decision-making unit, in that observed variety seeking or switching behaviour may be due to one shopper making purchases on behalf of others in a household. We address this issue further in Chapter 4, Section 4.1.2.

There are other operational differences between Dirichlet-type analyses and other modelling approaches, the main one being the specification of fixed-length time periods rather than purchase sequences. The logic for using fixed-length time periods is that this approach enables output measures to be linked to a particular marketing event, e.g. a price promotion, advertising campaign, introduction of a line extension or distribution problem (additionally the output can also be for different lengths of time period as mentioned above).

There are two other main criticisms which particularly relate to attitudinal measures of brand loyalty.

a) When attitudinal measures are not connected to actual purchase (which is quite usual), additional measurement steps are required to link attitude to purchase (often these links are inferred by asking questions about preference rather than measured directly). Although the association between brand attitude and purchase has been well-established (Barwise and Ehrenberg 1985; Bird, Channon and Ehrenberg 1970), evidence on the causal priority favours the view that behaviour comes before attitude (Castleberry and Ehrenberg 1990; Dall'Olmo Riley *et al.* 1997, Barnard and Ehrenberg 1997b).

b) Attitudes measured at a single point in time tell us little about loyalty (which has a time dimension). Sometimes consumers are asked how much they agree with a statement such as, "I always buy the same brands", but this requires the respondent to make an individual evaluation of how long "always" is (it might be considered as the last three shopping occasions, or all shopping occasions over the past five years). With behavioural measures which utilise panel data we can calculate brand purchasing over specific time periods - the past month, quarter, year, or longer.

2.3.5 Differences in Weight of Empirical Evidence

Despite the well-publicised emphasis (especially in consumer behaviour text books) on a cognitive approach to loyalty research and the proposed separation of "spurious" brand loyalty from "true" brand loyalty by many researchers, as detailed in Section 2.3.2, there is very little empirical evidence to back the cognitive approach. In this Section we detail some of the limited empirical evidence cited in support of the cognitive approach and contrast this with the evidence in support of a "Dirichlet" view of brand loyalty.

In the late 1950s a popular view was that personality could be related to the consumer decision process. Koponen (1958) applied the Edwards Personality Preference Schedule (EPPS) to around 5,000 respondents and concluded that there were some (small) differences in personality scores between purchasers of different brands of the same product. Following on from this, Evans (1959) used the EPPS to look for differences between buyers of different makes of car (Chevrolet versus Ford owners). However he, and Kuehn (1963) and Marcus (1965), who later re-analysed Evans' data, *did not find that personality variables were able to distinguish between buyers of one brand and those who bought another brand*. Another early researcher, Guest (1964), admitted that the effect of adding an attitudinal component to revealed loyalty led to *only a very small improvement in the explanatory power of any descriptive model*.

Brody and Cunningham (1968) using a similar methodology, and analysing coffee purchases, found that personality variables were useful in discriminating the brand choice of buyers most likely to have perceived high performance risk and to have high specific self confidence. However, again they conclude that, "for explaining relative loyalty to a family's favorite brand, personality variables were found to have negligible practical value".

Cunningham (1967) also suggested that brand loyalty might be more than the repeat purchase of a brand. Cunningham suggested that the fact that previous studies had demonstrated that personality variables or psychological measures had little predictive power in explaining brand loyalty, meant simply that the correct measures had not yet been identified. He defined the high brand loyal consumer as one who demonstrated their commitment to the brand by claiming that they always buy the same brand *and* would go to another store or wait until the next shopping trip if their favourite brand was out of stock. Cunningham proposed that those consumers who were high in perceived risk⁴¹ should be more likely to be brand loyal. Although Cunningham claimed that his experiments supported this view, he admitted that perceived risk was not related to specific brands, and that, *"the relationship between perceived risk and brand loyalty is not a simple one"*.

The view that brand loyalty should include an attitudinal component as well as a behavioural one is reinforced by Day (1969). He felt that purely behavioural measures over-represented the existence of brand loyalty since they reflected not only "true" or "intentional" loyalty (high repeat purchase plus a positive attitude towards the brand), but also what he termed "spurious" or inertial loyalty, "associated with the consistent purchasing of one brand because there are no others readily available or because a brand offers a long series of deals, had better shelf or display locations" (Day, 1969, p30).

⁴¹ Cunningham (1967) did not report how perceived risk was measured; presumably he used a similar methodology as in the Brody and Cunningham (1968) paper, where Edwards Personal Preference Schedule (EPPS) was used.

Day correlated a behavioural measure of brand loyalty (the proportion of purchases to a brand), calculated at the individual consumer level with attitudinal and sociodemographic data on each consumer. He found that, using a series of multiple regression equations, the R^2 improved from 0.04 *(surely implying no link)* to 0.27 when the full set of 21 descriptive variables were used. This result implies that the most important factor(s) in explaining brand loyalty must still be missing from Day's account.

More recently Engel, Blackwell and Miniard (1995) support their approach to consumer decision processes and brand loyalty with many reproduced advertisements or anecdotes which illustrate their viewpoint. However they do not appear to document any consistent and generalisable patterns of purchase behaviour which enable us to separate repeat-buyers who are expressing inertia from those who are exhibiting "true" brand loyalty.

It has also been suggested by Engel, Blackwell and Miniard (1995, p158) that inertia will be found in categories which show little differentiation between brands and which are household necessities, while categories with a greater variety in product formulation and where personal choice is more important, will show (higher levels of) brand loyalty. They suggest that where the decision-making process is habitual (e.g. most grocery shopping) only one brand will be considered.

The evidence, as shown in Uncles, Hammond, Ehrenberg and Davies (1994) and Ehrenberg and Uncles (1997), directly contradicts this assertion; product categories as diverse as detergent, toothpaste, coffee, cough syrup and petrol (among many other frequently-bought products), have been shown to have very similar levels of brand loyalty and portfolio effects. As have potentially higher involvement goods, eg. womanswear (Brewis-Levie 1997), and even pharmaceutical prescribing (Stern and Ehrenberg 1995). In order to further test this issue, in the empirical studies detailed in Chapters 5 to 8, I have chosen both undifferentiated household products (laundry

69

detergent),⁴² differentiated household products (toothpaste), and food products (coffee and carbonated drinks).

If we now turn to the evidence provided by Dirichlet modelling, it was demonstrated in Section 2.2 that variations in brand loyalty in the UK detergent market can mostly be explained by differences in brand size and that this effect is captured effectively by the Dirichlet model. Table 4 listed around 60 other markets where similar predictable brand loyalty patterns have been found. As noted by Ehrenberg and Uncles (1997) there is a positive relationship between market share, a brand's repeat-buying rate and the share of category requirements measure: a larger or "more popular" brand has more buyers; its buyers buy it more heavily; and it enjoys greater loyalty from its buyers in that they devote a larger share of their product category purchases to that brand.

These relationships which explain how popularity varies between brands, stem from the "laws" of "Double-Jeopardy" and "Natural Monopoly", so named by McPhee (1963) and reviewed by Goddard (1977); Double Jeopardy is described in detail in Ehrenberg, Goodhardt and Barwise (1990).⁴³ The Dirichlet model has been shown to generally provide accurate predictions of both these laws and the wider brand purchasing patterns described in this Chapter.

The Dirichlet, together with the empirical evidence which supports it, suggests that consumers are not only multibrand-buyers, but also multibrand-loyal. It follows, then,

70

⁴² Although laundry detergent can have very differentiated forms, e.g. powder or liquid, each major manufacturer tends to offer both forms under its brand name. When data are aggregated to the brand level, this effectively means that the brands have essentially undifferentiated offerings.

⁴³ The Double Jeopardy law is briefly described in Chapter 2, Section 2.1. The Law of Natural Monopoly is briefly described in Chapter 2, Section 2.2.3, footnote 24. Raj (1985) also noted the double-jeopardy relationship (though he did not give it that name) and he also suggested that there is a negative relationship between the number of brands available and brand loyalty, i.e. as concentration in a category increases loyalty increases.

that we should not think of low or high loyalty, but rather that consumers show steady propensities to purchase different brands. For example, if a consumer purchases coffee ten times in a year, making six purchases of brand A, one of brand B, and three of brand C, they have 0.6 probability of purchasing A, 0.1 probability of purchasing B, and 0.3 probability of purchasing C.⁴⁴ The loyalty which each competing brand "commands" will therefore depend mostly on the number of buyers the brand has (in a given time period), since, in Dirichlet-type markets, each brand has the same proportion of light and heavy buyers, i.e. the frequency with which each brand is bought, by its buyers, differs very little across brands.⁴⁵

2.4 Limitations to the Dirichlet

The parsimony of input requirements needed for the Dirichlet makes it a convenient analysis tool and is one of its major attractions. However its parsimonious nature means that much data collected by the marketing manager (e.g. on price, promotions, advertising, distribution, etc.) are not used. Some researchers have sought to incorporate marketing mix variables into Dirichlet modelling. For example, Wagner and Taudes (1986) develop an integrated stochastic model of purchase timing and brand selection which incorporates the influences of marketing mix variables, seasonality and trend; Fader (1993) incorporates the Dirichlet model as a loyalty variable in the multinomial logit model of brand choice; Fader and Lattin (1993) develop a non-stationary Dirichlet-multinomial model of brand choice that aims to separate nonstationarity from heterogeneity in consumer purchase. However, in addition to requiring many more model parameters, the results from these extensions to the Dirichlet have so far tended to provide market share estimates rather than

⁴⁴ A consequence of this is that, for this consumer, the probability of purchasing other brands in this market is zero. A consumer's repertoire or portfolio of brands covers all those brands that are purchased in a given time period. This differs from their consideration set, which includes all brands they might consider buying.

⁴⁵ Except for the Double Jeopardy effect, described and illustrated in Chapter 2, Section 2.1.

loyalty output measures, i.e. their aim has been to (more accurately) predict changes in market shares over time.

My aim here is to highlight known discrepancies or weaknesses in the Dirichlet in regard to the brand loyalty output measures. There are four main systematic deviations from the model as noted below. These deviations have been found for almost all brands in all markets studied (see Ehrenberg and Uncles 1997). Most deviations are fairly small, but none have yet been fully documented systematically or quantified in a generalisable manner.

2.4.1 Systematic Deviations in Model Fit

- 1. Period-to-period brand repeat buying in relatively long periods (a year or more) is over-predicted by the model.
- 2. Repeat-buying over time (e.g. from period 1 to period 3 or 4) is over-predicted by the model.
- 3. The percentage of 100% loyal brand buyers in the longer term (a year or more) is under-predicted by the model.
- 4. The average purchase frequency of 100% loyal brand buyers is under-predicted by the model.

The first and second deviations relate to the buying of a single brand over time; when revealed brand preferences are not as stable as the model assumes. The third and fourth deviations relate to brand loyalty in a multibrand buying environment; the implicit assumption in the model that, over a long enough time period, almost all buyers will buy more than one brand, is not totally reflected in behaviour.
The aim of this Chapter has been to take the NBD-Dirichlet model of choice in competitive markets as a focus for a discussion of the existing literature and evidence on brand loyalty. The main empirical work of this thesis is to (a) document, (b) build on the discrepancies and weaknesses noted above to develop new measures of brand loyalty which give generalisable empirical findings and which can be predicted either directly from the Dirichlet, or related to established measures which are predictable. In Chapter 3, the research approach adopted in this thesis is detailed, and the broad hypotheses and main empirical studies are introduced.

3. RESEARCH AIMS, APPROACH AND OBJECTIVES

Summary

The broad aim of the research described in this thesis is to further our understanding of brand loyalty for frequently-bought goods. I do this by:

- Empirically identifying general discrepancies from our core model of brand loyalty the NBD-Dirichlet.
- Extending existing measures of brand loyalty to produce new measures which help to quantify these discrepancies.
- Exploring the relationship between the new measures of brand loyalty and existing ones, i.e. do they all produce the same findings.

The approach adopted is to focus on measures which produce generalisable results and to establish if these results are routinely predictable (e.g. how they are linked to variables which can be predicted by the NBD-Dirichlet model). This follows on from the work of Ehrenberg and his "ETET" approach to consumer behaviour research in Marketing.

A number of empirical objectives relating to the development and testing of new loyalty-related measures are detailed. These measures are concerned with (a) the purchasing of a single brand over time, (b) brand loyalty within a multibrand-buying environment. The main objectives are to relate these new measures to existing measures, to each other, to the Dirichlet model predictions, and to other findings on revealed patterns of purchasing behaviour.

3.1 Research Aims

The broad aim of this research is to further our understanding of brand loyalty for frequently-bought goods. More specifically, this involves:

- (a) The identification of patterns of consumer behaviour relating to brand loyalty which show up as discrepancies from the Dirichlet model.
- (b) The extension and refinement of well-established behavioural measures of brand loyalty and the development of new behavioural measures in order to gain additional insight into these discrepancies.
- (c) Testing these new measures across a wide range of situations, e.g. different brands and categories, countries and time periods.
- (d) Testing if, and establishing how, these new behavioural measures are routinely predictable, i.e. can they be predicted using the Dirichlet model; for some measures this involves creating simulated data from given Dirichlet parameters.
- (e) Testing if, and how, all measures of brand loyalty used, are empirically linked, i.e. do they produce the same findings and conclusions.
- (f) Relating the findings from these empirical studies to other empirical studies (by the author and colleagues) on different aspects of purchasing behaviour. These include: the effect of dynamic situations (e.g. promotions and line extensions); attitudes to brand loyalty; patterns of store choice; the lack of brand segmentation.

3.2 Research Approach

Proponents of the deterministic approach to brand loyalty, who seek to find a limited number of underlying causes or explanations for "brand loyal" behaviour (e.g. Jacoby and Chestnut 1978), typically adopt a hypothetico-deductive methodology which involves the "development of a conceptual and theoretical structure prior to its testing through empirical observation" (Gill and Johnson 1991, p28). Such hypothesis-testing methods are used in both behavioural and cognitive research in Marketing and a number of studies referred to in Chapter 2 (e.g. Day 1969; Guadagni and Little 1983; Fader and Lattin 1993), exemplify this approach. Ehrenberg has cautioned against this hypothesis-testing approach, or as he calls it, "theory-in-isolation", since as he states:

"One starts with no very solid basis of prior marketing knowledge, develops a novel hypothesis or analytic approach, and then tests it on a single isolated set of data. The outcome is generally a statistically significant (that is, probably non-zero) result pointing in the conjectured direction. But usually the result is left unquantified descriptively - only the measures of its significance are mathematized, not what the result actually is."

Ehrenberg 1993, p81.

Ehrenberg (1959, 1968, 1972/1988, 1993, 1995) has long proclaimed that the main emphasis in marketing research should be on generalisability and routine predictability. More recently this call has been taken up by other prominent marketing academics (Bass 1993, 1995; Hubbard and Armstrong 1994; Bass and Wind 1995; Barwise 1995). In order for research results to be generalisable, we need to focus not on whether we can obtain the best fit of a model for a single set of data, but rather on whether the findings hold generally across a wide range of situations which define the scope of the model/theory. Ehrenberg's view is that this goal can best be achieved by adopting the "*empirical-then-theoretical*" research approach. This "*empirical-then-theoretical*" approach is the one which I adopt as a starting position for my research. A brief description of this approach is now given.

3.2.1 Empirical-Theoretical-Empirical-Theoretical (ETET) Approach

The empirical-theoretical-empirical-theoretical (ETET) approach to marketing research as described by Ehrenberg (1993) involves:

- (E) Establishing a generalised empirical pattern or patterns of revealed consumer behaviour which hold under a range of different conditions (such as different products, populations, time periods, marketing actions). (Lindsay and Ehrenberg (1993) discuss the problems of designing such replication studies).
- (T) Development of a theoretical model or explanation of the observed patterns.
- (E) Testing of the theory more widely (i.e. comparing the results of further empirical research with earlier findings and with model norms),
- (T) Deduction of new conjectural theory (which is then further tested, etc.)

3.2.2 What the ETET Approach Means in Terms of This Thesis

The research presented in this thesis builds on previous empirical studies into buyer behaviour, concentrating on brand loyalty as an output of revealed behaviour. The focus is on:

- (i) the systematic appraisal and refinement of commonly-used measures of brand loyalty,
- (ii) relating new findings to previous research,
- (iii) assessing the implications of new findings for existing theory,
- (iv) assessing the implications of new findings for practitioners.

This research concentrates on the *measurement* of brand loyalty. My work builds on earlier empirical studies into brand loyalty (Cunningham 1956, 1961; Ehrenberg and Goodhardt 1968; Ehrenberg 1991; Uncles *et al.* 1994; Uncles *et al.* 1995) and focuses on loyalty as demonstrated by patterns of revealed behaviour.

This focus on revealed behaviour at the aggregate level is not to deny that individual consumers have reasons for their behaviour. Rather it is based on the belief that the behaviour of individual buyers is caused by a number of factors which interact with each other and which occur, at the individual level, in an largely unpredictable manner. For example, you may normally buy Brand A instant coffee, but purchase Brand B when your mother-in-law comes to visit. As noted in Chapter 2, underpinning this behavioural research is the stochastic theory of buyer behaviour which states that individual repeat-buying behaviour is the net result of many influences so that, in aggregate, the behaviour "appears" stochastic (Ehrenberg 1972/1988; Bass *et al.* 1984).

3.3 Research Objectives

Building on prior evidence, especially the known discrepancies or weaknesses in the Dirichlet model, as described in Section 2.4.1, I examine a number of aspects of brand loyalty which have not been systematically studied before. The main aim is to refine existing measures of buyer behaviour in order to gain insight into the extent and nature of brand loyalty. Below I describe a number of related objectives and broad hypotheses, and outline the empirical studies (a to g) which have been designed to explore, and where possible, test, these hypotheses.⁴⁶

⁴⁶ I use the term 'hypotheses' in a general sense here. I do not set up rigid hypotheses which are then proven or dis-proven using tests of significance, rather I suggest propositions which are then explored across a range of different situations.

(a) Loyalty to a Single Brand Over Time⁴⁷

As described in Chapters 1 and 2, there is limited evidence (Ehrenberg 1972/1988; Fader and Schmittlein 1993; Barnard *et al.* 1997) that, in stationary markets, over the medium to longer term, there is a discrepancy in the fit of the NBD for repeat purchase. But there have been no studies which document the extent of this deviation and whether it is systematic.

The "null hypothesis" here, based on the NBD assumption of stationarity, is that there is no systematic fall in repeat-purchase over time. The main objective of the empirical study on loyalty to a single brand over time (described in Chapter 5) is to establish if there are systematic departures from this assumption (when the overall market is approximately stationary). More specifically our objectives are to:

- Refine the repeat-purchase measure to form a new measure of brand (dis) loyalty, the proportionate fall in the repeat-purchase rate over time. We term this measure erosion.
- Calculate for the leading brands in nine categories; the existence, scale and extent of erosion.
- Relate erosion to other category factors, e.g. market concentration, brand order.
- Relate erosion to other brand measures, such as weight of purchase.

(b) Loyalty in a Multibrand-Buying Environment

We know that sole brand loyalty (loyalty to one brand only in a product category) over a reasonable time period (a year or so) is uncommon in the area of frequently purchased grocery products; consumers usually have a repertoire or portfolio of around three brands which they buy regularly (Collins 1971; Ehrenberg 1972/1988).

⁴⁷ The results of this study have appeared as a published paper, East and Hammond (1996).

But, as established by Cunningham (1956, 1961), consumers typically have consistent preferences within this portfolio, i.e. a most preferred or 'favourite' brand, a second favourite, etc. The Dirichlet has no explicit formula to predict what percentage of a consumer's portfolio goes to their favourite brand, nor what values might be expected for the share of category requirements (SCR) measure for light or heavy brand buyers.

The main supposition on favourite brands is that a behavioural measure of the share of category requirements given to the most preferred or favourite brand will relate in a systematic way to the basic share of category requirements measure. Similarly, the hypotheses on light versus heavy brand buyers is that the Dirichlet will closely⁴⁸ predict their (different) share of category requirements.

We also highlighted in Chapter 2 two deviations from the Dirichlet relating to loyalty in a multibrand buying situation. First, is that the percentage of 100% loyal brand buyers in the longer term is under-predicted by the model. Second, the purchase frequency of these 100% brand loyal buyers is under-predicted. We have no explicit hypotheses to test relating to these points, but aim to quantify and explore the degree of brand loyalty shown by light, medium and heavy brand buyers (including 100% loyal buyers).

The objectives of the empirical study on loyalty in a multibrand buying environment (described in Chapter 6) are to:

• Tabulate a number of favourite brand measures for the leading five brands across ten products (involving different categories, different countries, different time periods and different methods of data collection). Compare the results with those for the more commonly used SCR measure.

⁴⁸ Closely here can be thought of as little or no systematic bias in the predictions and a correlation or 0.7 or more, as previously found in studies comparing observed and predicted loyalty-related measures (e.g. Ehrenberg and Uncles 1997).

- Repeat all analyses for heavy category buyers.
- Segment households by *brand* purchase weight (i.e. into sole-brand loyal, light, medium and heavy brand buyers) and tabulate brand purchase frequency and category purchase frequency (and hence SCR) for each segment.
- Develop simulated datasets from given Dirichlet parameters in order to obtain Dirichlet predictions for the favourite brand and for SCR by weight of brand purchase. Compare observed and predicted values.

(c) The Relationship Between Loyalty to a Single Brand Over Time and Loyalty in a Multibrand-Buying Environment⁴⁹

If we take the supposition that loyalty is a single concept, then this implies that high revealed brand preference (e.g. a large percentage of category requirements going to the favourite brand) should be closely related to loyalty to the brand over time (i.e. customer retention or the inverse of repeat-purchase erosion).

We therefore suggest that the two behavioural loyalty measures, repeat-purchase erosion (a measure of dis-loyalty) and revealed preference for the favourite brand (the measures developed in the studies described in (a) and (b) above)), will be negatively correlated. The objective of this empirical study (Chapter 7) is to:

• Explore and test the nature of the relationship between repeat-purchase erosion and revealed preference for the favourite brand.

These three empirical studies (Chapters 5 to 7) form the central empirical focus of the thesis.

⁴⁹ The main findings from this study are available as a working paper, Hammond and East (1997).

In Chapter 8 I summarise a number of related studies, by the author in conjunction with co-authors, whose findings influence how we view brand loyalty. The relevance of this work to the subject of brand loyalty is that, as we have argued in Chapter 2, brand loyalty is not an isolated cognitive "feeling" that the buyer has to an individual brand in a particular market, but rather it is a propensity to re-purchase, and therefore all revealed patterns of purchasing behaviour are related, and have relevance, to the issue of brand loyalty. Additionally one of the studies summarised explores the relationship between behavioural and attitudinal loyalty measures. The studies are:

(d) The effect of dynamic situations (e.g. promotions and line extensions) on household purchasing behaviour. ⁵⁰

(e) The extent of store patronage.⁵¹

(f) Documenting the extent of brand segmentation and discussing how the (lack of) brand segmentation relates to brand loyalty.⁵²

(g) The relationship between behavioural and attitudinal loyalty measures.

In line with the methodology set out in Chapter 4, exploring and testing these propositions involves replicating the research within each study over many different product categories and also testing under which additional conditions the patterns hold - different time periods, consumer segments etc. In the three main empirical studies (Chapters 5 to 7) all panel data analyses are carried out on samples of at least eight of the twenty-nine available panel datasets. The main datasets are described in

⁵⁰ The findings from the promotions study have been published; Ehrenberg, Hammond and Goodhardt (1994). As have the findings from the extensions research; Lomax, Hammond, Clemente and East (1996).

⁵¹ Grocery store patronage is a published study; Uncles and Hammond (1995).

⁵² This research on brand segmentation has been published; Hammond, Ehrenberg and Goodhardt (1996).

Chapter 3

Chapter 4. They cover four different countries, several different product categories, different time periods (minimum of a year) and different methods of data collection.

This extensive empirical analysis enables the establishment of generalisable patterns. Where relevant, these patterns are compared with NBD-Dirichlet predictions, and the patterns and deviations from the model norms are interpreted.

In this thesis I do not report theoretical sampling errors for the following reasons:

- 1. The data samples are very large (therefore sampling errors will be small).
- 2. I have many different samples products, brands, countries, etc, and, as described in Chapter 2, individual loyalty-related measures have previously been demonstrated to exhibit consistent relationships (e.g. repeat-buying is always highly correlated with share of category requirements; frequency of purchase (w) values are always similar across brands), therefore I do not check this explicitly for each dataset.
- 3. Because the samples come from different populations, the observed measures (e.g. for different brands) are subject to two different kinds of variation:
 - (i) sampling errors in the measure for that sample of that brand's buyers,
 - (ii) real differences in the measured variable between brand A and brand B.

Since in our data the variations for results (as illustrated in Chapter 2) are small, the sampling error must be even smaller (and is therefore of generally no practical concern).

This Chapter has been concerned with research aims, approach and objectives, in Chapter 4 I discuss data and methodological issues.

4. DATA AND RESEARCH METHODOLOGY

Summary

In this Chapter I discuss the types of data which are used in the empirical studies reported in Chapters 5 to 8, how these data were obtained, and the analyses and computing procedures employed. The problems of data acquisition, relative advantages and disadvantages of panels versus surveys, representativeness of household panel members, etc., are discussed.

The main source of data is individual household panel purchase records from four countries: the UK, US, Germany and Japan. Survey data of panel members' replies to a questionnaire (a rare data source) were provided by Unilever. The extensive manipulation of the data into useable formats is performed using standard statistical packages (such as SPSS), or more commonly, specially written computer programs.

Empirical computation of brand loyalty measures is performed using a suite of computer software developed over the course of the thesis for this purpose. These programs can now be used by other researchers. NBD-Dirichlet "norms" are calculated for each dataset using the "BUYER" package. Simulated data created from Dirichlet model parameters, used to provide "norms" in one of the reported studies are created using a specially written computer program.

4.1 Behavioural Measures - Data Requirements

In order to carry out the research objectives detailed in Chapter 3, data on shoppers' purchases of different products over time are needed. For each product category, over a minimum period of a year (and longer for some studies), we need to know when and how often the product was purchased, the brands potentially available for purchase, and the actual brand purchased by each consumer on each purchase occasion.⁵³ In this thesis the emphasis is on the generalisability of the findings, therefore many different sets of data for a range of products from different countries were required. This purchase information comes from long-running standard household panels.

Panel data and survey data mostly serve different research needs and correspondingly have different advantages and limitations. The distinguishing characteristic of a panel is that respondents' behaviour or attitudes in a particular area are monitored over time. As Sudman and Ferber (1979) note, even two interviews on the same topic with the same respondent qualify as a panel study. However in the research presented in this thesis we are mainly interested in the weekly (and sometimes daily or even more frequent) recorded or reported purchasing behaviour of households over the medium to long term.

For this type of research, panel data are ideal; panellists either record in weekly diaries all their shopping purchases in various categories, or (increasingly common now) such data for each panellist are captured electronically at the point of purchase. However, panel data are very expensive to collect and academic researchers mostly rely on access to commercial panel data collected by market research companies. Below the relative advantages of panel data over survey data (for capturing purchasing behaviour), and the limitations of panel data are noted.

⁵³ Where two different brands are bought on the same shopping trip, these are counted as two separate purchase occasions.

4.1.1 Advantages of Household Panel Data over Survey Data

For capturing purchasing behaviour, commercial household panels have a number of definite advantages over survey methods of data collection:

- (i) Household panels are large enough to ensure a good statistical base. Panels provide vast quantities of data; the panels used in this research each consisted of between 1,000 and 5,000+ households, who provided weekly records of their grocery purchasing over a year or longer. Panels are sampled in such a way as to ensure an accurate as possible representation of the total population. This involves initial random samples with quota controls by demographic measures, and constant checking of panel findings with findings from store audit data. Survey data are more commonly collected, but surveys tend to be based on a convenience sample (i.e. they are often too limited to be representative of the total population), or cover one store or one manufacturer rather than the total market. ⁵⁴
- (ii) The data gathered from panels are of actual or reported behaviour and are broadly reliable (though see a number of possible biases detailed in the following section). Records for individual households can be monitored over time and data which appears unreliable (usually because households are irregular in their reporting) can be excluded from the dataset. This is in contrast to a recall interview situation, where Parfitt (1967) notes that respondents tend to equate their "most recent" brand purchased with their "normal" brand, and also to exaggerate their purchase frequency for recently-bought products. Parfitt (1967) found that when consumer panel members were interviewed, their purchase claims for a variety of grocery products over a 13-week period were substantially higher than the figures recorded in their diaries (for example, 24% higher for washing powder, 78%

⁵⁴ There is a temptation to compare "good panels" with "bad surveys". I appreciate that many surveys, especially commercially run ones, also use large sample sizes, however such data are rarely available, especially across different countries, to the academic researcher. Consumer panel data is collected regularly in many countries, and there is a long history of market research companies (after considerable perseverance on the part of the researcher!) making these data available for research.

higher for washing up liquid, 117% higher for toothpaste). This discrepancy was even greater for a matched sample of non-panel interviewees, whose claimed levels of purchasing in these three categories were 43%, 110%, 182% higher, respectively, than the diary panel had suggested.

Parfitt (1967) also studied claimed and actual brand loyalty, where loyalty to a brand was defined as 50% or more of the total category purchases. Parfitt found that claimed loyalty to a particular brand was rather higher than actual loyalty; e.g. 75% of the panellists who claimed to buy a particular brand of washing powder did in fact have that brand as their principal purchase over the previous 13 weeks, but only 55% did so for toothpaste and 45% for toilet soap. Accuracy was associated with experience; heavy category buyers were more accurate in their purchasing estimates than light or medium buyers, and accuracy was increased in frequently-purchased fields. We should note here than a discrepancy in brand loyalty findings is not wholly attributable to recall; there is a random error component in panel data which is quite large when loyalty ratios are calculated from a limited number of sales.

Sudman (1964) also compared recall versus diary methods of capturing household purchasing behaviour and found that the brand shares for leading nationally advertised brands were overestimated by an average of fifty percent on recall surveys compared to diary records. Wind and Lerner (1979) found that, at the individual level, 48% of respondents who claimed that a particular brand was their most often bought, did not actually record that they had bought this brand in their diary for the previous six months. Even for those most loyal (recorded proportion of purchases accounted for by a particular brand is 81%-100%), only 24% of respondents said they bought this brand most often.

Sudman and Bradburn (1973) summarise frequency biases in surveys under three headings; a downward bias termed forgetting - when respondents underestimate

87

their purchasing in very frequently used categories; an upward bias called telescoping - when they include purchases which were not made in the relevant time period; and a "sensitivity" bias (which can be either up or down), where the respondent replies in what they perceive is a "desirable" manner (i.e. some respondents may not wish to admit that they only buy certain products when they are discounted).

(iii) Panels provide a continuity of data, enabling trends and changes over time to be investigated. Only through a consumer panel is it possible to monitor changes in the behaviour of particular cohorts. Surveys, even when repeated regularly, always provide "snap-shots" of the market.

However there are a number of limitations which have to be considered when using household panel data. These are now discussed.

4.1.2 Limitations on the Use of Consumer Panel Data

The two main potential problems with generalising from panel data results are, first, that members of the household panel may not be representative of the wider population, and second, that the panel member may be purchasing on behalf of a household consisting of several people, all with different tastes and needs. These points are now addressed.

(i) Representativeness of Consumer Panel Members

There are two main worries concerning the representativeness of consumer panel members. First, in terms of socio-demographics and the range of products bought, are panel members representative of the total population? Second, are households who remain on consumer panels for one or more years typical, in terms of their buyer behaviour, of the wider population?

(a) Are Panel Members Representative?

The first point is a general concern and applies not only to consumer panel data but also to survey data. The panels used in this study are commercially-collected by the leading panel operators in each country; they involve large samples (all are for over 1,000 households) and designed to be fully representative in socio-economic and demographic terms of the total population. However, Parfitt (1986) points out that some groups - the very prosperous, the very poor, and also fluctuating and transitory households composed mainly of young single people, particularly those living in large cities - are traditionally difficult to recruit and are under-represented in virtually all market research samples.

Ehrenberg (1960) conducted a number of studies comparing "co-operators" with "non cooperators", and found that there were no behavioural or attitudinal differences between the two groups. Sudman and Ferber (1979) agree that there is a very low correlation between panel sample biases and purchase behaviour. However, Leeflang and Olivier (1985) suggest (but from analysis of only one category) that shoppers who buy relatively cheaper brands may be over-represented on panels.

(b) How Typical are Households Who Remain on Panels for Long Periods of Time? This second point is of more concern when measuring brand loyalty. Sudman and Ferber (1979) state that continuing co-operation rates for panel members average around 50% (over a year). It is possible that long-term panel members may be more habitual in their purchasing habits than the average shopper, or that where the panel is of the self-reporting diary type, panel members may become "sloppy" in their reporting. However, Parfitt (1986) notes that three studies (in the UK, Germany and France) which investigated the relationship between the length of time households served on a panel and conditioning, found that there were virtually no differences in brand loyalty or price consciousness between newly recruited panel members and long-serving members.

We have confidence from previous research that data collected using different methodologies give comparable information. For instance, Ehrenberg and Uncles (1997), state that Dirichlet-type patterns have been found in over fifty different packaged goods categories as well as for television programmes, pharmaceutical prescriptions, etc., (see Chapter 2, Table 4). These data came from different countries and were collected under different conditions.

The panel data used in this research were gathered in a variety of ways; some of the US data were collected at the point-of-sale through the electronic scanning of purchases. Other US data were home-scanned; German and Japanese and UK data were from diaries (either customer-completion or completion by interviewer). In the empirical analyses reported here in Chapters five to eight, we can again check that different panel data collection methods do not bias results.

(ii) Household versus Individual Loyalty

The consumer panel purchase data used in this study are collected at the household level and may represent purchases for a number of individual family members. By analysing household loyalties, individual loyalties may be understated, i.e. the purchaser may not be the correct decision-making unit, in that observed variety-seeking or switching behaviour may be due to one shopper making purchases for others in a household. This problem applies to all studies which use household panel data and also to many which rely on questionnaire or survey data. The results which are reported in this thesis therefore apply only to household loyalty. However, Ehrenberg (1972/88) notes that different brand performance measures produce very similar patterns for products such as cosmetics and other personal care products, which are mostly individually consumed, and laundry detergent, disinfectant, etc. (where usage is usually at the household level).

4.1.3 Types of Data from Consumer Panels

Market research companies recruit households to be on consumer panels in order to study many different types of shopping and consumption behaviour. Here we are concerned only with static⁵⁵ panels which are established to look at grocery shopping behaviour. For shoppers recruited to these panels, all their grocery shopping purchases,⁵⁶ usually for a year or more, are recorded. Participating households are given a small incentive for taking part in the panel. The socio-demographic characteristics of panellists are recorded and tracked to ensure that they are representative of the population as a whole. One recently-established US household panel consists of up to 60,000 households.

The panel data are usually divided into electronic files which represent the purchasing behaviour of each panellist who buys over a particular time period in a particular category, e.g. the file on laundry detergent purchasing over 52 weeks will contain one record for each laundry detergent purchase that each panellist makes in that time period. The record will contain information on the brand or brand variant purchased, the pack size, the pack price (often the information is recorded at the SKU or UPC

⁵⁵ In a static panel no attempt is made (by panel operators) to rotate the panel members during the life of the panel. It is essential that panel members are not rotated if one wishes to study consumer loyalty over time. In practice, market research companies operate dynamic panels; they need to maintain as representative a sample as possible of a particular population, so new members will be brought in to replace those who drop out. Over a particular time period operators can provide data from a panel which was 70% or 80% static (as the panels used in this study were). Additionally in this thesis a more rigid definition of continuous purchase was subsequently applied to the samples acquired from the panel companies (see section 4.4.2). Also, for some analyses, it was necessary to exclude very light buyers (because they did not provide enough purchase records). These two factors do mean that the samples used in this thesis are no longer guaranteed to be representative of the population as a whole.

⁵⁶ In the case of a diary panel, panellists will be asked to record all purchases, wherever bought (but some purchases may be forgotten, or not recorded for other reasons). In the case of data which is collected electronically at point of purchase, only purchases from stores participating in the scheme will be recorded (again, some purchases, especially in smaller stores, will not be recorded). So there are systematic biases in the information gathered from electronic panel data, but researchers have not reported any systematic differences in loyalty findings (Ehrenberg and Uncles 1997), and this bias issue is not mentioned in a recent paper on research using scanner panel data (Neslin *et al.* 1994).

level)⁵⁷, the amount purchased, the store where the purchase was made, the week when the purchase was made, and, if the data were gathered electronically, the day and time of purchase. Sometimes additional information, e.g. whether the purchase was on special offer, or if a coupon was used or not, is also recorded.

Consumer panel data can be collected in two main ways, (i) electronically at the point of purchase, (ii) the shopper records all their purchases in a daily/weekly diary which is regularly collected or sent to the panel operator. This second method can operate in two ways. Shoppers can scan items at home (with hand held scanners) and enter manually into an electronic diary deal information or data on items which have no barcode. The scanners are then later connected to a database by a visiting company researcher. Alternatively, shoppers collect all labels/containers from which information is then scanned or recorded manually once a week by a researcher from the panel operator company.⁵⁸

(i) Electronic Data Collection at Point of Purchase

The purchase information for an individual person or household is recorded each time they shop for groceries in a participating store. The data are collected by associating a reference number for the household (usually from a swipe card), with the UPC codes for each item they purchase. The market research companies which operate

⁵⁷ SKU stands for stock keeping unit. UPC stands for universal product code. UPC information covers SKU details such as manufacturer, brand, brand variant (e.g. flavour), price, pack size, and additionally may carry some promotional information. The UPC is usually stored as a 10-13 digit number on the side of the pack - the "barcode". This barcode can be read electronically at the checkout.

⁵⁸ In the 1990s home scanners ("wands") can be linked to an in-home terminal which is connected to the telecom network (e.g. AGB's UK Superpanel). An alternative method is to ask the panellist to enter all the information directly into a computer and then require them to send disks back regularly to the company (for example, the UK AGB frequent flyer panel (1994-96) employed this technique - and gave a laptop computer to all recruited panellists).

these data collection schemes try to ensure that all stores (above a certain size) which operate in a particular area, are involved in the scheme.⁵⁹

The two main advantages of point of purchase panel data over diaries are that (i), it is more difficult for panellists to "forget" to include items that they have bought, (ii) purchase data can be linked to other electronically held data on the store environment, e.g. total sales of each category by store, deal and display information, and out of stock data.⁶⁰ A disadvantage is that panellists might forget to take their reference card on some shopping trips, and may also make trips to stores not in the data collection scheme. The US data used in this thesis were collected in this manner, all other data came from diaries.

(ii) Diaries - Completed by Panellist (or Market Research Agent)

An alternative method of electronic scanning is for the consumer to scan the barcode at home. Hand-held scanners are provided for the shopper, but they must also remember to record information on purchases where there is no barcode and to enter details of any "deals". Data from the scanner can then be accessed at a later date, or can be relayed to the market research company via a telephone/modem. The more traditional diary method required each panellist to record in a (paper) diary all grocery purchases made each week, the price of each purchase, the store where it was made and whether any coupons were used. A variation of this method is the AGB "dustbin diary", used up until 1990, where panellists kept all packaging from products used in the week and a researcher from AGB would collect the packets and complete the diary for the panellist.

⁵⁹ In 1992 approximately 77% of US supermarkets collected consumer scanner data (Neslin *et al.* 1994).

⁶⁰ Although price and display data is available for some of the datasets in this study, the effect of marketing mix variables is not a primary concern here, and such data is used only selectively. For instance, some store data and promotional data have been incorporated into studies into the effect of promotions and the modelling of store choice using the Dirichlet, these studies are referred to briefly in Chapter 8.

One potential problem with the diary method is that shoppers might forget to record some purchases. This could introduce biases in the data if the forgetting is selective, e.g. a panellist could "forget" certain types of product purchase or certain brands (perhaps private label or value lines), or which products were on deal, or over/under record the number of purchases made of their favourite brand/less frequentlypurchased brand or category, or not record items bought on "top-up" shopping trips. In the case of the dustbin diary system, some "messy" types of packaging and packaging from products consumed away from home might not be kept for the researcher.

Fulgoni and Eskin (1981) found that findings from data collected in these different ways were essentially very similar. Ehrenberg and Uncles (1997) report that the NBD-Dirichlet model has been shown to fit closely across a very wide range of product categories, where the data has been collected by a variety of different methods. Also from the studies reported in this thesis, we find that loyalty-related measures are robust across different data collection techniques.

4.2 Data Acquisition

Market Research companies have an interest in new and different approaches to interpreting their data; analyses and interpretation which shed new light on a particular aspect of consumer purchasing could be incorporated into a valuable analysis tool to sell to clients. In principle, such companies are often willing to discuss research projects proposed by academics and are agreeable to providing (free or at nominal cost), some of their data (collected at considerable cost). However, further data analyses by the company, especially when not for a paying client, is costly and time consuming, and consumer panel data are usually only made available to academic researchers in a very raw form (flat ascii files where every purchase constitutes a separate record).

94

The thirteen datasets used in the main empirical studies in this thesis were provided by five different market research companies, and the raw data arrived in a number of different electronic formats. The datasets were:

UK: source Taylor Nelson AGB

laundry detergent, 6 years of data (1985-90) toothpaste, 2 years (1988-89) instant coffee, 1 year (1988)

Germany: source GfK

laundry detergent, 2 years of data (1989-90) toothpaste, 2 years (1989-90) ground coffee, 3 years (1988-90) carbonated drinks, 2 years (1989-90)

USA: source A. C. Nielsen

laundry detergent, 2 years (1986-88)

USA: source IRI

instant coffee, 2 years (1982-84) crackers, 2 years (1980-82)

Japan: source MIC

laundry detergent, 1 year (1983) toothpaste, 1 year (1983) instant coffee, 1 year (1983)

In addition many of the above datasets plus data on another fifteen categories across the same four countries were used in two large scale studies summarised in Chapter 8; "The After-Effects of Price-Related Consumer Promotions" (Ehrenberg, Hammond and Goodhardt 1994), and "Market Segmentation for Competitive Brands" (Hammond, Ehrenberg and Goodhardt 1996). These data are detailed in Chapter 8. The line extension study briefly reported in Chapter 8, "New Entrants in a Mature Market: An Empirical Study of the Detergent Market" (Lomax, Hammond, Clemente and East 1996) used data on laundry detergent from the UK and Germany. The study on store choice, "Grocery Store Patronage" (Uncles and Hammond 1995), also mentioned briefly in Chapter 8, used consumer panel data from the US (IRI BehaviourScan 1984/85). In the "Attitudes and Behaviour" study referred to in Chapter 8, the panel data on laundry detergent, toothpaste and washing-up liquid were collected by TN AGB; the questionnaire-based data came from a subset of the same panel. Research staff at Unilever drew up the questionnaire and conducted the survey on the UK panel immediately after it was wound up (in 1990).

The total number of grocery purchasing datasets available for analysis were therefore twenty-nine. These were obtained by contacting the relevant market research companies, but often we had no or little choice in categories made available for research. The set of categories studied in the main empirical section of this thesis (Chapters five to seven), were chosen firstly because they mostly represented the more extensive datasets (in terms of number of weeks of data).

Secondly, when designing a replication study it is useful to have data which are different on some dimensions but not others (Lindsay and Ehrenberg 1993). I chose to conduct a variety of studies on laundry detergent and coffee (purchasing data from four countries), toothpaste (two countries), plus carbonated drinks, crackers and washing up liquid. These categories give a mix of household products, personal care products and food/drink products. Some panellists from each country were common across panels, i.e. the German panels for toothpaste, detergent and carbonated drinks contained the same panellists (but not all panellists bought in all three categories).

96

4.3 Panel Data: An Example - UK Detergent

Taylor Nelson AGB (TNAGB) provided a dataset on laundry detergent purchasing in the UK for around 10,000 households for six years from 1985 to 1990. In fact, TNAGB, in common with other market research companies, usually keeps only up to three years of back data, and this long run of six years' worth of data (very valuable when assessing loyalty over time) was traced to one of their clients, Unilever. Unilever, with permission from TNAGB, who continue to own the data, agreed to make the raw data available for the research reported in this thesis. The 10,000 households on the UK detergent panel bought detergent, on average 14 times a year, each purchase is represented by one ascii record, so the six-year detergent file contained as many as 850,000 individual purchase records.

4.3.1 Data Manipulation

As an example, when we want to analyse repeat-buying over three years, we need households who were panel members for the whole of a three year time period.⁶¹ This involves matching each panellist on the purchase data file with their data from a demographic file on when they joined and left the panel. Similarly, the segmentation of buyers according to their weight of purchase (light, medium or heavy category buyers), or on the basis of socio-demographic information, requires further manipulation of the data. Many datasets have related information stored in separate files. This information can include data not only on the socio-demographic characteristics of panel members, but also the characteristics of all brands available, and store data such as details of promotional offers, in-store displays, etc.

The thirteen datasets referred to in Chapters 5 to 7 consist of over 30 separate electronic raw data files. Because of their size (the 30 raw data files alone required around 100MB of disc space), these files were stored on a UNIX mainframe

⁶¹ Over such long runs of data small individual lapses in data collection, e.g. holidays by panellists, will tend to cancel out.

computer. Data manipulation was carried out in two ways. Initially all empirical studies were carried out on one dataset and the data were manipulated using the statistical package SPSS.

To calculate the necessary information to produce findings for just one category, for the empirical analyses detailed in Chapters five to seven, required the production of around 500 SPSS files. Some of these were data files (selected for particular brands, or by light, medium or heavy brand or category buyers), but most were instruction files. Later, a suite of specialist computer programs was written in order to simplify some of the complicated, but repetitive, empirical analyses across the other datasets. This software is written in standard Fortran and is designed to be run on a UNIX system.

At present this software is used only by the author and a few other colleagues working in this area, however a PC version is under development and the software, with documentation, will eventually be made available to any interested researchers.

NBD-Dirichlet norms were calculated using *BUYER* (1989) software, developed by Mark Uncles while he was at London Business School. The Dirichlet simulation software was written by Professor Gerald Goodhardt who gave me help and advice on its use. Tables of output for all brands/categories/buyer segments were produced and managed in a spreadsheet package.

In total, some 8,000 computer files (including raw data files, secondary data files, instruction files, results files and tables) needed to be managed, by the author, in order to carry out the analyses reported in this thesis.

4.4 Factors which Affect the Measurement Process

I now focus on factors which affect the measurement process.

4.4.1 Definition of Category Boundaries

When we consider multibrand buying within a particular product category, it is necessary to establish the maximum consideration set for all possible consumers, i.e. which brands compete with each other. This is because measures which define loyalty as a proportion of category purchase are dependent on the definition of the category boundary. This consideration set may be different for individual consumers, but must be defined so that it is consistent across all buyers. For example, Consumer A may choose orange juice one week instead of carbonated cola, but for most practical purposes, we are interested in which brand of orange juice they purchase on this occasion compared with the brand they bought last time they purchased orange juice.

The approach here has been to start with broad categories, as defined by market research companies, e.g. all laundry detergent (which includes both powder and liquid formulations), and then to test empirically whether consumers "segment" their purchasing, and, if so how this affects our loyalty measures.⁶² Analyses can be broken down by sub-category where relevant, e.g. we might want to compare cross-purchase between brands of instant coffee and brands of ground coffee.

A related issue is whether a consumer tends to stick to the same brands across categories, e.g. are buyers of Fairy washing-up liquid more likely to purchase Fairy laundry detergent than we would expect? This and similar questions which relate to purchasing across categories are not dealt with directly in this thesis, but the implications of findings from a related study on brand extension research are considered in Chapter 8.

4.4.2 Population to be Considered

In the analyses reported in this thesis (and for many commercial applications), a subgroup of households who remained on the panel for the whole of the reference

⁶² In Chapter 8, I describe a study which looks explicitly at brand segmentation.

period (a minimum of a year, sometimes longer), is taken as the relevant sample. This sample is termed "continuous buyers" or a static sample. It is important to note that included in this sample are panellists who do not necessarily make any purchases in the category being studied. Although such panellists will have no purchase records, their numbers need to be known as many measures are related to the percentage of the population who buy the product at all (in a particular time period).

For the single brand loyalty measures (average purchase frequency and repeat purchase), it is necessary to know the number of buyers of the brand, and how much they purchase (in given time periods). For the share of category requirements and other multibrand buying measures you additionally need to know the number of purchasers and purchases of all other brands. All common measures are described in some detail (with numerical examples) in Chapter 2. Base analyses are always calculated for the whole population, but many measures are also calculated separately for light and heavy buyers of the brand and/or category.

4.4.3 The Unit of Analysis

For each individual buyer, brand choice is analysed at the level of the brand, identified from the UPC code or other coding, rather than the packsize or flavour of the brand. This is because we are primarily interested in loyalty to the *brand*.⁶³ Brand choice in this thesis also refers to purchase "occasions", rather than the volume or value of sales to the brand over time. This is consistent with previous theoretically-based work by Ehrenberg and others (see Ehrenberg and Uncles 1997 for a review of the many studies) and is a function of the fact that the NBD-Dirichlet model is defined around the purchase occasion. Ehrenberg (1972/1988) has shown that while the amount bought on any purchase occasion varies by category (people usually buy one packet

⁶³ In some studies we separate out liquid and powder variants of the same brand of detergent, and in the study on line extensions mentioned briefly in Chapter 8 (Lomax *et al.* 1996) we do drill down further to look at other brand variants (e.g. Sunil "ordinary" detergent and Sunil concentrated).

of detergent at a time, but frequently buy six cans of soup and 30 litres of petrol) it varies very little by brand within the category.⁶⁴

4.4.4 The Measurement Period

The measurement period for analysis is a set time period common to all purchasers. As discussed in Chapter 2, Section 2.3.3, measuring brand choice over a fixed time period has proved to be the most useful method for researching brand loyalty (and other aspects of consumer buying behaviour). This is because the fixed time period means that results can be related to marketing activities, or compared across categories.

The alternative method - taking a sequence of purchases for each buyer, results in the problem that these sequences bear little relation to each other, e.g. a heavy buyer may be on purchase number 10, while a lighter buyer is on only their second purchase. Relating results from sequence of purchase data to other, time dependent information (sales or store data which are collected weekly, promotional campaigns, etc.), is almost impossible. However, repeat buying for two sequential purchases is the norm when looking at durables (e.g. cars) or other infrequently-purchased goods/services.

The time period used should be long enough to ensure that consumers have the opportunity to repeat purchase, i.e. longer than the average inter-purchase repeat time. In the analyses described in Chapters 5 to 8, the minimum time period is a quarter of a year, with a maximum time period of two years (three years in one example in Chapter 5).

⁶⁴ This focus on the purchase occasion means that we do not have to analyse separately purchases of different pack sizes, etc. The amount purchased on any one occasion is obviously of considerable importance to marketing managers, and price promotions can cause sudden "blips" in the data for a particular brand, however, over the longer term Ehrenberg (1972/1988) suggests that such "blips" have little effect compared with differences in share between brands. Ehrenberg (1972/1988) also suggests that results can be weighted by volume or value where this is of importance, and where the data are available.

4.5 Simulated Panel Data

In Chapter 6 I use simulated panel data to generate Dirichlet "norms" for favourite brands and for light and heavy brand buyers. Simulated data are created for any number of individual "households" by feeding into a computer program the model parameters and brand shares for the particular dataset and particular time period you wish to simulate. Appendix 1 gives more detail on the Dirichlet model parameters, but briefly, for each category the following information (relevant to a particular time period) is required: M (the product class mean purchasing rate); the S and K parameters for the category (S indicates the extent of heterogeneity in brand choice, K reflects how much purchaser's individual product category purchase rates differ from M); the shares for each brand.

The program generates a category purchase "record" for any number of "households",⁶⁵ for any number of periods (of a notional same length). Each purchase record gives the purchase frequency over this time period for a household for each brand specified. Not all households, of course, are required to buy all brands during the period (depending on the value of the parameters, the number of brands and size of the brand shares). Indeed, some simulated households may make no purchases of any brand (and this will be recorded; both the number of non-buyers of the category and the number of non-buyers of the brand are important inputs in Dirichlet modelling).

A further computer program reformats these category purchase records into typical panel data with a line for each purchase detailing the week that purchase was made. The week numbers are generated randomly The simulated data can then be analysed just like any other dataset.

⁶⁵ As a strictly random sample from the theoretical probability distributions. See Appendix 1 for more detail on the Dirichlet.

In this Chapter I have detailed problems of data acquisition, relative advantages and disadvantages of panels versus surveys, representativeness of household panel members, etc. I have also discussed the types of data used in this thesis, how these data were obtained, and the analyses and computing procedures employed.

In the next three Chapters I describe the three main empirical studies of this thesis.

5. LOYALTY TO A SINGLE BRAND OVER TIME

Summary

The NBD-Dirichlet model assumes stochastic stationarity. If we choose two periods where the overall market is stable and the individual market shares of brands are very similar, i.e. the market is near-stationary, the model closely predicts repeatpurchase from one period to the next (as illustrated in Chapter 2). However there is some empirical evidence which suggests that over time patterns of actual repeat purchase deviate from model predictions, even under near-stationary market conditions. In this Chapter we quantify these deviations by systematically comparing model predictions with observed repeat purchase over successively longer time periods in stationary markets. The data cover the leading brands in a number of frequently purchased and mature grocery categories in three countries.

We find that:

- In the medium term, there is a systematic but limited decline in repeat-purchase loyalty; across nine markets, erosion (the proportionate fall in repeat-purchase) averages 15% in the first year for the brands studied.
- Erosion does not differ by weight of brand purchase similar rates are found for light, medium and heavy buyer-segments.
- Brand leaders are found to have lower erosion than smaller brands.
- Erosion is found to flatten over periods longer than a year.

5.1 Purchase in Mature Markets

As described in Chapter 2, Section 2.1.1, there are a number of loyalty-related measures which relate to a single brand (rather than the market as a whole). These are the average purchase frequency of the brand, the percentages of buyers purchasing at different rates, and the percentage repeat-buying from one period to another. In Chapter 2, Section 2.4.1, we noted that there were systematic deviations in model fit in terms of period-to-period brand repeat buying in relatively long periods. This Chapter is concerned with quantifying these deviations.

In the medium term, most mature markets are approximately stationary, both at the brand and the category level (as illustrated in Chapter 1, figures 1 and 2). Models such as the NBD-Dirichlet assume a stationary market and therefore no change in aggregate purchase propensities and no fall in repeat-purchase from one period to the next. However, buyers do sometimes change brands and this will affect predictions drawn from stationary market models. This has stimulated the development of mathematical models that allow for change in individual consumer loyalty over time (e.g. Fader and Lattin 1993; Sabavala and Morrison 1981). However, by contrast, there has been little empirical work on establishing empirically the *scale* of *aggregate* changes in brand loyalty and how these vary between categories.

In this Chapter we measure erosion (the proportionate fall in repeat-purchase over time) in near-stationary markets. We also measure the shape of the erosion function and explore the relationship of erosion to other factors (category, purchase frequency, brand size, market concentration and weight of purchase).

If we focus on frequently bought products and compare any two adjacent sales periods, e.g. two quarters, we find that many of the buyers of a brand in quarter 1 (Q1) return in Q2, particularly the heavier buyers. Replacing the 'lapsed' buyers who do not buy in Q2 is an approximately equal number of 'new' buyers. These 'new' buyers are mostly light buyers of the brand (like those that they replace) and, although they did not buy in Q1, they have usually bought the brand before and are thus not totally new to the brand. At Q3 about the same proportion of Q2 buyers drop out and are replaced by more 'new' buyers including some of those who lapsed in Q2.

This intermittent pattern of purchase does not show loss of loyalty but instead reflects the fact that many people buy a brand so infrequently that they often miss quarters. Thus stationarity at the aggregate level rests on a constant pool of purchasers which is sampled at each quarter. This reflects the finding that consumers have constant propensities to purchase which may or may not manifest as actual purchase in a given period; the change of buyers at each quarter is not explained as a change of allegiance but instead as the outcome of a stochastic process (Bass, Jeuland and Wright 1976; Ehrenberg 1959, 1972/1988).

Markets therefore remain approximately stationary because brand purchase propensities are largely immune to change; people will experiment with a brand on deal but they rarely modify their later purchase pattern (Ehrenberg, Hammond and Goodhardt 1994). As we saw in Chapter 2, this is in keeping with the assumption that purchase and brand choice can be well represented by a zero-order process (Bass *et al.* 1984; Ehrenberg 1959, 1972/1988; Kahn, Kalwani and Morrison 1986).

5.2 Repeat Buying Erosion and New Buyer Growth

In practice however, some individual propensities to purchase will change and our interest in this Chapter is in the proportion of buyers of a brand who do switch permanently - the leakage from the pool. Ehrenberg (1972/1988) compared repeat-purchase from Q1 to Q2 with repeat-purchase from Q1 to Q3 (for one category) and found that the erosion of repeat purchase over the extra three months was approximately 6%. In a stationary market such erosion will be counterbalanced by new buyer growth among those who do not currently buy the brand. By following a

cohort of brand buyers over several quarters we should be able to detect any proportional loss of repeat-purchase (erosion).

5.3 Research Objectives

Our focus here is on the repeat-purchase of buyers over an extended period. The objectives are to establish:

- (i) The incidence and scale of repeat-purchase erosion.
- (ii) The shape of the repeat-purchase erosion function.
- (iii) Whether erosion differs:
 - (a) between categories
 - (b) according to market concentration
 - (c) by brand purchase frequency within categories
 - (d) by brand order
 - (e) between heavy and light brand buyers

5.4 Methodology

5.4.1 Data

Consumer purchase data were analysed using nine non-seasonal grocery panel datasets, each covering a period of two or more years in the 1980s. The datasets were:

Germany: ground coffee, laundry detergent, toothpaste and carbonated drinks UK: detergent and toothpaste

US: laundry detergent, instant coffee and crackers

For each dataset the purchase histories for between 2,000-3,000 households were studied - only continuous buyers' purchase histories were used since it was important

that the brand erosion findings were not confounded with panel attrition. These datasets are all for mature near-stationary product categories.⁶⁶

5.4.2 Procedure

For each dataset repeat-buying rates for the five leading brands were calculated, provided that these brands were well-established and relatively stable; in two cases the fifth brand showed substantial growth in some quarters and was replaced in our analysis by the sixth largest brand. Buyers who bought the brand during the base quarter (termed here Q1) were identified and their repeat purchases in the following five quarters recorded. The number of new buyers of each brand in these five quarters, plus the purchase frequencies for new, repeat and lapsed buyers, were also computed. The quarterly NBD repeat-purchase norms were calculated for each brand.

For each of the five leading brands in every dataset the analysis was performed three times, using the first, second and third quarters, respectively, as the base period. The results of the three analyses were averaged to reduce the effect of short-term sales fluctuations (in Tables 7 to 10 the base is always referred to as Q1 for simplicity). In addition, brand buyers were segmented into light, medium and heavy purchasers, according to their weight of purchase in an extended base period (of three quarters), and the above analyses were repeated for each of these buyer segments. In total, across all brands this equals over 400 separate calculations of the five quarterly repeat-buying rates.

⁶⁶ Overall market and brand stationarity was checked by calculating quarter-to-quarter penetration, frequency and sales data for leading brands in each category. In all categories there were small quarterly fluctuations for such measures, but categories/brands showing any systematic trends were excluded from the analyses (initially two other categories - soup and catsup from the US - were considered, but both were rejected as their strong seasonality made them unsuitable for this study). For all brands included in the study, year-on-year market shares were virtually the same (within 1 or 2 percentage points). The brand purchasing frequency of repeat-buyers was also approximately stable over time.
5.4.3 An Example - German Coffee

To illustrate the procedure the results for German ground coffee are shown in Table 7. For the leading brand, Jacobs, 61% of buyers in the base period (Q1),⁶⁷ were repeat-purchasers in Q2; repeat-purchase rises - 63% of buyers in the base period were repeat-purchasers in Q3 and Q4 - then falls to 58% in Q6 - an erosion of 3 points or 5% over the year. For this single brand there is little trend in the repurchase rates.

Brand*	Repeat-b	uyers as a in the ba	percenta se quarte	ge of thos er (Q1):	e buying	Erosion			
	Q2	Q3	Q4	Q5	Q6	(Q2-Q6 as % Q2)			
Jacobs	61	63	63	61	58	5			
Aldi	69	65	62	59	57	17			
Tchibo	62	60	57	55	54	15			
Eduschio	54	48	44	44	43	20			
Arko	60	61	57	58	52	13			
Weighted av.	63	61	58	56	54	14			

 Table 7. Repeat-Purchase and Erosion: German Ground Coffee

 (GfK data, 1988-90)

Note: *Five leading brands in market share order

The last row of Table 7 shows the average erosion for the five leading brands in this category (weighted by market share). The average rate falls quite uniformly by about two points a quarter so that for German ground coffee there is an average decline in repeat-purchase from 63% in Q2 to 54% in Q6, an erosion of 14% over the year.

 $^{^{67}}$ Not literally Q1, but the average of results for the three analyses starting in Q1, Q2 and Q3, as described in the previous section.

5.5 Main Results Across Nine Datasets

5.5.1 The Scale of Erosion

Table 8 shows quarter-by-quarter repeat-purchase rates for all nine datasets. The first column gives the average NBD-predicted repeat-purchase rate for the five leading brands in the category based on Q1 penetrations and weighted by market share - the Table is ordered by this variable. The main section of Table 8 details the repeat-purchase rates from Q2 to Q6 for each dataset. The NBD model closely predicts the average Q2 repeat-purchase rate (last row, 56% predicted, 55% observed), but, as can be seen, the observed repeat rate for later quarters progressively falls away from this predicted rate (Q2 = 55%, Q3 = 53%, Q4 = 51%, Q5 = 49%, Q6 = 47%).

Table 8.	Quarterly Repeat-Purchase Rates for Nine Datasets
Repeat-bu	yers as a percentage of those buying in base quarter (Q1)
(W	eighted average of top five brands in each dataset)

Dataset	NBD	%	Repeat-b	uyers in	ient	Erosion	
	predicted		Ģ	uarters	:		
	repeat rate %	Q2	_ Q3	Q4	_Q5	_Q6	(Q2-Q6 as %Q2)
Ger. carb. drinks	71	65	60	59	58	56	14
UK detergent	67	65	61	58	56	54	17
Ger. ground coffee	67	63	61	58	56	54	14
US instant coffee	57	55	52	48	46	45	18
US crackers	56	54	54	51	49	46	15
UK toothpaste	52	53	51	47	43	39	26
US detergent	52	51	49	47	48	47	8
German detergent	43	47	47	44	43	40	15
German toothpaste	42	43	43	42	40	37	14
Average	56	55	53	51	49	47	15

The last column of the Table gives the average annual erosion in each category. Erosion occurs in every category. The average erosion over a one-year interval for all nine datasets is 15%. *This means that, even when sales are stationary, a typical* brand is losing 15% of its regular (repeat) buyers each year.⁶⁸ With the exception of two categories, US detergent (8%) and UK toothpaste (26%), the category erosions are close to the average.

5.5.2 The Shape of the Erosion Function

In Table 9 we compare the overall trend in the average repeat-purchase rate (bottom line, from Table 8) with the corresponding data for "new" brand purchase. New brand purchase is also expressed as a percentage of the buyers in Q1 (so that repeat-purchase and new purchase will sum to 100% in an exactly stationary market). It can be seen that, in the cases studied here, repeat-purchase and new purchase are approximately balanced. Repeat-purchase shows a linear decline from Q2 to Q6, while new purchase flattens after two quarters.

	Quarters:							
	Q2	Q3	Q4	Q5	Q6			
Repeat-purchase %	55	53	51	49	47			
New purchase %	45	49	51	51	51			
Sum : %	100	102	102	100	98			

 Table 9. Repeat and New Purchase Over One Year

 Average of nine datasets, leading five brands

To test whether the fall in repeat-purchase will also flatten after the first year we conducted a longer two-year analysis of German coffee and UK detergent data (in both cases we had access to datasets containing three or more years of purchasing information and so were able to conduct three replications on each category using Q1, Q2 and Q3 as base periods - as described in Section 5.4.2). It was found that erosion averaged 16% in the first year and a further 8% in the second year with corresponding

⁶⁸ More accurately, the average brand is losing 15% of its repeat-buyers in a year. We can term repeat buyers regular buyers because we know that around half a brand's buyers only buy once in a year (see Chapter 2). The aggregate gains and losses must match since these are all near-stationary markets (so the average brand must be acquiring an equal number of new buyers in the year).

changes in purchase growth. Thus there is limited evidence from these two cases that both erosion and purchase growth flatten over periods longer than a year.

5.5.3 Differences by Category

Table 10 shows the erosion results from the last column of Table 8 with the corresponding data on purchase frequency and market concentration for each dataset. We have already noted the two outliers - UK toothpaste and US detergent - however differences in the scale of erosion do not appear to be either country or category specific. Neither does there appear to be an obvious difference by method of data collection; the three US categories came from scanned purchase data and the German and UK data were collected by home-diary. There is also no relationship between erosion and the frequency of brand purchase (r = < 0.1) but there is a small positive correlation (r = 0.4) with market concentration (aggregate market share of top five brands).

Dataset	Av.quarterly brand purchase frequency	Market concentration (top 5 brands) %	Average erosion (from Table 8) %
German carb. drinks	3.2	61	14
UK detergent	2.6	76	17
German ground coffee	2.6	35	14
US instant coffee	2.0	59	18
US crackers	1.8	23	15
UK toothpaste	1.7	64	26
US detergent	1.7	46	8
German detergent	1.5	55	15
German toothpaste	1.4	30	14

 Table 10. Erosion, Purchase Frequency and Market Concentration

 (Weighted average of top five brands in each dataset)

5.5.4 Erosion and Purchase Weight

Buyers of each brand were divided into light, medium and heavy using a nine-month base period.⁶⁹ A base period of nine months (Q1 to Q3) allowed erosion to be calculated over a one-year interval (Q4 to Q8). The aim was to achieve a light:medium:heavy buyer breakdown of roughly 50:30:20 (because of integer jumps in purchase weight the actual outcome was 54:29:17). This ratio of buyers gave a *sales* ratio of approximately 20:30:50.

	Average of nine datasets, leading five brands									
Buyer group	n base ers	Erosion								
	Q4	Q5	Q6	Q7	Q8	(Q8-Q4 as % Q4)				
Light	25	24	22	23	22	13				
Medium	53	51	48	46	45	15				
Heavy	83	80	77	73	71	15				

 Table 11. Repeat-Purchase by Light, Medium and Heavy Brand Buyers

 Average of nine datasets, leading five brands

Table 11 shows repeat-purchase rates for light, medium and heavy brand buyers averaged across the nine categories. Erosion is close to 15% over a year, as previously found, and is not related to purchase weight. Lighter buyers naturally have much lower quarterly repeat-purchase rates, but they do not appear to be more prone to change allegiance over the medium term (i.e. the annual erosion finding is very similar across the three segments).

5.5.5 Brand-Order Effect

In seven of the nine datasets the brand leader exhibited less erosion than other brands. However, this did not seem to be a market share effect - there was no difference in the erosions for the second to fifth-placed brands. On average, erosion for the brand

⁶⁹ The original one-quarter base period was too short for most buyers to make enough purchases to gauge individual household brand purchase weights, while a base period of a year or more gave too few subsequent test periods.

leader was 11% over a one-year period, while erosions for the second to fifth-placed brands were 17%, 18%, 19% and 18% respectively.

5.6 Discussion

5.6.1 Scale of Effects

The incidence and scale of the erosion of repeat-purchase brand loyalty has been established. Erosion was observed in all nine product categories covered; the variation was modest with most results close to the average of 15% in the first year. Analysis of two 3-year datasets indicated that erosion tended to flatten after the first year. This flattening would be expected if buyers differ in their loyalty and, after the first year, the more loyal purchasers remained. It should be emphasised that all the brands studied were in mature, near-stationary markets and that at the aggregate brand level, erosion was therefore necessarily balanced by an approximately equal growth in new buyers.

The built-in replication design of this study - the results reported for each dataset are an average of three analyses using different base periods - allows us to have considerable confidence in the robustness of these findings. The finding that erosion is again close to 15% using the longer base period gives strength to the main finding and suggests that erosion is not sensitive to the length of the base period. The relative constancy of erosion for different base periods is a consequence of the finding that erosion does not differ by weight of purchase. Longer base periods include a higher proportion of light buyers, but since light buyers erode at much the same rate as heavier buyers, there is little or no impact on the overall rate of erosion.

The evaluation of these findings depends on the perspective taken. Those who think that the stationary market contains little churn may consider a 15% loss in repeatpurchase loyalty over a year to be large, and may see more justification for promotional spending (often designed) to retain and to recruit buyers. Those who think that purchasing is volatile may be surprised by the fact that so many buyers continue to re-purchase over long periods of time (even though they may not buy in some quarters).

5.6.2 Factors Underlying Erosion

The results presented in this Chapter indicate that erosion of brand loyalty is a consistent, pervasive empirical fact that is little related to the other factors studied. The lack of a relationship between erosion and average brand purchase frequency is consistent with the view that buyers can have ongoing and stable purchase propensities for brands that are infrequently bought.

The evidence that erosion does not differ by weight of purchase is contrary to findings by Kuehn (1962), based on much more limited data, that the purchase probabilities of light brand buyers change more than those of heavier buyers. The uniformity of erosion between buyers of different weight is relevant to the division of sales between heavy and light buyers (reviewed by Schmittlein, Cooper and Morrison 1993). The computation of this ratio depends upon the length of the base period taken; longer base periods include a higher proportion of light buyers, but, since light buyers erode at much the same rate as heavier buyers, erosion does not bias this ratio.

The scale of erosion was related to brand order; the market leader in a category usually displayed less erosion than any of the lower-placed brands, i.e. market leaders maintain their repeat-purchase better than lower-placed brands. It is possible that the lower erosion for market leaders is connected with the higher advertising spends or the better distribution that are common for such brands. But it has not been attempted here to explain erosion with reference to marketing activity. First, because the main and most important aim was to establish the extent and scale of erosion. Second, because replication in different categories and countries was felt to be essential and much of the data carried no information on marketing mix variables. However, it is recognised that marketing activity can provide the basis for long-term changes. In this connection we draw attention to the low erosion for US detergent. This market was particularly turbulent over the period of measurement (additional data indicate that there was a large amount of promotional activity in this market, compared to the other markets studied here; up to 80% of purchases involved a deal of some sort), yet erosion was below average. This result is consistent with the finding that promotions mostly attract past buyers (Ehrenberg, Hammond and Goodhardt 1994).

5.7 Further Applications

This work has established a method for measuring erosion and opens the way for further investigations. In particular there is scope for examining:

- 1. The sources of erosion. Buyers may leave brands because they abandon the category, substitute one brand for another, or because a change of store or distribution affects brand availability.
- 2. Erosion and long-term brand sales movements. In non-stationary markets erosion and new purchase growth are not symmetrical since erosion is limited by existing sales while growth is not limited in this way. Brands may grow both by reduced erosion and by increased growth and an understanding of these mechanics could assist marketing strategy.
- **3. Stability of erosion by weight of purchase**. The evidence that erosion does not differ by weight of purchase, or the related finding that it does not differ for base periods of different length, needs further investigation and testing.
- 4. The relationship between temporal brand loyalty and preferential loyalty. Temporal brand loyalty can be measured as the inverse of erosion and preferential

brand loyalty can be measured (in behavioural terms) as the proportion of category purchase or expenditure. We know that, at the aggregate level, the common measure of share of category purchase (SCR) correlates closely with repeat purchase (since both are related in the NBD-Dirichlet model to market share), but we have no previous evidence of the relationship between different levels of preference and erosion.

In the next Chapter we take a preferential measure of brand loyalty - share of category requirements - and refine this measure to take account of a buyer's favourite brand. Again I relate this "new" measure to the corresponding Dirichlet predictions. In Chapter 7 we investigate point 4 above - the nature of the relationship between erosion and preferential loyalty. Points 1 to 3 above are not examined in this thesis and remain opportunities for further work.

6. THE IMPORTANCE OF THE FAVOURITE BRAND

Summary

In this Chapter loyalty is considered in the context of multibrand buying. Most consumers have a portfolio of brands that they buy, some more frequently than others. But what percentage of a consumer's product category purchases are accounted for by their most preferred or favourite brand? How does this differ from brand to brand, between different kinds of products and for different consumer segments? Related to these questions, are others concerning heavy brand buyers: are heavy brand buyers more "loyal" than lighter buyers (in terms of the percentage of category requirements satisfied)? Finally, can we predict preferred brand and heavy buyer loyalty by creating NBD-Dirichlet "norms" using simulated data.

In this Chapter I answer these questions through the empirical investigation of the most preferred brand across a number of different categories. We find that:

- The average brand accounts for around 30% of buyers' category requirements.
- When a brand is the favourite brand it is bought about twice as often by its buyers compared with the average brand bought, and accounts for just over half of its buyers' category requirements.
- In terms of sales importance, the approximately one third of customers of a brand who treat it as their favourite, account for two thirds of a brand's sales.
- These findings are well-predicted by the Dirichlet model.
- The results for heavy category buyers are broadly similar to those listed above.
- For heavy brand buyers, there is a discrepancy in model fit. Heavy brand buyers give a significantly higher share, than expected, of their category purchases to the brand.

6.1 Multibrand Buying

In this Chapter loyalty is considered in the context of multibrand buying. The main loyalty-related measure which takes account of the tendency of shoppers to be multibrand buyers (and multibrand loyal), is a measure of revealed preference, namely the proportion of category purchasing accorded to any particular brand. This measure is termed "Share of Category Requirements" (SCR), sometimes also called "Share of Requirements Satisfied".⁷⁰

SCR is the percentage of category sales accounted for by a particular brand amongst all buyers of that brand in the relevant time period, i.e. how much the customers of each brand satisfy their product needs by buying that brand rather than by buying other brands. This is one of the most common loyalty measures used by market research companies and, according to Bhattacharya *et al.* (1996), typically the only measure of brand loyalty that most marketing managers see on a regular basis. Johnson (1984) made use of the SCR measure in his longitudinal study of brand loyalty changes over a ten-year period and numerous further practical applications of the measure can be found in Ehrenberg (1991) and Uncles *et al.* (1994).

This empirical study builds on the SCR measure. It has been shown empirically that SCR for an average brand is typically low - around 30% over a year, e.g. in Chapter 2, Table 3, we saw that SCR for the average brand of UK laundry detergent was 29% over a year. However, SCR may be misleading as a measure of brand loyalty, because, as described in Chapter 2, a brand typically has a large number of *light* buyers; on average, 50% of brand buyers buy the brand once only in a period as long as a year. These once-only brand buyers will tend to ensure that the overall brand SCR is low. SCR includes all brand buyers, but it may be more appropriate to

⁷⁰ Our focus here is on revealed purchase behaviour, not "share of mind" - which is a common attitudinal measure.

concentrate on a consumer's most preferred or "favourite" brand, or to break SCR down by light, medium and heavy buyers of the brand.

In this study we compare average brand SCR with SCR for the most preferred or favourite brand (SCR_f), and additionally break down SCR by different weights of brand purchase. The study is conducted across ten datasets of frequently-purchased consumer goods categories in four countries: the UK, US, Japan and Germany. Data for this study come from long-term consumer panels. The time period of analysis is one year.

6.2 Previous Evidence

There is extensive empirical evidence that, for frequently purchased products, buyers tend to have a portfolio of brands from which a particular purchase is made (Cunningham 1956; Ehrenberg 1972/1988; Uncles *et al.* 1994). Over a period such as a year, the proportion of buyers purchasing one brand exclusively (sole brand buyers) is low, ranging from, for example, 4% for US paper towels to 17% for US chilled orange juice (Ehrenberg and Uncles 1997). The relative share of purchase that individual households give to each brand is usually calculated as a ratio of brand to category purchases - the share of category requirements (SCR) ratio (Bhattacharya *et al.* 1996; Bucklin and Lattin 1991; Fader and Schmittlein 1993; Johnson 1984; Tellis 1988).

At the aggregate level, SCR can be calculated as the ratio of total purchases of the brand to total category purchases among those who buy the brand in the reference period (Ehrenberg 1972/1988; Uncles *et al.* 1994).⁷¹ However, in the long run, one brand is preferred and will be bought more than others. The SCR measure does not distinguish between a low share given to the most preferred or favourite brand and a

⁷¹ Ehrenberg (1972/1988) and Uncles *et al.* (1994) calculate aggregate SCR using purchase occasions as the unit of analysis, other researchers include the quantity or volume purchased (Bhattacharya *et al.* 1996; Tellis 1988).

secondary brand with the same share. In this study we use SCR, for the most preferred or favourite brand, *calculated at the individual household level*, as a measure of preferential loyalty, as in studies by Cunningham (1956), Deighton, Henderson and Neslin (1994), and Helsen and Schmittlein (1994). This measure covers the majority of sales and ensures that there is only one share measure per household.

Early studies using panel data revealed the extent of brand loyalty that could exist within individual product categories. Brown (1953) found that loyalty varied across product categories; taking six categories he showed that between 20% and 60% of buyers were loyal to their favourite brand during the 12 months under study. Cunningham (1956/1961) found that, across a total of 18 products, the average family concentrated 65% of its product class purchases on a favourite brand. For sixty-six families buying seven products over a three year period (excluding very light purchasers), loyalty to the favourite brand ranged from an average of 90% for the top 10% loyal households in each product category to an average of 25% for the least loyal 10% of households.

More recently, Deighton, Henderson and Neslin (1994) computed individual household brand shares (SCR) over just three purchases and found that, on average across three categories, 72% of purchases were concentrated on the favourite brand.⁷² The evidence from questionnaire surveys, where consumers are asked to recall their recent purchases or state their favourite brand, agrees with the results from panel analyses. Rubinson (1979) found that, after a gap of six months, consumers' reported brand loyalty in an unnamed but "common" product category varied from 54% to 100%; East *et al.* (1995) showed that, for four frequently-purchased grocery products, the "usual" brand accounted for approximately 65% of category spending.

 $^{^{72}}$ But this method may artificially raise the SCR measure; with just three purchases even an equal favourite brand must have a score of at least 33.3%.

6.3 SCR for the Average Brand

Ehrenberg (1972/1988) reports that, for a typical grocery product such as coffee or detergent, the share of category requirements (SCR) satisfied by any one of the leading brands is typically only about 30%. Confirmatory evidence for this low figure for SCR is provided by Uncles *et al.* (1994), who find that, across sixteen products where there are at least ten itemised brands, the average SCR is 29%. Both Ehrenberg (1972/1988) and Uncles *et al.* (1994) demonstrate that, within any particular category, there is a predictable and positive relationship between market share and SCR. A larger or more 'popular' brand has more buyers; its buyers buy it more heavily; and it enjoys greater loyalty from its buyers in that they devote a larger share of their product category purchases to that brand.

This trend with brand size, called 'Double Jeopardy' (DJ) (Ehrenberg, Goodhardt and Barwise 1990), has not only been found empirically, but is predictable from the Dirichlet model (Goodhardt, Ehrenberg and Chatfield 1984).⁷³ In the Uncles *et al.* (1994) study, the Dirichlet predictions for SCR for sixteen products averaged 32% (compared with 29% observed), and the model also closely predicted a larger SCR for bigger brands and a lower SCR for smaller brands. However, the model does not directly provide norms with which to compare buyer behaviour measures of favourite brands nor for SCR broken down by purchase weight. For these measures we need to obtain norms from simulated data generated from product field and brand summary data and the Dirichlet switching parameter.

6.4 The Favourite Brand: Research Objectives

The research questions in this study are:

⁷³ Strictly speaking the SCR trend is not due only to the law of Double Jeopardy, but also to the law of Natural Monopoly (see Chapter 2) which tends to reinforce the effect of the DJ trend.

- 1. What percentage of a consumer's category purchases are accounted for by their favourite brand?
- 2. How does this differ between brands, between different categories, between the same category in different countries, and between different consumer segments?
- 3. The SCR measure is commonly used to describe brand loyalty. What extra information do we gain when we focus on the share of category requirements for the most preferred or favourite brand? Or on SCR broken down by purchase weight?
- 4. SCR is well-predicted by the Dirichlet model. Can loyalty patterns for SCR for the favourite brand and SCR for once-only, light, medium and heavy brand buyers also be predicted accurately from simulated data obtained using Dirichlet model parameters?

6.5 Methodology

6.5.1 Data

In this study individual household panel purchase data from the UK, US, Germany and Japan are analysed. The product fields studied are:

Germany - ground coffee, laundry detergent, toothpaste UK - instant coffee, laundry detergent Japan - instant coffee, laundry detergent, toothpaste US - instant coffee, laundry detergent

The household panels range in size from 1,000 to 5,000 panellists; all panellists are 'continuous', i.e. they were on the panel for the whole time period being considered. The time period for analysis is a year and in that time the typical panellist makes around 14 purchases of each of these categories. The individual unit of analysis is again the single purchase occasion.

6.5.2 Observed Brand Preference Measures

A number of related measures of brand loyalty are used, enabling results to be compared with previous studies and also establishing new 'norms' for favourite brand measures. For each brand these measures are compared with similar measures calculated for the brand when it is a favourite or most preferred brand. SCR is also broken down by *brand* purchase weight and by *category* purchase weight. Results are aggregated at two levels; by category and by brand order (all the brand leaders are aggregated, then all the second-place brands etc.).

6.5.3 Minimum Thresholds

In the results presented in Sections 6.6 to 6.9, very light buyers of the product are excluded - a very light buyer is one making less than three purchases of the product category in the stated time period (here a year). The rationale for excluding such buyers is:

- (i) Manufacturers have limited interest in very light buyers: typically by excluding very light buyers, over 90% of sales and over 70% of buyers are retained in the sample.
- (ii) Very light buyers distort the loyalty findings: if a household makes only one category purchase in a year then the brand they choose must account for 100% of their category requirements, if they make two purchases, then their brand loyalty will be at least 50%. For this reason other researchers, e.g. Cunningham (1956, 1961); Deighton, Henderson and Neslin (1994), also excluded very light category buyers from their loyalty analyses.

6.5.4 Predictions from Simulated Data

Simulated data are created for a sample of the available datasets. For these datasets, for the leading five brands over the year being studied, the Dirichlet model parameter (S) and the exponent of the NBD (K), are calculated from the raw panel data using the *BUYER* software package. The S parameter gives an indication of the heterogeneity of buyers in the market. A high value of S indicates that there is minimum diversity, everyone has a similar propensity to buy individual brands. The K parameter reflects the extent to which overall purchasing differs from the mean, M.⁷⁴ The other descriptive information needed to create a simulated panel is the market share for each named brand and the overall mean rate of purchasing in the market (M).

These data (S, K, M, plus brand shares) are input into a purpose-written computer program which then generates brand choice probabilities and product and brand rates of buying (according to Gamma and Poisson distributions), and outputs brand frequencies for each "household". The simulated panel size were set at roughly the same number as the actual panel size (e.g. around 4,000 household for UK detergent).⁷⁵ As a double-check on the simulation procedure, Dirichlet values for all common measures (e.g. penetration, purchase frequency, etc.) were calculated for the simulated panels; the fit was found to be very close.

⁷⁴ The S and K parameters are described in more detail in Appendix 1.

⁷⁵ The size of the simulated panel was largely set by the computing space available for storing the records produced. With increasingly disc storage, we can now increase such panel sizes to 10,000+.

6.6 An Example: Bold Laundry Detergent (UK)

6.6.1 Brand Performance Measures for All Buyers of Bold

To illustrate the measures used, Table 12 gives an overview of the results for one brand of UK laundry detergent. The brand, Bold, with a market share of 13%, has been chosen since it is typical of this category (i.e. a largish brand but not the market leader).

 Table 12. Brand Performance Measures: All Buyers, Bold Detergent,

UK Laundry Detergent, 1986										
Brand	Market Share	SCR								
	%	%			%					
Bold	13	37	5.3	16.6	32					

Relative Market penetration (b/B)⁷⁶

Market penetration, in this study, is defined as the percentage of relevant *category buyers* purchasing a particular brand during the stated time period (rather than the more common definition where market penetration is the proportion of the relevant *population* buying the brand in a stated time period). In this study relevant category buyers are those making three or more purchases of the category in a year. For example, there are approximately 4,000 panel members on the AGB UK panel for 1986 of whom 3,402 make three or more purchases of detergent in the year, and of these 1,253 purchase Bold; Bold has a relative market penetration of 37% (1253/3402)*100.

Mean rate of purchase of the brand (w)

These 1,253 Bold buyers make 6,669 purchases of the brand; the average annual purchase frequency for Bold is 5.3. For (w) the distribution about the average is typically described by a Negative Binomial distribution (see Appendix 1 for more details).

⁷⁶ In order to simplify notation, 'b' not the more accurate 'b/B' will be used in subsequent tables.

Mean rate of purchase of the category by brand buyers (wp)

In a year the 1,253 Bold buyers also make 14,077 purchases of other brands, so in total they make 20,746 category purchases; the average annual category purchase rate for Bold buyers is 16.6.

Share of category requirements, SCR (w/wp)

For Bold buyers, Bold accounts for 6,669 of their 20,746 category purchases, or 32%.

6.6.2 Brand Performance Measures: Bold is the Favourite Brand

We now look at the same measures (plus some additional ones) for when Bold is the favourite brand. A buyer's favourite, or most preferred brand, is the single brand which accounts for the highest proportion of the buyer's purchases in that category. Where two brands tie as a favourite they are given a 0.5 weighting each for that buyer, where three or more brands tie, the buyer is excluded from the study for that dataset (typically less than 20 panellists were excluded for each dataset; around 1% of the sample).⁷⁷

The same four measures detailed in Section 6.6.1, are now reported for Bold when that brand is the favourite; these measures are reported in the left-hand section of Table 13.

Market penetration of the favourite brand (b_f)

Of the 3,402 detergent purchasers, 1,253 purchase Bold and of these 497 or 15% of all detergent buyers have Bold as their favourite brand.

Mean frequency of purchase of the favourite brand (w_f)

The 497 buyers of detergent who have Bold as their favourite brand make 4,963 purchases of Bold in the year; on average 10 purchases.

⁷⁷ We could have given a weight of 0.33 to each brand where there were three equal favourites, and so on, but as these ties were rare and the computations increasingly cumbersome, we excluded the 1% of panellists who had three or more equally preferred favourite brands.

Mean frequency of purchase of the category by favourite brand buyers (w_fp)

The 497 buyers with Bold as their favourite brand also make 2,380 purchases of other brands, so that in total they make 7,343 category purchases; the average annual category purchase frequency for Bold (favourite) buyers is 14.8.

Share of category requirements satisfied by the favourite brand, SCRf

For Bold (favourite) buyers, Bold accounts for 4,963 of their 7,343 category purchases or 68%.

Table 13. Brand Performance Measures: Favourite Buyers, Bold Detergent

UK Laundry Detergent, 1986									
Brand	b _f	Wf	w _f p	SCR _f	b _f /b	w _f /w	w _f p/wp	b _f w _f /bw	
	%			%	%			%	
Bold	15	10.0	14.8	68	40	1.9	0.9	74	

Additionally a number of other measures are reported for the favourite brand, these are shown in the right-hand section of Table 13.

The percentage of brand buyers with that brand as their favourite (b_f/b)

1,253 panellists buy Bold, 497 of them, or 40%, have Bold as their favourite brand.

Ratio: w_f/w

The rate of purchasing Bold when it is a favourite is about twice the average rate of purchasing Bold (i.e. w_f (10) divided by w(5.3) = 1.9).

Ratio: wfp/wp

However, the rate of buying any brand of detergent by favourite Bold buyers is about the same as for all buyers of Bold (ratio = 0.9).

Bold

25

The sales importance of the favourite brand ($b_f w_f / bw$)

If Bold has 6,669 sales and 4,963 of these are to buyers for whom Bold is the favourite brand, then these (favourite) sales account for 74% of all Bold sales.

6.6.3 Levels of Brand Loyalty for Bold

Preference for the favourite brand can be sub-divided into the percentage of buyers who buy only that brand (sole buyers), those with a high preference (their favourite brand accounts for 75% to 99% of their category purchases), moderate preference (their favourite brand accounts for between 51% and 74% of their category purchases), and low preference (their favourite brand accounts for 50% or less of their category purchases). These levels of preference, together with the brand purchasing frequency for each level are illustrated in Table 14, again with reference to Bold detergent.

 Table 14. Preference Levels: Favourite Buyers, Bold Detergent,

 	UK Laundry Detergent, 1986										
	Preferen	nce Level		P	urchase	Frequenc	у				
Sole	High	Med.	Low	Ws	w _H	WM	WL				
buyers	pref.	pref.	pref.								
%	%	%	%								

23

10

14

9

7

Sole Buyers = % buyers for whom $SCR_f = 100\%$ and,

28

$w_S = how$ frequently they purchase the brand

24

25% of buyers who have Bold as their favourite brand are sole-brand buyers (100% loyal). These sole-buyers make 10 purchases of Bold in the year (w_s). Since they are sole-brand buyers they make only 10 purchases of the *category* in the year; they are therefore relatively light buyers since the average Bold buyer makes about 17 purchases of the category in a year (wp, from Table 12).

High Preference Segment = % buyers for whom $SCR_f = 75\%$ to 99% and, w_H = how frequently they purchase the brand

For 24% of buyers who have Bold as their favourite brand, Bold accounts for between 75% and 99% of their category purchases, these buyers make 14 purchases of Bold in the year.

Medium Preference Segment = % buyers for whom $SCR_f = 51\% - 74\%$ and,

$w_M = how frequently they purchase$

For 28% of Bold (favourite) buyers, Bold accounts for between 51% and 74% of their category purchases, these buyers make 9 purchases of Bold in the year.

Low Preference Segment = % buyers for whom $SCR_f = 50\%$ or less and, $w_L = how$ frequently they purchase

For 23% of Bold (favourite) buyers, Bold accounts for 50% or less of their category purchases and they make, on average, 7 purchases of Bold in the year.

Through segmenting buyers by preference level for their favourite brand we see that the high preference segment buys their favourite brand at about twice the rate of the low preference segment (14 purchases compared with 7). Sole brand buyers have a lower rate of brand purchase (10) than the high preference segment, but higher than the medium or low preference segments (9 and 7 purchases respectively).

In the next Section we look at results for favourite brand measures for all brands of UK detergent and compare these results with Dirichlet norms from simulated data. In Section 6.8 we report observed results for all categories studied. In Section 6.9 we report results for heavy category buyers. In Section 6.10 we look at observed findings and Dirichlet predictions by weight of brand purchase. In Section 6.11 we summarise findings for this Chapter.

6.7 UK Detergent - Observed Values and Dirichlet Norms

6.7.1 Brand Performance Measures for All Buyers

Section 6.6 illustrated the methodology used in this research with results for one brand (Bold) from one category (UK laundry detergent). Bold is a typical leading brand; in market share terms the third largest brand in its category. There is, however, variation between brands on some measures; this is illustrated below using the leading five brands of UK laundry detergent as an example.

Brand	Market	Brand	Rate of brand	Rate of	Share of category
	Share	penetration	buving	category buying	requirements
	%	b %	W	wp	SCR %
Persil	30	57	7.6	16.1	47
Ariel	18	42	6.1	17.1	36
Bold	13	37	5.3	16.6	32
Daz	10	31	4.6	17.3	26
Surf	10	31	4.5	17.3	26
Average	16	40	5.6	16.9	33

 Table 15. Brand Performance Measures: All Buyers, UK Laundry Detergent

 52 weeks, 1986

Results are presented in Table 15 for all buyers of UK detergent making three or more purchases of the category in a year (this represents 84% of UK detergent buyers and accounts for 98% of UK detergent sales). From Table 15 we see that Persil, the market leader with a share of 30%, is bought, over the year, by 57% (b) of detergent buyers. These buyers purchase Persil an average of 8 times (w=7.6), they make 16 purchases of the category (wp) so Persil accounts for just under half, 47%, of their category requirements (SCR). Similarly, Surf, a smaller brand but still accounting for 10% of the market, is bought by 31% of detergent buyers making, on average, just under 5 purchases. For buyers of Surf, that brand accounts for 26% of their category requirements. From Table 15 we also see that the results for both frequency of purchase (w) and share of category requirements (SCR) measures show a pronounced downward trend in line with decreasing market share. This is the double-jeopardy (DJ) trend (Ehrenberg, Goodhardt and Barwise 1990); not only do smaller brands have less buyers, but these buyers buy the brand less often and hence the brand accounts for a smaller percentage of its buyers' category requirements.⁷⁸ So the variation between brands on these measures is closely related to the differing market share of the brands. We will see this closely predicted in Table 17.

6.7.2 Brand Performance Measures for the Favourite Brand

Table 16 reports the same measures for each brand when that brand is the favourite. Persil is the favourite brand for 32% of detergent buyers, Surf is the favourite brand for 10% (b_f); these figures are in line with these brands' market shares - Persil has a market share of 30%, Surf a market share of 10%. Since the percentage of buyers with a brand as their favourite and the market shares of that brand are so close, the brand penetration (b) and favourite brand penetration (b_f /b) figures will also be very close (i.e. fifth column of figures from Table 16 and second column from 15).

The frequency of purchase measure for the favourite brand (w_f) varies from 12 for Ariel down to 9 for Surf. Favourite buyers of each brand make, on average, 16 purchases of the category $(w_f p)$. The average favourite brand accounts for 67% of its buyers' category purchases (SCR_f), again this measure shows a strong DJ-type trend; when Persil is the favourite brand it accounts for 75% of its buyers' category requirements, while when Surf is the favourite it accounts for 54% of its buyers' category requirements. Persil is the favourite brand for 57% of Persil buyers and Surf for 32% of its buyers (b_f/b), with the other brands following this trend.

⁷⁸ The SCR ratio is also affected by the law of Natural Monopoly, as mentioned in Chapter 2. Here we can observe Natural Monopoly in operation in the slightly lower rate of category buying by buyers of the brand leader (wp for Persil = 16.1 versus around 17.0 for other brands).

				<u></u>	<u>KS, 1900</u>			
Brand	Brand	Rate of	Rate of	Share of	Fav. buyers			Sales
1	penetr-	brand	category	category	as % of all			importance of
	ation	buying	buying	req'ments	brand buyers			fav. brand
	b _f %	Wf	w _f p	SCR _f %	b _f /b %	w_f/w	w _f p/wp	b _f w _f /bw %
Persil	32	11	15	75	57	1.5	0.9	85
Ariel	17	12	16	74	41	1.9	0.9	77
Bold	15	10	15	68	40	1.9	0.9	74
Daz	9	10	16	64	29	2.2	0.9	64
Surf	10	9	17	54	32	2.0	1.0	65
Av.	17	10	16	67	40	1.9	0.9	73

Table 16.	Brand Performance	Measures:	Favourite	Buyers,	UK	Laundry	Detergent
		52 wool	1086				

The w_f/w measure records the ratio of the frequency of purchase when a brand is the favourite compared with the average frequency of purchase for that brand. The average w_f/w ratio is 1.9, suggesting that when a brand is a favourite it is bought almost twice as often compared with the average purchase frequency for that brand. This ratio varies from 1.5 for Persil to 2.2 for Daz and 2.0 for Surf, implying that, although the smaller brands have fewer buyers treating them as favourite brands, those that do buy them as a favourite, buy the brand with a higher frequency than do favourite buyers of larger brands (however this finding does not generalise across the other categories studied here).

The $w_f p/wp$ ratio compares the product category purchase rate of favourite buyers with that for all buyers of the brand. The average $w_f p/wp$ ratio is 0.9; there is almost no difference between the product category purchasing rates of all brand buyers and favourite brand buyers.

The sales importance of favourite brand buyers to brand sales is given by $b_f w_f / bw$. Again there is a trend with market share. For the market leader, Persil, 85% of its sales are to buyers for whom Persil is their favourite brand, while for Surf, favourite brand sales account for 65% of all brand sales. On average for UK laundry detergent, favourite brand sales account for 73% of all sales.

6.7.3 Dirichlet Norms for UK Detergent

How do these findings compare with the Dirichlet norms, created from simulated data? Table 17 compares observed and predicted values for some of the main brand performance measures. From Table 17 we see that, on average, the Dirichlet provides an extremely close fit on these measures (e.g. rate of brand buying 5.6 observed and predicted, SCR 33% observed and predicted, etc.). By brand the fit is also generally good. Correlations for observed and predicted values of r=0.98 or greater for brand penetration, rate of brand buying and SCR. For the rate of category buying measure, r=0.49, but here there is very little variation between the values for the different brands.

The only noticeable brand discrepancy is for Persil; the observed rate of brand buying, at 7.6 is higher than predicted (6.8) and this effect feeds through to the SCR measure (47% observed, 42% predicted). Since rate of buying and penetration are the components of brand share - the input into the simulation program - the observed penetration is lower than predicted (57% observed, 64% predicted).

The results in Table 17 provide an extension of the normal observed-versus-predicted comparison; not only were these Dirichlet norms created using simulated data, but the predictions and observed values are for a sample of households who all bought the category three times or more in the year.

				<u> </u>	æks, 190	0				
Brand	Market	Brand		Rate of	brand	Rate of o	category	Share of category		
	Share	penet	ration	buy	ing	buy	ing	requirements		
	%	b %		v	v	W	/p	SC	R %	
		_ 0	T	0	T	0	Т	0	<u> </u>	
Persil	30	57	64	7.6	6.8	16.1	16.2	47	42	
Ariel	18	42	45	6.1	6.0	17.1	16.8	36	36	
Bold	13	37	36	5.3	5.4	16.6	17.4	32	31	
Daz	10	31	29	4.6	5.0	17.3	17.5	26	28	
Surf	10	31	28	4.5	5.0	17.3	16.7	26	30	
Average	16	40	40	5.6	5.6	16.9	16.9	33	33	
Correlation		r= 0.99		r= 0	r= 0.99		r= 0.49			

Table 17. Observed versus Predicted Values: All Brand Buyers, UK Laundry Detergent52 weeks, 1986

O=observed values, T=Dirichlet norms

Table 18 compares observed values for the main favourite brand measures with the corresponding Dirichlet predictions. Again we can see that there is a generally good fit between observed and predicted values, except for the rate of category buying where there is a negative correlation (r=-0.69).⁷⁹ For the sales importance variable (last pair of columns in Table 18), the average observed value is 73%, while the average predicted value is 66%. For this sales importance variable, the predicted values are all lower than the observed ones.

There is also a trend for the observed values to have a wider spread than the predicted ones. If we calculate relative mean absolute deviations (MADs) for each column, we find that the relative MADs for the Dirichlet predictions are always smaller than for the observed values. For example, the relative MADs for the SCR_f variable are 10% for the observed values and 3% for the predictions.

					JZ WCCK	5, 1700	_				
Brand	Fav b	rands as	Ra	ate of	Ra	ite of	Sh	are of	Sales importance		
	% of a	ll brand	b	rand	cat	category		egory	of the favourite		
	bu	yers	b	buying		buying		requirements		brand	
	b _f ,	<u>/b %</u>		Wf		w _f p	sc	R _f %	Sales Importance of the favourite brand b _f w _f /bw% O T 85 76 77 70 74 61 64 63 65 61		
	0	Т	0	Т	0		0	Т	0	T	
Persil	57	49	11.3	10.5	15.1	15.2	75	69	85	76	
Ariel	41	39	11.5	10.8	15.6	16.0	74	67	77	70	
Bold	40	33	10.0	10.1	14.8	15.6	68	65	74	61	
Daz	29	33	10.0	9.4	15.5	15.6	64	61	64	63	
Surf	32	33	9.1	9.4	16.9	14.5	54	64	65	61	
Av.	40	37	10.4	10.0	15.6	15.4	67	65	73	66	
Correlation	г=	0.93	r= 0.91		r=-	r=-0.69		0.68	r= 0.86		

Table 18. Observed versus Predicted Values: Favourite Brands, UK Laundry Detergent52 weeks, 1986

O=observed values, T=Dirichlet norms

⁷⁹ The predicted values are all reasonably near the observed ones, but there is very little variation in this variable (e.g. there is no obvious DJ trend in either the observed or predicted data). The lack of variation and anomalous results for the predicted value for Surf - the predicted values for both wp (see Table 17) and $w_f p$ for Surf are lower than predicted - combine to give a negative correlation. The predicted values for Surf reflect random error in the simulated data (a larger simulated panel would minimise this sampling error).

Chapter 6

6.8 Empirical Findings Across All Datasets: Favourite Brands

6.8.1 Main Findings

Are the results found so far unique to UK detergent, or do the patterns generalise to detergent in other countries and to other frequently-purchased consumer products? Table 19 reports the main brand behaviour measures and favourite brand measures for ten datasets. The Table is ordered by the average rate of buying the category by brand buyers (wp, third column of numbers) which varies from 24 purchases per year for German coffee down to 7 purchases per year for Japanese detergent.⁸¹

	For	all bra	nds bou	ıght	For the favourite brand						
	b	w	wp	SCR	br	Wf	w _f p	SCRf	b _f /b	b _f w _f /bw	
Category	%			%	%			%	%	%	
Ger. Coffee	28	5	24	22	11	10	24	45	37	74	
UK Detergent	40	6	17	33	17	10	16	67	40	73	
UK Coffee	26	6	16	34	13	10	15	66	43	77	
US Detergent	33	3	15	21	12	5	13	41	33	56	
US Coffee	35	4	14	29	13	7	13	58	35	65	
Jap. Toothpaste	47	3	10	32	18	6	7	59	32	58	
Ger. Toothpaste	21	2	10	24	8	4	10	44	35	64	
Jap. Coffee	50	3	9	38	22	5	9	61	39	64	
Ger. Detergent	28	3	8	33	13	4	9	51	44	70	
Jap. Detergent	39	2	7	31	12	4	7	56	_30	55	
Average	35	4	13	30	14	7	13	55	37	66	

 Table 19. All Brands Versus Favourite Brands: Ten Datasets

 Brand Performance Measures for average of top five brands in each category ⁸⁰ 52 weeks, 1980s

Concentrating on the average brand across all ten datasets, and summarising the main results, from Table 19 it can be seen that:

⁸⁰ The total market share accounted for by the top five brands varies from 88% for Japanese coffee down to 20% for US coffee.

⁸¹ The wp variable is very similar to the overall rate of buying the category (W) by all buyers making 3+ purchases. The only difference is that here we are averaging the top five brands in each category.

- (i) In a year the average leading brand (out of the top five in each category considered here) is bought by one third of category buyers (b = 35%). They buy, on average, four times (w). Of those that buy the brand, only 37%, (b_f/b) have it as their favourite brand almost two thirds of brand buyers do not have that brand as their favourite.
- (ii) When a brand is a favourite brand, it is bought by its buyers, on average, almost twice as often as the average brand is bought; 7 times a year (w_f) compared with 4
 (w). When a brand is the favourite it accounts for just over half (SCR_f=55%) of its buyers category requirements, compared with just under a third (SCR=30%) for all buyers of the brand.
- (iii) In terms of sales importance, the 37% of customers of a brand who treat it as their favourite, account for two thirds of the brand's sales ($b_f w_f / bw = 66\%$).

These are the overall results, we now look at the variation between brands - the effect of market share.

6.8.2 Variation Across Brands: The Effect of Market Share

In Section 6.8.1 above, results are reported for the average brand (of the top five brands) in each category. As we noted in the UK example, there is generally variation between brands in a category, for all measures. Most of the variation for UK detergent can be explained (as is usual in Dirichlet-type markets) by differences in market share. In order to establish whether the UK findings (especially those on favourite brands) generalise across categories, the results for all categories are now aggregated by market share position, i.e. all brand leaders, all second placed brands, etc. These results are presented in Table 20. A number of patterns can been seen:

(i) The constancy of some measures; the rate of buying the product is largely unaffected by whether the brand is a favourite or not (both $w_f p$ and wp = 13).

Also there is little variation between the values of wp or $w_f p$ for brands of different size (i.e. the Natural Monopoly effect - usually a very small effect - is not generally observed here).

- (ii) The Double-Jeopardy type of effect is well displayed; the average rate of brand purchase, (w), varies from 5 for the average market leader to 3 for the average fifth-placed brand, (however w_f varies less - from 7 to 6). In a similar way the share of category requirements satisfied by the brand (SCR) varies from 39% for the average market leader down to 21% for the average fifth placed brand. SCR_f, although overall almost twice as high as SCR, shows a similar pattern -59% for the average market leader down to 44% for the average fifth-placed brand.
- (iii) In terms of sales importance, the 51% of customers of the average brand leader who treat that brand as a favourite (b_f/b), account for more than threequarters of the brand's sales ($b_f w_f/bw = 78\%$). The 26% of buyers of the average fifth-placed brand, who have that brand as a favourite, account for only around half of the brands' sales (51%).

		For all	buyer	s of the	e brand		When	the b	rand is t	he favou	favourite				
	Ave.	b	W	wp	SCR	p ^t	Wf	¶,₩	b _f /b	SCR	b _f w _f /bw				
	M.S.	%			%	%			•⁄•	%	%				
Brand leader	24	53	5	12	39	28	7	12	51	59	78				
2 nd	15	37	4	13	34	15	7	13	42	58	72				
3 rd	10	32	3	13	27	10	7	12	32	54	60				
4 ¹⁰	8	26	3	13	25	7	7	13	29	52	60				
5 th	6	21	3	12	21	6	6	12	26	44	51				
Average	13	35	4	13	30	14	7	13	37	55	66				

 Table 20. All Brands Versus Favourite Brands: Ten Categories, By Brand Order

 Average across ten Categories, 52 weeks, 1980s

Favourite Brands by Preference Segment

Finally on the topic of variation by market share, we look at differences in the brand purchasing rate by preference segment. Table 21 shows the proportion of buyers in each preference segment (left half of table), and the purchase frequency for each segment (right half of table). One clear trend is that brand leaders tend to have a higher percentage of sole brand buyers (those who are 100% loyal to that brand) and also a higher percentage of buyers with a high preference for the brand, compared with lower-placed brands. While for these smaller brands a greater percentage of their favourite buyers are in the low preference segment. This is in line with our finding from the previous Table that brand leaders have a higher average SCR_f than lower-placed brands.

	Average across ten categories, 52 weeks, 1980s											
	Sole Buyers %	High Pref. Segment	Med. Pref Segment %	Low Pref. Segment %	W _S	w _H	₩ _M	wL				
Brand leader	20	20	25	36	8	11	7	5				
2 nd	18	19	25	39	9	11	7	4				
3 rd	15	19	24	42	8	10	7	4				
4 th	13	15	26	46	8	11	8	5				
5th	12	12	22	45	8	8	7	4				
Average	16	17	25	42	8	11	7	4				

 Table 21. Favourite Buyers of the Brand, by Preference Segment

 Average across ten categories, 52 weeks, 1980s

The allocation of buyers into different preference segments was explained earlier in this Chapter in Section 6.6.3

The average proportion of buyers in the different loyalty segments differs by brand order (which is here used a proxy for market share). But frequency of brand buying, though varying by loyalty segment, is remarkably consistent across the brand order. The rate for the average (favourite) sole-buyer (w_s) is 8 - similar to the average buying rate for all favourite brand buyers (w_{f_s} =7, Table 20). The average brand buying rate for the high preference segment (w_H) is 11; for the medium preference segment (w_M) it is 7; for low preference segment it is 4. Hence, buyers who are 100% loyal to the brand over a year buy that brand twice as often as buyers who allocate 50% or less of their category purchasing to their favourite brand. We further explore the breakdown by brand purchase weight in Section 6.10, where we compare observed findings for SCR by preference segment with Dirichlet predictions.

We have seen that buyers allocate about twice as much of their category purchasing to a favourite brand as they do to the average brand bought, but that this is generally the same across categories and is predictable. A related issue is how the share of category requirements ratio differs by *weight of category purchase* and by *weight of brand purchase*. In the next Section, 6.9, we repeat the analysis for favourite brand buyers, but this time concentrating on heavy buyers of the category. In Section 6.10 we look at SCR by differing weights of brand purchase, and compare the findings with Dirichlet norms.

6.9 Heavy Category Buyers

The segment of buyers that many managers would like to know most about are buyers who have their brand as a favourite and who are also heavy buyers of the category. In Table 22 below we show brand performance measures for the average heavy category buyer for ten categories. The left-hand side of the Table shows results for measures for all brands bought, the right-hand side of Table 22 shows results for measures for the average favourite brand.

In this Table heavy category buyers are defined as those whose rate of purchase is in the top 20%. These heavy category buyers account for around 50% of category sales (this is a good example of the 80:20 rule - the heaviest 20% of buyers accounting for 50% of sales). In Table 22 the results for heavy category buyers have been calculated for each of the leading five brands in each category and then averaged across these five brands. Again the Table is ordered by the average rate of category purchase (wp). For heavy category buyers this is 22 times a year - almost twice the rate for all buyers (wp = 13 in Table 19). From Table 22 we see that:

140

	Fo	r all bra	ands bo	ught	For the favourite brand						
Category	b %	w	wp	SCR %	b₁ %	Wf	wrp	SCR _r %	b _f /b %	b _f w _f /bw %	
Ger. Coffee	34	8	41	20	12	18	41	45	34	74	
UK Detergent	51	9	32	30	17	21	31	68	33	73	
UK Coffee	32	10	32	31	14	21	32	66	36	78	
US Detergent	48	4	26	16	14	9	27	32	27	49	
US Coffee	47	6	26	24	12	15	26	55	26	62	
Jap. Toothpaste	55	4	15	29	19	9	15	57	29	58	
Ger. Toothpaste	30	3	15	19	9	6	15	38	31	63	
Jap. Coffee	61	5	14	35	24	9	15	60	37	65	
Ger. Detergent	35	4	14	28	15	7	15	47	41	71	
Jap. Detergent	48	3	11	28	14	6	12	55	27	55	
Average	44	6	22	26	_15	12	23	52	32	65	

 Table 22. All Brands Versus Favourite Brands: Ten Datasets, Heavy Category Buyers

 Brand Performance Measures for average of top five brands in each category, 52 weeks, 1980s

- (i) In a year the average brand is bought by 44% of heavy category buyers (b), who make 6 purchases of the brand (w). Of those who buy one of the leading five brands, only 32% (b_f/b) have it as their favourite brand; this is slightly lower than b_f/b for all category buyers (37%, see Table 19).⁸²
- (ii) Favourite brands are purchased by heavy category buyers twice as frequently as the average brand (w_f =12, compared with w = 6). The average rate of buying the category by brand buyers is 22 times in the year (wp). So for heavy category buyers, when a brand is the favourite it accounts for just over half (SCR_f=52%) of their category requirements, compared with just over a quarter (SCR =26%) for all brands bought. The SCR and SCR_f figures for heavy category buyers are slightly lower than for all category buyers (for heavy category buyers, SCR averages 26%, SCR_f averages 52%; for all category buyers SCR averages 30%, SCR_f averages 55%). Heavy category buyers therefore have, on average, a slightly broader brand portfolio than the average category buyer.

⁸² All category buyers here refers to the results in Sections 6.8.1 and 6.8.2, i.e. all 3+ category buyers.

(iii) In terms of sales importance, the one third of heavy category buyers who treat a brand as their favourite, account for two thirds of the brand's sales (b_fw_f/bw = 65%). This is very similar to the figure of 66% for all category buyers (Table 19). Again there is nothing unexpected in the findings for heavy category buyers.

6.9.1 Heavy Category Buyers: Variation Across Brands

If we look at the results for heavy category buyers by brand order (Table 23), the patterns are again very similar to those for all category buyers:

- (i) The rate of buying the product (wp) is largely unaffected by market share or by whether the brand is a favourite. There is little variation between the values of wp for brands of different size (wp = 22, $w_f p = 23$).
- (ii) The Double-Jeopardy effect is again well-observed (w=8 for the brand leader, falling to 4 for the average fifth-placed brand, SCR=35% for the brand leader, falling to 17% for the average fifth-placed brand. The figures for the favourite brand show a similar pattern).
- (i) In terms of sales importance, for heavy category buyers, the 47% of customers of the average brand leader who treat that brand as a favourite (b_f/b), account for more than three-quarters of the brand's sales ($b_f w_f/bw = 79\%$). The 20% of buyers of the average fifth-placed brand, who have that brand as a favourite, account for around half of the brand's sales (48%) (last column, Table 23).

		For	all bra	unds bo	ought		F	or the fa	favourite brand			
	Ave. MS	b •⁄~	w	wp	SCR	b _r	w _f	w _r p	b _f /b	SCR	b _f w _f /bw	
D 11 1	111.5.					/0			70	70	70	
Brand leader	23	62	8	22	35	31	13	23	47	57	79	
2**	15	47	7	22	30	17	13	23	37	57	73	
3 rd	10	42	5	23	23	10	12	23	26	52	58	
4 th	8	36	5	23	22	9	12	23	26	51	61	
5 th	5	28	4	21	17	6	9	21	20	39	48	
Average	13	44	6	22	26	15	12	23	32	52	65	

 Table 23. Brand Performance Measures: By Brand Order - Heavy Category Buyers

 52 weeks, 1980s

Chapter 6

6.10 SCR by Weight of Brand Purchase

Finally, we address the issue of heavy *brand* buyers. Are there differences in the extent to which light, medium and heavy buyers of a brand buy other brands? Can we predict these differences using simulated Dirichlet norms?

In order to explore these questions we take a sample of the datasets already used in this Chapter, and segment brand buyers into once-only, light, medium and heavy buyers. In this Section, and the next, we consider all category buyers, i.e. we do not exclude those who bought the category less than three times in the year. In the time period studied here, a year, once-only brand buyers are, on average, 44% of all buyers, and account for 13% of sales. In sales terms our aim was for roughly a 10:20:20:50 ratio split for sales from the once-only: light: medium: heavy segments. The achieved ratios (averaged across the five leading brands in eight datasets) were 13:18:22:48. This gave averages of 27% of buyers in the light buyer segment, 16% in the medium buyer segment and 14% in the heavy buyer segment.

The actual frequency of purchase cut-off points obviously varied according to the rate of buying the different categories, but for example for UK detergent, a household buying the brand 2-4 times a year would be assigned to the light buyer segment, 5-9 times a year to the medium buyer segment, and those buying the brand 10 or more times a year would be allocated to the heavy buyer segment.

In Table 24 we report the SCR values by the different segments, averaged across the five leading brands in each category. The observed values for SCR are matched with the Dirichlet norms created from the simulated category panels. Table 24 is again ordered by the average rate of category purchase.

	Once-only		Li	ght	Me	lium	Heavy	
	0	Т	0	Т	0	Т	0	Ť
Ger. coffee	5	5	12	12	27	24	63	44
UK detergent	7	8	17	19	38	34	68	59
UK coffee	9	10	22	24	47	43	77	68
US detergent	9	10	18	19	29	29	48	46
US coffee	11	11	21	21	35	33	57	51
Jap. tpaste	20	23	34	35	47	43	60	58
Jap. coffee	21	21	30	30	43	38	63	54
Ger. detergent	18	19	33	32	44	43	67	64
Weighted av.	12	13	23	24	39	36	63	55
Correlations	r= 0.99		r= (0.99	r= () 98	r = 0.77	

 Table 24. Observed and Predicted SCR by Weight of Brand Purchase

 Category averages of top five brands, 52 weeks, 1980s

Average weighted by market share. Overall SCR weighted average = 32%

O = Observed values, T = Dirichlet norms from simulated data

If we look first at the observed values in Table 24, we see clearly that, as expected, for households who are heavier buyers of a brand, that brand, on average accounts for a greater proportion of their category purchasing (compared with lighter brand buyers). If we now compare the observed findings with Dirichlet predictions, the two most interesting findings from Table 24 are:

- (i) There is a close fit between observed and predicted values for the once-only, light and medium segments. In terms of trend, SCR for medium brand buyers is very slightly but consistently under-predicted.
- (ii) The main discrepancy is for heavy brand buyers. For every category, the observed values are higher than the predicted ones. Heavy brand buyers give a significantly higher share of their category purchases to the brand than expected (on average 63% observed compared with 55% predicted).

A further important finding is that, in absolute sales terms, heavy brand buyers are still also average buyers of other brands. We illustrate this in Table 25.
Table 25. Buying of the Brand and Buying Other Brands by Weight of Brand Purchase
Averages of top five brands across eight categories - observed values

	Light Buyers	Medium Buyers	Heavy Buyers
Frequency of brand purchase	3	5	13
Frequency of category purchase	12	14	21
Frequency of buying other brands	9	9	8
SCR	23	39	63

The average frequency of brand purchase for heavy buyers is 13 and their average frequency of category purchase is 21; for every 13 purchases going to any one particular brand, 8 are going to other brands. However, heavy brand buyers make roughly the same number of purchases of other brands in a year as do light or medium brand buyers; for light buyers, 3 purchases to the brand are matched by 9 to other brands (total 12); for medium buyers, 5 to the brand are matched by 9 to other brands (total 14).

6.10.1 SCR by Purchase Weight: Variation Across Brands

From Table 26 we see a similar finding to that shown for favourite brands; the Double Jeopardy effect is well observed and well-predicted. For each segment, average SCR declines more-or-less steadily from the brand leader to the fifth-placed brand. The main finding again is that SCR for heavy brand buyers is consistently under-predicted by the Dirichlet. This applies to all brands - large and small.

	Once-only		Lig	Light		ium	Heavy	
	0	<u> </u>	0	Т	0	Т	0	T
Brand Leader	15	15	26	26	42	38	65	58
2 nd	12	13	23	24	40	38	64	54
3 rd	12	13	22	23	34	34	58	52
4 th	11	12	20	21	36	32	56	51
5 th	11	12	19	21	32	33	59	51
Weighted av.	12	13	23	24	39	36	63	55

 Table 26. Observed and Predicted SCR by Weight of Brand Purchase by Brand Order

 Average across eight categories, 52 weeks, 1980s

6.11 Summary of Findings

This is a rather complex Chapter, covering several different aspects of revealed preference: (a) favourite brands, (b) heavy category buyers, (c) heavy brand buyers. The main findings are summarised below:

- The average brand accounts for only around 30% of its buyers' category requirements (SCR = about 30%, as found in previous research).
- (2) When a brand is the favourite brand it is bought twice as often by its buyers compared with all buyers of that brand. But a favourite brand still accounts for only just over half of its buyers' category requirements (SCR_f = 55%).
- (3) In terms of sales importance, the one third of customers of a brand who treat that brand as their favourite, account for two thirds of a brand's sales.
- (4) These various findings are all well-predicted by the Dirichlet model.⁸³
- (5) The results for heavy *category* buyers are broadly similar to the results for all category buyers (i.e. heavy category buyers are no more or less "loyal" than the average buyer), and hence light category buyers must also be no more or less "loyal").
- (6) For heavy *brand* buyers, there is however a consistent (but not major) discrepancy in model fit. Heavy brand buyers give a significantly higher share of their category

⁸³ The closeness of the fit of the Dirichlet for favourite brands for UK detergent was confirmed by analysing another category - German detergent. Since the observed patterns for favourite brands are consistent across the ten categories, we have some confidence that the UK and German detergent findings will also generalise. We therefore suggest that the findings for favourite brands are closely predicted by the Dirichlet model. The Dirichlet predictions for favourite brands should be checked across more categories (e.g. before publishing these findings).

purchases to the brand than expected (average SCR = 63% observed, 55% predicted).

(7) However, heavy brand buyers are also average buyers of other brands; heavy brand buyers make almost the same number of purchases of other brands in a year as do lighter brand buyers.

6.12 Conclusions and Further Research

The findings presented in this Chapter contribute to the study of brand loyalty in two main ways:

- They provide us with generalisable findings regarding favourite brands and heavy buyers. Some of these are "new" findings. Others are extensions or confirmations of earlier work.
- This work has demonstrated a useful extension of the Dirichlet model. The closeness of the fit of the Dirichlet means that we can have general confidence in using the model to predict results for favourite brand buying measures, and for SCR by preference segments (if the deviation in observed versus predicted results for heavy brand buyers is consistent and systematic, this can be allowed for).

Further work in the future could include the investigation of second and third favourite brands and the comparison of favourite brands in time periods of different length. We expect to make increasing use of simulated data to provide model norms.

7. REVEALED BRAND PREFERENCE AND CUSTOMER RETENTION

Summary

In the NBD-Dirichlet model aggregate loyalty-related measures draw on the same base (market share), and as such all correlate. This leads to the view that brand loyalty is a single concept which can be measured in a number of different ways. In this Chapter we relate loyalty measures that are not linked by virtue of their definitions so that any association is empirical. The measures used are those developed in the previous two Chapters; the proportionate fall in repeat-purchase loyalty (erosion), from Chapter five, and the share given to a favourite or most preferred brand, from Chapter six.

Our study of nine grocery categories in three countries suggests that:

- Preference for a brand is not related to the change in repeat purchase over time.
- Households with a high preference for their favourite brand had only a very slightly lower erosion rate than households with lower levels of preference.
- Erosion is very slightly greater for the most preferred brand than for secondary brands in a buyers' portfolio.

These findings suggest that, although we may describe brand loyalty as a propensity to (re) purchase, the different forms of this propensity may not be closely related.

7.1 Brand Loyalty - One Concept, Different Measures?

Following on from the previous two Chapters we now look at the relationship between loyalty to a brand over time and preference for the favourite brand. Aggregate measures of brand loyalty which draw on the same bases relate and this is seen in the brand analysis of market share, purchase frequency, repeat purchase, share of category requirements and sole-brand purchase which all correlate and can be predicted using the NBD and Dirichlet models (Ehrenberg 1972/1988; Uncles, Ehrenberg and Hammond 1995). This has led to the view that brand loyalty is a single concept (but one which can be measured in a number of different ways).

From the empirical evidence presented in Chapter five we were able to quantify a systematic deviation from the NBD-Dirichlet model relating to repeat-buying over time. It was found that erosion (the proportionate fall in repeat-purchase loyalty) averaged 15% in the first year for the forty-five brands studied. Erosion is therefore a measure of dis-loyalty. In the empirical study presented in this Chapter we relate erosion to a share measure of brand loyalty - revealed preference for the favourite brand. This enables us to capture the relationship between loyalty to a brand over time and loyalty as a proportion of purchase. If brand loyalty is a single concept then different measures of it should correlate - customer segments who have high preference for a brand in terms of the share of purchase they allocate to that brand should also show lower erosion over time.

By taking two measures of loyalty which are not intrinsically linked, and which represent different aspects of brand purchase - preference and retention (retention is the inverse of erosion) - we seek to understand how these aspects of brand performance are linked in the medium term. In order to establish the nature of the relationship between different levels of preference and erosion we again conduct a broad study using different categories, countries and time periods.

149

7.2 Methodology

7.2.1 Data

Consumer purchase data were analysed using nine non-seasonal grocery panel datasets, from three countries, each covering a period of 104 weeks in the 1980s. The datasets are listed below and a detailed description of the data are to be found in Table 27.

The datasets were:

ί K .

These datasets were chosen because, (i) they provide us with a comparison both across countries and between categories, (ii) they include both food and household goods (Shoemaker and Shoaf 1977 suggested that consumers may have stronger preferences or loyalties for food products), and (iii) they cover mature categories and are therefore reasonably stable in terms of average sales at both the category and brand level. This last point is particularly important as this study was designed to discover generalisable results under stationary conditions. Two additional datasets were considered, but initial descriptive analyses of the data showed that in these two cases - soup and catsup for the US - the seasonal trends in the data might bias the results.⁸⁴

For each dataset, individual household purchase histories were analysed for the leading five brands. The datasets covered from 70 itemised SKUs (German toothpaste) to around 500 itemised SKUs (US crackers). As in the research presented in the previous two Chapters, all SKUs relating to a particular brand name (i.e. all pack sizes, flavours, etc) were aggregated. However, clear differences in product formulation were counted as separate brands. For example, Tide packeted laundry detergent and Tide high density liquid laundry detergent were kept as separate brands. The leading five brands accounted for 82% of category sales for UK detergent down to 26% of category sales for US crackers.

The market shares of each brand were tracked quarter-by-quarter over the two years to ensure that the markets were reasonably stable. In two cases the fifth brand showed substantial growth and was replaced by the sixth brand in the category. For US detergent, the shares of all five leading brands fluctuated considerably over the two-year analysis period (the results for this dataset are inconsistent with our other findings, but we kept the dataset in our study because of its wide use in previous research; the results for US detergent are discussed separately in Section 7.4.2).⁸⁵

⁸⁴ This was mainly because, in order to compare results across datasets, we needed to confine our analyses to 2 years. For this we needed a 39-week base period (3 quarters) to calculate the preference measure and then an additional 65 weeks (five quarters) for the repeat-purchase erosion measure. When data are seasonal the erosion results can fluctuate considerably and should be calculated over a longer period on a moving average basis. We did not have long enough data runs to do this.
⁸⁵ The US detergent dataset used here is the same one as used in Chapter 5. In the study reported in Chapter 5, we were able to smooth out much of the non-stationarity by averaging the results of three analyses with different start dates. Here we need a longer base period, hence only one analysis is possible and the share fluctuations are more noticeable.

7.2.2 Purchase Histories

For each dataset, the purchase histories of between 500 and 2,000 households over 104 weeks were studied. The unit of analysis was the brand purchased on a single purchase occasion by an individual panellist. The purchase histories of all panellists were used provided that they fulfilled the following four criteria. First, they had to be continuous purchasers in the relevant category over the whole 104 week period (according to the panel companies' definition of a continuous panellist and our own checking procedure).⁸⁶ This was because it was important that the loyalty findings were not confounded with panel attrition.

Second, panellists had to make a minimum of three purchases of the category in the 39-week base period, in order to provide a realistic ratio for the measurement of preference, which was calculated over this initial 39 weeks. Third, we limited our analysis to the study of the leading five brands in each category, since a preliminary examination of the data revealed that smaller brands were preferred by too few households to give meaningful sample sizes. Fourth, households were permitted to have two joint preferred brands (see Section 7.2.3 for how these ties were handled), but the small number of households with three or more equally preferred brands (at most, 3% of the base period sample) were excluded from the analyses.

On average, the overall sample for each dataset comprised 58% of continuous households making three or more category purchases in the 39-week base period. The actual numbers of buyers of each brand whose purchase histories were used in the analysis, are noted in Table 27, together with other descriptive data for each category.

⁸⁶ See Chapter 4 where we discuss the importance of continuous buyers, i.e. "static" panels.

	<u> </u>	King 5+ purchases	uie category over a .	59-week base period	
	Brand	Av. purchase	Number of	Av. SCR for most	o of sample wit
	snares	rate	from total sample	preferred brand 00	brand as most preferred brand
US Detergent		9.2	1572/2373	52, range	11% - 100%
orand 1	17	3.6	667	55	26
orand 2	7	2.3	283	45	7
orand 3	7	2.5	229	51	7
orand 4	7	2.5	216	60	7
orand 5	6	2.2	177	54	6
JS Coffee		9.7	575 1002	64. range	14% - 100%
L	15	3.7	165	68	16
2	15	3.7	190	61	18
3	11	4.5	120	69	11
4	4	30	59	64	A
5	6	3.5	41	65	5
IS Crackers		13.1	2006/2071	35	50/ 1000
	14	3.1	1220	35, range	5% - 100-6
)		3.4	100	37 24	52
-	2	J.4 7 1	177	34	5
4	3	2.1	197	31	4
+ 5	3	3.2 23	187	41	5
	5	2.5	1/4	26	4
UK Detergent		11.7	1655/1878	71, range	18% - 100°o
1	32	6.4	638	81	35
2	19	5.1	381	77	19
3	14	4.9	276	77	14
4	10	4.0	193	67	10
5	7	4.1	127	68	6
UK Toothpaste		7.0	1451/2265	75, range=	28% - 100%
1	24	3.7	543	80	23
2	16	3.0	365	72	15
3	11	3.0	251	74	10
4	10	2.7	197	72	8
5	5	2.3	95	75	4
German Coffee		16.2	1168 2286	51 range	5° - 100° -
1	10	4.3	385	49	16
2	10	5.5	350	57	15
-	8	5.0	242	53	10
1	š	3.0	167	11	7
5	1	6.9	24	64	1
German Detergant		6.7	022/1707	70	-
l	16	0.4	333/1/2/	73, range	23°0-100°0
7	10	4.0 2.4	310	/3	16
	10	3.3	209	82	15
, 1		2.2	1//	67	9
5	3	2.2 1.9	148	03 72	7
Demon Tradition de	-				4
Jerman I oothpaste	0	6.8	496/2108	77, range	34% - 100° •
<u>.</u>	7	4.4 2.2	130	/8	7
I	0	4.4	72	/3	4
	0	2.3	92	-17	4
•	6 4	2.3	93	74	4
i i i i i i i i i i i i i i i i i i i	4	1.9	00	/8	3
5					
5 German Carbonated Drink	s 	17.8	1046 1692	66 range	28° • - 100%
5 German Carbonated Drink	s 27	17.8 9.2	1046 1692 438	66 range 75	28° • - 100% 25
5 German Carbonated Drink I 2	s 27 21	17.8 9.2 6.1	1046 1692 438 423	66 range 75 70	28° • - 100% 25 24
5 German Carbonated Drink I 2 3	s 27 21 8	17.8 9.2 6.1 4.1	1046 1692 438 423 102	66 range 75 70 58	28° • - 100% 25 24 5

Γat	ble	e 2	27	•	Descri	iptive	Data	for	the	Nine	Datas	ets
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7.2.3 Segmentation in a Base Period by Preference Level

For each household, in each dataset, a measure of revealed brand preference was established from the individual household purchase history over a base period of 39 weeks. This preference measure was calculated as the number of purchases of their most preferred brand as a percentage of their total number of category purchases in the base period (i.e. SCR_f as in Chapter 6). As reported in Table 27, this measure showed considerable heterogeneity within datasets. For instance, for US crackers, the most preferred brand accounted for 5% of category purchases for some households and 100% of category purchases for others (with almost all points in between also represented). For the most preferred brand to account for 5% of purchases, a household would have to buy more than 20 different brands during the base period, with one brand being bought slightly more than the others.

This preferred brand calculation did not take into account purchase weight or recency of purchase; a household purchasing only one brand in the base period would be given a score of 100%, whether they made 3 or 30 purchases of that brand. Two households with the following purchasing sequences in the base period: BCAAA or AAAAAABBBB, would both have a revealed preference of 60% for brand A.⁸⁷ In many cases, an individual household had two equally preferred brands, for example, they purchased four times in the base period - two purchases of brand A and two of brand B. In these cases both brands would be given a preference score of 50%, and in the aggregation procedure this household would be given an 0.5 weighting (instead of 1.0) for each of these brands.

Households were segmented into three preference groups. The one-third of households in each category who exhibited the highest preference for their most preferred brand were the high preference segment, the middle third the medium

⁸⁷ This is in line with the Dirichlet model where SCR is not affected by recency of purchase. Purchase weight is taken account of in the model (at the aggregate level), but this is a second order effect and, if necessary, can be investigated further once the main effect has been established.

preference segment, and the lowest third the low preference segment. Taking a third of buyers for each segment led to a range of preference cut-off or break points across the nine datasets. The highest cut-off points for both the high and medium segments were for UK detergent (95.3 % and 65.5% respectively), the lowest cut-off points were both for US coffee (40.9% for the high segment and 23.5% for the medium segment).

Additionally, we repeated all analyses using fixed cut-off points (a flat rate across all datasets of 75% or above for the high preference segment, 50% to under 75% for the medium segment, less than 50% for the low segment, to test how sensitive the results were to different divisions of the data.

7.2.4 Calculation of Repeat-Purchase Erosion

The medium to long-term allegiance to their preferred brand was calculated for buyers within each preference group. This was operationalised by calculating the erosion of repeat-purchase loyalty for those buyers who had one of the leading five brands in each category as their preferred brand. The base period for the repeat-purchase analysis was the same 39 weeks (Q1 to Q3) over which revealed brand preference was established, repeat-purchase rates were calculated from this base period for each of the following five quarters (Q4 to Q8).

Erosion was measured at the brand level, i.e. for all those who had a particular brand as their preferred brand in the base period, the percentages of these brand buyers who bought this brand again was calculated for Q4 to Q8. The difference in the repeatpurchase rate from Q4 to Q8 as a percentage of the Q4 figure, is the measure of annual erosion. In order to compare findings across categories, results for the leading five brands in each category were aggregated to produce a weighted (by market share) average brand erosion for each category. This procedure was also conducted separately for the high, medium, and low preference segments for each dataset.

7.2.5 An Example: German Coffee

Re	Repeat-buyers as a percentage of those buying in a base (39-week) period										
	High preference segment			ence Medium preference t segment				Low preference segment			
	repeat buyers in Q4	repeat buyers in Q8	annual erosion	repeat buyers in Q4	repeat buyers in Q8	annual erosion	repeat buyers in Q4	repeat buyers in Q8	annual erosion	overall annual erosion	
	%	%	%	%	%	<u>%</u>	%	%	%	%	
Brand 1	92	81	12	80	75	6	71	57	20	13	
Brand 2	93	80	13	79	58	27	63	39	38	26	
Brand 3	95	83	13	77	63	18	61	52	15	15	
Brand 4	87	66	24	70	58	18	44	43	3	15	
Brand 5	100	83	17	60	60	0	29	14	50	22	
Wghted av.	93	80	14	77	65	17	61	48	21	17	

 Table 28. Repeat-Purchase and Erosion, by Preference Group

 German ground coffee, 1988-89

From Table 28 we see that for Brand 1, for the high preference segment, 92% of buyers in the base period repeat-purchased that brand in Q4, 81% in Q8. This eleven point fall in the repeat-purchase rate produces an erosion figure of 12% (11 as a percentage of 92). In the medium preference segment, 80% of Brand 1 buyers in the base period repeat-purchase in Q4, 75% in Q8 - an erosion of 6%. In the low preference segment the erosion for Brand 1 is 20%. The average annual erosion rate across the three segments for Brand 1 is 13%. For Brand 5, for the medium preference segment, 60% of buyers repeat-purchase in both Q4 and Q8 - no erosion, however there is erosion for this brand for the other preference segments and for every other brand in each segment.

For the leading five brands of German coffee the average erosion (weighted by market share) for the high preference group is 14%, for the medium preference group 17%, for the low preference group 21%. Overall the average erosion for German ground coffee is 17%.⁸⁸

⁸⁸ In Chapter 5, we found an overall erosion of 14% for German ground coffee. The small difference between these two figures (17% and 14%) can perhaps be explained by the difference in the data analysed. First, the base period used in the Chapter 5 was 13 weeks, not 39 weeks as here. Second,

7.3 Results

At the brand level there is considerable volatility in findings. If we take all 45 brands there is no significant effect of preference level on the prediction of brand erosion. We conducted a regression analysis with annual brand erosion as the dependent variable and preference level and brand order as independent variables. Again we found that preference level is not a significant predictor of erosion (Beta= 0.06, t=0.7, p=0.46), but brand order is a significant predictor of erosion (Beta=-.22, t=2.6, p=0.01). Much of the variability in the data disappears if we aggregate to the category level; this is partly because of reduced random variation, but also because sales changes for one brand tend to be balanced by reverse changes among competitor brands. In order to detect a generalizable pattern in the relationship between share of purchase and repeat purchase over time, i.e. findings which might be applicable to grocery markets in general, results are presented at the category level in Table 29, aggregated by preference level in Table 30 and aggregated by brand order in Table 31.

Table 29 shows the annual repeat-purchase erosion, averaged across the leading five brands (weighted by market share), for each of the nine datasets, broken down by the three preference levels. The Table is ordered by the average annual erosion for each dataset. Over a year, there is erosion for each preference level in each dataset (with the exception of US detergent, low preference segment). The average annual erosion is 14% for the high preference segment, 19% for the medium preference and 16% for the low preference segment. On average, the annual repeat-purchase erosion across all preference groups, is 17%.

in Chapter 5 we included all purchases made by all buyers who bought the brand during the base period, whereas in this study we limit our sample to the buyers' most preferred brand. In Chapter 5 buyers were counted more than once if they bought more than one of the five leading brands; in this study we are restricted to the most preferred brand and each panellist appears in the analysis once, and only if their favourite brand is one of the leading five brands.

	High preference segment:	Medium preference segment:	Low preference segment:	Overall erosion
	annual erosion %	annual erosion %	annual erosion %	(Q4-Q8) %
UK toothpaste	21	32	34	29
German detergent	14	28	22	21
UK detergent	14	22	23	20
German coffee	14	17	21	17
German toothpaste	16	18	17	17
US coffee	16	24	8	16
US crackers	14	15	13	14
German carb. drinks	11	17	11	13
US detergent	7	2	(3)*	2
Average	14	19	16	17

 Table 29. Erosion for Different Levels of Preference

 Average % decline in repeat-purchase (erosion) for the preferred brand over a year

* Note: this implies a gain in repeat-buyers over the year.

There is a significant difference between erosion levels for the high and medium preference segments (t=2.79, p=0.024); erosion for the high preference segment is lower than for the medium preference segment in all cases except for US detergent. However there is no significant difference in erosion between the medium and low preference segments (t=1.62, p=0.14) or between the high and low preference segments (t=0.81, p=0.44). There is a slight tendency for non-food products to have higher erosion than food products, and for the three US categories to have lower than average erosion. Apart from US detergent, the main outliers in Table 29 are the low preference group for US coffee, and UK toothpaste where the erosion rates for each segment are around 50% greater than the average.

Categories with a high average SCR score for the most preferred brand (see Table 27 for these scores) tend to show a higher average rate of erosion (r=0.55). With only nine cases this was not significant (p=0.127), and there was no effect at the brand level (r=0.19, p=0.205), but the direction of the result is counter-intuitive and perhaps relates to the result, reported below, on erosion for the most preferred brand relative to erosion for secondary brands (see Discussion, Section 7.4.1).

7.3.1 Repeat Purchase and Erosion Over Time by Preference Segment

The erosion scores for each segment in Table 29 represent the average annual erosion of repeat-purchase in each category (the percentage difference in repeat buying rates from Q4 to Q8). If we look at the decline in repeat purchase quarter-by-quarter we see that the annual change is broadly reflected in the quarterly changes, with little difference by preference level. From Table 30 we can see that the differences in average quarterly repeat rate are: -3, -3, -3, -2, giving an erosion of 4% from Q4 to Q5 (3/67*100), 9% for Q4 to Q6, 13% from Q4 to Q7, and 17% for Q4 to Q8. The pattern is similar for all three preference levels, although erosion for the medium preference segment takes place at a faster rate than for the other two segments.

I able 30. R	cpeat I u	i chase al	JU EIUS		i inne,	by Hiel	crence.		
	Repeat those bu	buyers f ying in b	for Q4 to ase peri	D Q8 as iod (Q1	% of to Q3)	Erosic for eac	on of rej ch quart	oeat pur er as %	chase of Q4
	Q4	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8
High preference segment	81	79	75	72	70	3	8	12	14
Med. preference segment	66	62	58	55	53	6	12	17	19
Low preference segment	53	51	49	47	44	4	8	_12	<u>1</u> 6
Overall Average	67	64	61	58	56	4	9	13	17

Table 30. Repeat Purchase and Erosion Over Time, by Preference Level

7.3.2 Sensitivity of Results to Preference Break-Points

In order to analyse erosion by preference segments the cut-off points were set by the spread of household preference scores within each category. Households with the highest third of preference scores were placed in the high preference segment, the next highest third in the medium segment and the lowest third in the low segment. To test the sensitivity of the results to different cut-off levels, a separate analysis was conducted using fixed cut-off points. In this analysis, households giving 75% or more of their category purchase to their most preferred brand were allocated to the high preference segment; 50% or over to under 75% to the medium segment; less than 50% to the low segment.

Using this method, the ratio of buyers in the different segments varied considerably by category, from 8% (high): 13% (medium): 79% (low) for US crackers, to 55% (high): 22% (medium): 23% (low) for UK detergent. Erosion showed greater variability within categories using these fixed cut-off points, probably because of the small sample sizes for some segments in some categories. However the overall results were very close to those presented in Table 29 where the segments were of equal size. Across nine categories, the high preference segment showed an average erosion of 14%, the medium segment 20%, and the low segment 16%. The results are therefore robust to different cut-off points.

7.3.3 The Effect of Brand Order

The regression analysis showed that, at the brand level, brand order was a significant predictor of erosion. Our results using three preference segments across the nine categories, give some support to this finding. From Table 31 we can see that, for the high preference segment there is a steady increase in erosion (i.e. a decline in retention) from 11% for the average brand leader, to 29% for the average fifth-placed brand. The findings for the other two segments are not so clear cut. This is mostly due to the effect of US detergent where the third and fourth placed brands both showed very high gains (+70%) in the repeat purchase rate (and hence negative erosions) for the low preference segment. Without the inclusion of US detergent the market leader has a lower erosion for each preference level.

	High preference segment	Medium preference segment	Low preference segment	Average
Brand leader	11	17	11	13
2 nd brand	13	20	26	20
3 rd brand	16	14	6	12
4 th brand	23	24	8	18
5 th brand	29	31	27	29
Average	14	19	16	17

 Table 31. Decline in Retention for Different Levels of Preference by Brand Order

 Average annual % decline in repeat-purchase for the preferred brand, across nine datasets

7.4 Discussion

The main conclusions are:

- 1. There is brand erosion for each preference level in each dataset.
- 2. On average, across nine datasets, 83% of repeat buyers are still purchasing their most preferred brand after a year.
- 3. High preference is very slightly related to greater customer retention. The erosion rate for the high preference segment is 14%. However, medium or low preference levels have only slightly lower customer retention (19% and 16% respectively). We interpret this as no real relationship between erosion and preference.
- 4. Erosion is very slightly greater for the most preferred brand than for secondary brands in a buyers' portfolio.

7.4.1 Most Preferred Versus Other Brands Bought

If we compare our overall results across all preference segments with the findings from Chapter 5 (using the same datasets), we find that erosion is slightly higher for favourite or most preferred brands than for all brands bought (17% versus 14%). This implies that erosion is lower than 14% for brands that are secondary in the portfolio, i.e. that *erosion is greater for the favourite brand*. This finding is not intuitive and we have no empirically based explanation for it. It could be that secondary brands are purchased more automatically and that consumers give more thought to, and may be more ready to change, a brand that takes a higher fraction of their category expenditure. Another possibility is that secondary brands are more often specific in their function and harder therefore to substitute.

Related to this is the tendency for categories with a high average brand preference score to have a higher average erosion than those with a lower average brand preference. This suggests that frequency of purchase may raise erosion. However this finding was not statistically significant and needs to be investigated further.

7.4.2 Results for US detergent

Although laundry detergent is a mature market in the US, the shares of the leading five brands in this category fluctuated considerably over the period covered by the data. The low erosion results (Table 29) show that, at the category level, US detergent is clearly an outlier. The low erosion figure results from some individual US detergent brands showing large negative erosions, i.e. gains in the repeat-purchase rate over time. What might these results imply for loyalty in the US detergent market (and other markets with similar levels of marketing intervention and consumer buying patterns)? First, this pattern of low brand erosion was seen whether the average SCR measure was used or the SCR measure for the most preferred brand.

Second, in order to check if the results were due to one anomalous time period, the analysis was rerun with a different base period. This gave very similar results, suggesting that the findings were due to some unique feature of the US detergent market. One such feature is that this market showed a far higher level of promotional activity, compared with the other US categories, over the period analysed. We did not have promotional data for the UK and German datasets, but believe that promotional activity was generally much lower in these countries than in the US.

A high level of promotional activity could make buyers in the US detergent market brand indifferent so that they buy by reference to available promotions. If the level of customer retention in this market is generally very low, there may be little room for further erosion. However, we must be mindful that this market was the least stationary of the ones studied here. A more detailed analysis could look separately at periods when brand shares were rising and compare them with periods where share was falling.

7.4.3 Methodological Issues

The measure of share of purchase used here is still contaminated to some extent with the measure of erosion. A proportional measure of loyalty requires a sample of category purchases to be gathered over a period of time so that a ratio of brand to category purchase can be constructed. In this study we used a 39-week period and over this period some households will change their most preferred brand. Suppose that a household was 100% loyal to Brand A and then shifted completely to Brand B, making an equal number of purchases of each brand. It could be argued that, in a true proportional sense, this household is 100% loyal since it gives all its share to one brand until it switches and gives all its share to another.

In human terms this pattern is serial monogamy rather than polygamy. However, if we measure SCR for the most preferred brand over a period covering this household's purchases of both Brand A and Brand B, we will record a proportional loyalty of 50%. In this instance, the proportional measure is affected and the household will be allocated to a low preference segment. A change of allegiance within the base period can also increase preference, e.g. when a minor brand in the portfolio is dropped and purchases are concentrated on the most preferred brand.

There are likely to be some mis-assignments as a result of this measurement artefact, and the erosion measures for the different preference groups could be affected, but these effects of erosion cannot easily be removed from the preference measure. As the period of measurement is shortened they will have less effect but two other problems increase as purchases in the reference period become fewer. One is that preference ratios for light buyers are upwardly constrained: if a household makes only three category purchases in the qualifying period the preference score for their favourite brand cannot be less than 33.3%. The second problem is that the "random" error in the measurement becomes unacceptably large in short time periods.

However, our findings proved robust to different cut-off points. It is possible that correcting mis-assignations could smooth out the difference in erosion between the high and medium preference segments (i.e. our present findings probably show some regression to the mean), but, more than half of the households in the high preference segment gave 100% of their share of category purchases to their most preferred brand during the reference period, and such sole-brand loyal buyers are less likely to be mis-assigned.

7.5 Implications for Loyalty Research

This study is a first attempt to establish the relationship between revealed brand preference and the erosion of brand loyalty over time. The assumption that high preference for a brand implies a high level of customer retention receives some support from our findings, but the effect is very weak. It seems more likely that the factors which underlie revealed preference are slightly different from those which underlie customer retention. For example, changes in customer retention might occur as a result of factors external to the consumer, such as availability, while different factors (perhaps the presence of promotions) may play a greater role in influencing preference.

This work has been concerned with exploring the relationship between revealed preference and erosion (retention). Now we have established that no strong relationship exists the way is open for further empirical work. Related work could include analysis of dynamic (non-stationary) situations, e.g.:

- 1. The change in revealed preference over time and its link to erosion.
- 2. The effect of promotions on erosion.
- 3. The analysis of erosion during periods of brand share growth and brand share decline.

8. RELATED PATTERNS OF PURCHASING

Summary

In this Chapter, additional studies on consumer purchasing behaviour by the author (together with a number of co-authors) are summarised). I also include a brief description of a study where attitudes are related to behaviour.

The relevance of this work to the subject of brand loyalty is that, as we have argued, brand loyalty is not an isolated cognitive "feeling" that the buyer has to an individual brand in a particular market, but rather it is a propensity to re-purchase, and therefore all revealed patterns of purchasing behaviour are related, and have relevance, to the issue of brand loyalty.

The main findings are:

- Store loyalty is predictably divided (and low): e.g. only 19% of shoppers' annual grocery requirements are met by any one store (19% predicted).
- Price-related promotions are used by existing customers of the brand; promotions do not make customers more loyal.
- Competitive brands do not segment the market. This is consistent with the lack of segmentation variables in the Dirichlet.
- Form loyalty (the type or form of the product previously bought) appeared to be more important than brand loyalty in determining which customers bought a new offering.
- At the individual level, behavioural and attitudinal loyalty-related measures show very little correlation.

8.1 Store Loyalty

Various aspects of how shoppers patronise grocery stores have been found to be regular and predictable, so that the pattern of buying at a particular store can be interpreted against known patterns at other stores, and against the NBD-Dirichlet model (Uncles and Hammond 1995). The store loyalty findings from the Uncles and Hammond study were reasonably well predicted by the NBD-Dirichlet model.⁸⁹ For example, they found that, on average, only 19% of shoppers' annual grocery requirements were met by any one store (19% predicted), and that while 40% of shoppers were 100% loyal to a store in a week (30% predicted), this fell to only 1% over a year (0% predicted).⁹⁰

The main findings from the Uncles and Hammond study are:

- 1. Store loyalty was predictably divided.
- 2. Sole buying buying at one store only was under-predicted by the model, even in short time periods such as a week.
- 3. Smaller stores had fewer shoppers who patronised them less often (the DJ effect again).
- 4. Light or infrequent shoppers were not fundamentally different from heavier buyers in terms of their store patronage behaviour.
- 5. Patterns associated with "minor" or secondary shop visits were similar to those for "major" or primary ones, despite the difference in \$-value).

Numerous previous studies have been published to show why different groups of shoppers choose particular stores. Most findings have centred on convenience, access

⁸⁹ Apart from 100% loyal buyers which were under-predicted (40% observed in a week, 30% predicted, 4% observed in a quarter, 1% predicted) and the repeat-patronage rate which was consistently lower than predicted.

⁹⁰ Uncles and Hammond (1995) analysed 100,000 shopping records for 466 shoppers at nine stores over a two-year period in the urban area of Rome, Georgia, US. The results presented here are for the average store.

and personal mobility and these factors are reflected in the standard store location models (e.g. Dunn, Reader and Wrigley 1983; Ghosh and McLafferty 1987). The Uncles and Hammond (1995) study represents an extension of a proven approach (the Dirichlet) to a new situation. The fit of the Dirichlet model is not as close in its prediction of store choice as it is generally for brand choice. In this study the aim was to look at store patronage in general and to test the fit of a very parsimonious model; no account was taken of the socio-demographic characteristics of shoppers or of the particular type and location of different stores. Other authors have re-specified the NBD-Dirichlet to take account of these factors in specific situations (Wrigley and Dunn 1985; Bawa, Ghosh and Sabavala 1991).

Further work by Uncles and Hammond (1997) which assesses the impact of sociodemographic segmentation on grocery store patronage and loyalty suggests that market share is the dominant factor in the explanation of differences in patronage and loyalty between stores, and that while socio-demographic factors are often important, their impact is secondary.

8.2 The After-Effects of Price-Related Consumer Promotions

It is widely accepted that short-term price promotions lead to short, sharp sales peaks for the promoted brand (Totten and Bloch 1987; Neslin, Henderson and Quelch 1985). This is largely due to brand switching with the short-term sales gain mostly, or all, at the expense of other competitive brands (Bawa and Shoemaker 1989; Neslin and Shoemaker 1989; Grover and Srinivasan 1992). Some writers had previously suggested that price-related promotions could have negative after-effects (e.g. Lattin and Bucklin 1989), but empirical studies suggested that most promotions had no after effects (Davis, Inman and McAlister 1992; Grover and Srinivasan 1992). In an extensive and international study covering 25 packaged grocery products across four countries, Ehrenberg, Hammond and Goodhardt (1994) sought to establish the extent and nature of the after-effects of price promotions.

167

Ehrenberg, Hammond and Goodhardt assessed whether the extra buying during sales peaks produced after-effects by comparing sales from before to after to sales peak.⁹¹ They also assessed the overall impact of price promotions on before-to-after repeat buying and established to what extent the extra buyers during a sales peak were past customers of the promoted brand. They found that:

- 1. For 175 individual promotional sales peaks the sales differences from before-toafter the peak were mostly small and both positive and negative. The overall average was a 1% increase in sales, i.e. there was little, if any, general after-effect on sales.
- 2. The average before-to-after repeat-buying level for pairs of eight-week periods (one before and one after the sales peak) was 39% compared with an NBD prediction of 41%. The closeness in the average observed repeat-buying level to the predicted one suggests that the promotions were having no lasting effect.
- 3. The general observed repeat-buying rate for all possible eight-week pairs of periods across all categories was again very close to the predicted rate (43% observed, 44% predicted). This implies that the high prevalence of promotional activity in these categories had not eroded general consumer loyalty. It also supports the assumption in the NBD model of a zero-order buying process, i.e. no learning or purchase feedback.
- 4. 70% of buyers during the average sales peak had bought the brand in the previous half-year, 80% in the previous year and nearly all buyers, 93%, in the previous 2½ years. This compares with normal long-term penetration growth of around 40% over two years for these products. This explains why the extra buyers who were attracted during a sales promotion were not converted into repeat buyers: when a brand is available at a reduced price, some consumers respond if the bargain is for a familiar brand, i.e. they are mostly already customers of the brand. It therefore appears that price promotions reward a brand's existing customers.

⁹¹ In this study a sales peak was used as a proxy for a price-related sales promotion; limited empirical evidence suggested that sales peaks were almost always due to price promotions.

This finding by Ehrenberg, Hammond and Goodhardt of a lack of after-effects for large price-related consumer promotions agrees with the general view promoted in this thesis of regular and predictable buying behaviour for frequently-purchased goods. This view acknowledges that consumers have a portfolio of around three brands which they buy habitually over time (with one brand perhaps being a favourite). This means that consumers can readily switch to a different (but familiar and not new) brand when it is on offer.

The evidence from this study also offers support for the assumption that buying a habitual brand (again) does not normally increase the likelihood of buying that brand in the future, i.e. there is no learning, and in the medium term these markets can best be described by a zero-order stochastic process (Bass *et al.* 1984; Goodhardt, Ehrenberg and Chatfield 1984; Ehrenberg 1988; Bass 1993).

8.3 Market Segmentation for Competitive Brands

It has long been accepted that consumers differ widely in their individual brand choices, as noted, for instance, by Massy, Montgomery and Morrison (1970) 25 years ago, and by Bass (1993) more recently. But can such heterogeneous consumers be classified into relatively homogeneous subgroups or segments who tend to buy different selections of brands?

Marketing texts (e.g. Engel, Blackwell and Miniard 1995; Kotler 1991) indicate that segmentation is important. Dickson and Ginter (1987) give a critical discussion of the different segmentation concepts. But there appeared to be no published examples where different brands had been shown to appeal to very different population subgroups. This is demonstrated particularly by reviews of segmentation over the years, such as Frank, Massy and Wind (1972); Wells (1975); Wind (1978) in a special issue of *JMR* to celebrate Wendell Smith's original (1956) segmentation article; Lunn (1986); Beane and Ennis (1987); McDonald and Dunbar (1995).

Academic papers on segmentation mostly concentrate on segmentation *techniques* (at times quite complex). For recent cases see Grover and Srinivasan (1987); Kamakura and Russell (1989); Green and Krieger (1991); Gupta and Chintagunta (1994); Bucklin, Gupta and Han (1995); DeSarbo, Ramaswamy and Cohen (1995). Most researchers however restrict themselves to one illustrative numerical example. No striking and generalisable instances of brand segmentation have been reported. Yet very few authors have explicitly questioned whether brand segmentation exists, with Paltschik and Storbacka (1992), Weilbacher (1993) and Dibb and Simkin (1994), among the exceptions, and Kassarjian and Sheffet (1991), claiming for brand segmentation by personality variables that *"if correlations [with brand choice] do exist they are so weak as to be questionable or meaningless."*

In an international study to determine the extent of brand segmentation, the sociodemographic characteristics of brand purchasers in 23 grocery product categories across four countries were compared using consumer panel data (Hammond, Ehrenberg and Goodhardt 1996). The focus of this study was on *brand* segmentation - how far directly competing brands differ in the kinds of customers they have.

The data were individual household purchase records for at least a year, from scanner or diary-based household panels with sample sizes of 1,000 to 5,000 continuously reporting households, and typically covering up to 50,000 or more individual purchases. For each category the 5 to 10 leading brands and aggregate groupings of "Private Label" and "All Other Brands" were analysed (down either to brands with a 1% share, or until at least 70% of the market had been covered).

The segmentation criteria were common socio-demographic variables, plus usage and (in some countries) a lifestyle measure. For each measure, households were segregated into between two and five subclasses. For each itemised brand, purchases over a year by each available consumer segment were tabulated and converted into brand profile percentages. These percentages show how much of a brand's purchases were made by the different segments. By comparing each brand's profile with the average (category) profile, we can determine the extent of brand segmentation.

To formalise and simplify the analysis for this extensive data, the average size of the differences between the purchase profiles of each brand and the category were summarised as a Mean Absolute Deviation or MAD.

Table 32 shows the main findings for this study. The Table sets out the results for the eight most common segmentation measures. The average deviations of brand profiles from category profiles are consistently around 3 points, with one marked exception of 16 (for ready-to-eat Cereals in the UK, segmented by the presence of children in the household). The results for demographics, lifestyle, and category usage measures are otherwise all very similar, as are the results for the other measures available such as ownership of durables (available only in the USA data and not shown here). The underlying 1,000 or so individual deviations for specific brands and segmentation criteria show a near-normal distribution, with few outliers.

The lack of market segmentation by category usage (column 1 in Table 32) is supported by the generally close fit of the Dirichlet model to these and similar data: the theoretical model assumes no segmentation (Ehrenberg 1988, Ehrenberg and Uncles 1997). An alternative analysis of the data (not reported in more detail here) compared market shares within each segment with average category market shares; this analysis also gave very low MADs.

	Cat.	Female	Age of	Size of	Income	Presence	Female	Life	Av.
	Usage	head	female	house-	or	of	head	style	MAD
	heavy/	work	head	.hold	class	Children	education		
	med/light	status					level		
US									
Coffee	5		5	4	6				5
Yogurt	5	3		3	3		2		4
Catsup	2	2		3	4		2		3
Detergent	5	3		2	2		1		3
Crackers	3	3	2	2	3		3		3
Soup	4	2		2	2		1		2
Average	4	3	3	3	3		2		3
UK									
Cereals	3	3	4	4	2	16*		1	4
Cheese	4	5	3	3	5	5		2	4
Sauces	4	1	4	3	4	7			4
Cleaners	4	4	4	2	3	6			4
Soup	2	3	3	4	4	7			4
Coffee	4	3	3	3	3	4		2	3
Choc. Bisc.	3	2	2	2	1	5		1	3
Pap. Towels	3	4	2	2	3	3		2	3
Average	3	3	3	3	3	6		2	4
Germany									
Detergent	6	4	4	4	3		3	4	4
Carb. Drink	2	3	3	4	3		4	3	3
Coffee	3	5	3	3	2		2	2	3
Toothpaste	2	3	2	2	3		2	2	3
Average	3	4	3	3	3		3	3	3
Japan									
Coffee	5			6	3				4
Toothpaste	4			4	3				4
Detergent	4			3	3				4
Margarine	3			3	2				3
Cooking Oil	2			2	3				2
Average	3			3	3				3
Overall Av.	3	3	3	3	3	6	2	2	3

	Table 32.	Average Brand Profile Deviations and MADs, for 23 Categories
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Gaps in the table mean data are not available.

*Major outlier, see text.

A Case of Market Segmentation

The MAD of 16 for RTE Breakfast Cereals, for UK households with and without children (see Table 32), is exceptionally high. There is therefore clear-cut segmentation in this market, and this has long been known in the industry. But is it segmentation by brand or by subtype, or both? The individual brands *within* each of the three sub-markets for RTE Breakfast Cereals (adult cereals, brans and children's cereals) show little evidence of appealing differently to households with or without children: the MADs fall to an average of only 5 percentage points when the individual brand profiles are compared with the subtype averages, rather than 16 when compared with the total category profile. The grouping of bran-type cereals in this market is by definition functional, so here we have some "type" segmentation (as is quite common) but also some true "brand" segmentation.

What is noteworthy here is not that a case of brand segmentation did occur in this instance, but that it has not occurred more often. There may be other isolated cases, but the main finding is that brand segmentation - different brands appealing to very different population segments - is not the norm.

Category and Sub-Type Segmentation

Markets are of course often segmented in other ways than by brand. Thus the appeal of a product category as a whole may be highly limited (e.g. the markets for disposable nappies or dog food). Segmentation may also occur by *usage benefits* (Haley 1985), *seasonally* (Wellan and Ehrenberg 1990), and for functionally different product *sub-types*, as for cereals. But this kind of product segmentation applies equally to the different brands in the market.⁹²

In addition, category sub-types may *partition* a market to some extent (as in the RTE Cereals case), with brands within a subtype clustering to show higher purchase

⁹² Additionally there can be geographic and distributional segmentation which can apply to a whole market or to individual brands, e.g. Sainsbury Corn Flakes are only available in Sainsbury Stores and therefore is not available in certain parts of the UK.

duplications. Examples of market partitioning occur for large price differences (e.g. luxury cars); leaded versus unleaded gasoline; pack-sizes; different types of coffee (ground, soluble, decaffeinated, etc); powder versus liquid laundry detergents.

Buyers of one brand of a type are much more likely to also buy the other brands of that same type, compared with purchase duplication across types (Ehrenberg and Uncles 1997). But, as we have shown here, such partitioning of brands does not show up as brand segmentation, or even necessarily as *type* segmentation, i.e. different groupings of consumers buying each type. In our data here for example, brands of packeted powder and of HDL (high density liquid) detergents each cluster markedly. But they did not segment the market; each variant - powder or HDL - was still bought by much the same kinds of people.

Individual consumers can differ greatly from each other in terms of the brands they buy - in that sense markets are almost infinitely segmented. Qualitative research can also show a wide variety of individual responses to different brands. But this does not mean that there are identifiable segments of buyers with consistently different reactions to similar brands.

8.4 Line Extensions

A major question facing a marketer with a new product to launch is what to call it. The prevalence of brand extension, and more specifically line extension, ⁹³ as a branding strategy in the 1980s and 1990s is well documented (Tauber 1981; Buday 1989; Aaker and Keller 1990; Kapferer 1992; Keller and Aaker 1992; Reddy, Holak and Bhat 1994). Many marketing managers choose to harness the power of an existing brand rather than create a new one. Estimates vary, but most authors (Aaker 1991; Lawrence 1993; Miller 1993) agree that more than two-thirds of all new product launches are line extensions. In

⁹³ Here we use line extension to mean a new line that extends the brand but only within a product category where the manufacturer already has a presence.

a study designed to determine the extent of cannibalisation (i.e. disproportionate substitution) of the core or parent brand by a line extension, Lomax, Hammond, Clemente and East (1996) studied new products and line extensions in two markets.

Lomax *et al.* (1996) looked at the UK and German detergent markets and examined the market profile (in terms of each brand's quarterly market share) before and after the launch of a new product. Four new product introductions were analysed. One new product was a flanker brand (a new product with a new brand name introduced by a manufacturer already operating in the market), the other three new products were line extensions. The pre-launch measure is taken in the quarter immediately prior to the launch of the new entrant, the post-launch measure is taken in the quarter after which sales indicate that market equilibrium has been restored.

In order to determine the extent of cannibalisation, an estimate of share of purchase is made assuming that a straight share order effect (SOE) model applies. The basis of the share order effect model is Luce's (1959) Axiom of the Independence from Irrelevant Alternatives. In essence the model predicts that all existing brands will lose share to a new entrant in proportion to their share before the launch. This concept of proportional losses (or gains) is consistent with the Duplication of Purchase Law (Ehrenberg 1959; Ehrenberg and Goodhardt 1970) and formalised in the Dirichlet model (Goodhardt *et al.* 1984). If cannibalisation exists then we would expect the new entrant to take greater share than predicted from the parent brand.

In the UK detergent market, Lomax *et al.* (1996) tracked the introduction of three new offerings; Wisk liquid detergent, Ariel liquid detergent and Persil liquid detergent. Wisk was a new entrant with a new brand name (analysed to provide a comparison) and the Ariel and Persil offerings represent line extensions. No significant cannibalisation was found; the powdered variants on Ariel and Persil suffered no more from the introduction of the new liquid variants than the SOE model would predict. However in the German detergent market, the parent brand Sunil, was cannibalised by its extension. Lomax *et al.*

(1996) suggest that in the UK examples, the liquid variants of Ariel and Persil were seen as being radically different from their parent brands, i.e. they were in a new sub-category, However, in the German detergent market, the Sunil extension was only a more concentrated version of the parent brand, and hence seen more as a direct substitute.

The conclusion here is that extensions do cannibalise the parent brand if the two products are seen as close substitutes. This needs to be viewed as a continuum with greater similarity leading to higher levels of substitutability. Similarity can be viewed on a number of dimensions, of which brand name is only one, and probably not the most important. This study has implications for brand loyalty research; in the UK detergent market, *form loyalty* (the type or form of the product previously bought) appeared to be more important than brand loyalty in determining which customers bought a new offering.

8.5 Attitudes and Behaviour

As noted in Chapter 2, brand loyalty has historically been treated as a sentiment about the brand or as a propensity, implied or observed, to purchase. We compare a loyalty-related measure calculated from panel data (SCR_f) with the same consumers' reported attitudes and judgements of past behaviour from survey data.

The study has three components:

- (i) Replication of earlier panel data research.
- (ii) Replication of survey data studies.
- (iii) Comparison, across three product categories, of panel and survey methods of calculating brand loyalty.

Chapter 8

Measures of Behaviour from Panel Data

The panel data relate to the UK and to one year (1990), the data come from weekly diaries in which panellists record all their grocery purchases. We focus on three categories; laundry detergent, washing-up liquid and toothpaste. In this study our sample is restricted to panel members who remained on the panel for the whole of 1990, who bought at least three times in the category during that year, and who returned a completed questionnaire. Over a year this gives us a sample of 1,807 people for laundry detergent, 1,689 for washing-up liquid, 1,456 for toothpaste.

Using individual panel purchase histories over (a) a year, (b) the last quarter of 1990, we calculate the average share of category requirements satisfied by the favourite brand for each category. This is calculated at the individual household level and averaged across brands in each category. Sixteen to eighteen individual brands were considered in each category, including the leading private label brands. The remaining very small brands were aggregated into an "all others" brand.

Measures of Attitudes Towards Brand Buying from Survey Data

The questionnaire was given to panel members at the end of 1990 (after they had completed their final diary). Respondents answered a series of questions about their general attitudes towards brand buying with reference to a number of categories (i.e. they answered the same questions separately for the three categories reported here). The main loyalty measure derived from the survey data is based on responses (with values on a five-point scale ranging from "agree strongly" to "disagree strongly") to the statement:

"I always try and stick to the same brands" (SAMEB measure)

We also construct an overall measure of attitudinal brand loyalty (ATTLOY), based on responses to the statement above plus responses to four other statements: "I like to try out new products",

"If I can't find the brand that I'm looking for in the supermarket, I find it easy to select an alternative brand",

"I regularly change brands depending on what's on special offer",

"I like to browse and see what's on the shelves".

These last four questions were aimed at measuring a lack of brand loyalty; in these cases, replies were re-coded, so that responses across questions could be aggregated. The reliability measure (Cronbach alpha) for ATTLOY was: for laundry detergent 0.79; washing-up liquid 0.82; toothpaste 0.81.

The degree of brand loyalty in each category, as measured by both SAMEB and ATTLOY was taken as the percentage of panellists who "agreed strongly" or "agreed a little" to the (re-coded) questions.

Aggregate Results

From Table 33 we see that the average share of category requirements given to the favourite brand, across three categories, is 76% over a quarter (with very little variation between the different categories). The quarterly SCR_f value is higher, in every case, than the yearly figure; this is because consumers make relatively fewer purchases in a quarter and this sets a lower limit on the SCR_f ratio (e.g. a household making only three purchases cannot have an SCR score of less than 33%).

Table 33.	Comparison of Behaviour	al and Attitudinal	Loyalty-Related Meas	sures
	Three cat	egories, UK: 1990		

	Panel Data Measures		Survey Measures	
Category	SCR _f	SCR _f	SAMEB	ATTLOY
	(1 year)%	(qtr) %	%	%
Laundry Detergent	67	76	77	45
Washing-up Liquid	75	77	75	47
Toothpaste	69	75	76	46
Average	70	76	76	46

The main findings are:

(i) SCR_f is similar across the three panel datasets (both for a year and a quarter).

(ii) The survey measures also produce very similar findings across datasets.

We note that the favourite brand measures, calculated from panel data, gives the same numerical value (76%) as the loyalty measure, SAMEB, "I always try and stick to the same brands". This is fortuitous since scale variation could have produced rather different results, as found for ATTLOY.

These results confirm previous findings. For example, Cunningham (1956/1961), using a favourite brand measure, constructed from panel data, found that over a total of 18 products, the average family concentrated 65% of its yearly product class purchases on a favourite brand. More recently, East *et al* (1995), used a mail survey which asked respondents to indicate the proportion of purchase devoted to their favourite brand. Across four categories they found approximate loyalties of 56% for soap, 66% for toothpaste; 66% for cereals; and 70% for washing-up liquid.

Comparison of Results for Individual Consumers

However, if we compare behavioural and attitudinal measures at the level of the individual consumer, we find that there is a very poor correlation between them. From Table 34 we see that the correlation between SAMEB and SCR_f is 0.23 for laundry detergent; 0.08 for washing-up liquid and 0.12 for toothpaste. The correlation between SCR_f and ATTLOY is higher (but still poor); laundry detergent: 0.39; washing-up liquid: 0.17; toothpaste: 0.15.

 Table 34. Correlation Between SCR, and SAMEB, ATTLOY Measures

 _______ For individual households, UK: 1990

	Survey	Survey Measures		
	SAMEB	ATTLOY		
Laundry Detergent	0.23	0.39		
Washing-up Liquid	0.08	0.17		
Toothpaste	0.12	0.15		

There is extensive evidence that how many people give a particular attitudinal response to a brand varies with how many of them use the brand and how often they do so (Bird, Channon and Ehrenberg 1970; Barwise and Ehrenberg 1985; Dall'Olmo Riley *et al.* 1997; Barnard and Ehrenberg 1997b). So we might expect attitudinal loyalty to be better correlated with behavioural loyalty. However previous research focused on brand-specific questions, here the questionnaire asked very *general* questions about brand loyalty; it was not specific about particular *brands*.

Dall'Olmo Riley (1997) found that respondents showed considerable volatility in their beliefs about *brands* (repeat-rates for attitudes towards brands average about 50% at reinterview), but that this repeat-rate varied systematically with the market share of the brand. The finding here of a very low correlation between behavioural and attitudinal measures at the *individual* level confirms earlier research in this area, e.g. Barwise and Ehrenberg (1985) and Castleberry and Ehrenberg (1990) also found that many statements about brands had little relationship to usage.

8.6 Summary

The research aim in the five studies reviewed in this Chapter has been to advance our knowledge of consumer purchasing behaviour in specific ways.

The research strategy in all of these studies has been two-fold:

- 1. Descriptive analysis of the extent and nature of the issue, across a number of different markets, using a range of behavioural measures.
- 2. Comparison of observed patterns with model predictions. Using the NBD-Dirichlet or related models (SOE model for line extensions), or other means of establishing norms (MADs in the case of brand segmentation). In the final study (Section 8.5), the aim was to explore the link between attitudes and behaviour, and to replicate much earlier work the earlier finding of only a weak correlation at the individual level between panel data and survey data still holds.
9. IMPLICATIONS

Summary

The empirical findings presented in this thesis reinforce the Dirichlet approach while at the same time quantifying deviations which show that buying behaviour is not always "Dirichlet". The purchasing paradigm suggested by the pervasiveness of Dirichlet-type markets is that purchase (and consumption) are passively produced by the environment so that loyal behaviour needs no explanation since it continues to be evoked (i.e. is habitual) until forces modify the consumer's environment. These forces (e.g. promotions, an out of stock situation, change in lifecycle or location) may cause a consumer to try a new or rarely-used brand. Mostly purchasers subsequently revert back to their usual portfolio and defections are temporary. Occasionally longer-term changes can occur.

The Dirichlet essentially describes the pattern of habit and will not predict permanent changes. The empirical work reported in this thesis has been concerned with quantifying deviations from the purely habitual model. Substantive findings which reinforce the Dirichlet approach and which quantify the range and extent of deviations are summarised. Directions for further research are noted. The substantive findings in this thesis have been descriptive. Brand loyalty is defined as an ongoing propensity to purchase the brand and the findings reported here generally support this view. The main theoretical basis for this approach is the NBD-Dirichlet model of choice in competitive situations. The empirical evidence, and also the model predictions, show that competing brands differ little in their levels of loyalty. Any differences that do occur are mostly related to market share.

Consistent deviations from the model have been described and quantified. But I have not offered any psychological explanations for the observed regularities nor for the exceptions documented in this thesis. Nor will I do so in detail now. Rather the contribution of this thesis has been to increase our knowledge about consumer purchasing behaviour, in general, and brand loyalty, in particular, in frequently-bought markets.

At a general level, the findings presented in this thesis add considerable weight to previous evidence (Ehrenberg 1972/1988; Goodhardt, Ehrenberg and Chatfield (1984); Uncles *et al.* 1994; Uncles, Ehrenberg and Hammond 1995) that aggregate purchasing patterns over time of competitive brands in frequently-bought consumer goods markets are regular and predictable. In terms of our understanding of brand loyalty, the findings here suggest a number of new (previously unknown or unquantified) brand purchasing regularities which can now be researched further. Below we consider the implications for brand loyalty research which arise from the general findings concerning consumer purchasing behaviour, and the more specific brand loyalty evidence.

9.1 Different Purchase Paradigms - Habit vs Cognition

As reported in Chapter 2 most texts on consumer behaviour (e.g. Engel, Blackwell and Miniard 1995), describe active decision-making as the prime explanation of consumer choice; limited attention is given to the more habitual aspects of purchase. Engel *et al.* concede that for repeat purchases (e.g. for frequently-bought goods), shoppers use what they term habitual decision-making, which can be based on high loyalty to the brand or on inertia (lack of interest/involvement in the product category). However, as East (1997) states:

"There is a contradiction in the idea of habitual decision-making; if it is habitual, then there is no decision in the sense of conscious cognitive processing before action. Habits, if they account for much of consumption, need a better explanation than absence of thought."

East (1997, p9).

The cognitive paradigm emphasises *changes* in consumer behaviour, whereas habits emphasise stability. Both cognition and habit can be used to make sense of purchasing behaviour. But while a cognitive approach *might* seem appropriate for the one-off purchase of a car, a fashion item or a computer (i.e. a high involvement good), it seems far less appropriate for most of the behaviour displayed in the purchase of frequently-bought products.⁹⁴

As we stated in Chapter 2, and support with the studies presented in this thesis, most markets, especially frequently-bought ones, are stable most of the time. The habit paradigm (which best describes purchase for most frequently-bought goods) can be used to explain different behaviours which are acquired at some point in time and thereafter produced when appropriate cues present themselves (so producing regular and predictable patterns of purchase behaviour).

If we turn more specifically to brand loyalty, loyalty is a term borrowed by Marketing from everyday life and, in consequence, carries a variety of meanings. In our everyday relationships we show loyalty by what we think, feel and do, and this is reflected in the variety of approaches to the study of brand loyalty. Thus we find

⁹⁴ Even for the purchase of cars (Ehrenberg and Pouilleau, 1992), and woman's clothing (Brewis-Levie, 1997), there is evidence that the NBD-Dirichlet model provides a good fit.

extensive discussion in the literature on what the brand connotes (Park, Jaworski and MacInnis 1986; Aaker 1991; Blackston 1993), or suggestions that the main requirement for brand loyalty is a feeling for the brand that is stronger than that felt for its competitors (Dick and Basu 1994; Mellens, Dekimpe and Steenkamp 1996). Such arguments might be appropriate for products that are strongly beneficial or where the consumer has a high level of involvement, but they have little place in the purchase of frequently-bought goods that often serve a simple instrumental function, e.g. detergent, coffee, sugar, kitchen towels, etc.

Also, it has been suggested by McWilliam (1997) that while consumers can be involved with *products*, it is difficult to find evidence they are highly involved with *brands*. McWilliam found that brands within the same category shared the same consumer motivations and involvement in purchasing behaviour, hence as she states:

"...manipulating the motivational antecedents of involvement, or the level of involvement at the brand level, does not appear to be within the easy gift of the brand manager."

McWilliam (1997, p65).95

As we have seen, for frequently-bought goods, the main reality of loyalty is continued purchase of a limited selection of brands, i.e. people draw on only a few brands from those available and tend to purchase these in much the same proportions over long periods of time.

Regularities of behaviour, i.e. habits, are learned in different contexts and then elicited when fragments of those contexts recur and cue the behaviour. Described in this way,

⁹⁵ McWilliam found that for 92% of the 254 FCB grid categories that she examined, there was no significant difference in brand involvement profiles within a category. The FCB Grid was developed by Foote, Cone and Belding Inc. and comprises responses from just under 1,800 US female consumers on 254 highly diverse consumer categories and services, asking respondents how "involving" they felt the purchasing decision was for each brand and category.

purchase and consumption are passively produced by the environment rather than actively produced by a consumer making deliberate choices after checking on any feelings and beliefs about the brand. In a sense loyal behaviour needs no explanation since it continues to be evoked until forces modify the consumer's environment. There is a parallel here with forces in physics: the velocity of a body continues unchanged until forces act upon it, but before Newton clarified this issue, philosophers sought an active principle to explain velocity.

Occasionally habits get reset by the environment (a promotion for a new brand, a favourite brand out of stock or new packaging for a brand not tried in a long while) and consumers may "defect" from one or more of their regular brands and try something new. Mostly purchasers revert back to their usual portfolio and defections are temporary, but occasionally longer-term changes can occur. The Dirichlet essentially describes the pattern of habit and will not predict such permanent changes. Much of the empirical work reported in this thesis has been concerned with quantifying deviations from the purely habitual model.

9.2 New Substantive Findings

The main aim of this thesis has been to extend and critically probe the Dirichlet approach. Previous researchers had noted various discrepancies and deviations from the model predictions. In the empirical studies reported here (in Chapters 5 to 8) these discrepancies have been researched in detail using individual household level panel from twenty-nine datasets across four countries. There are a number of substantive findings:

9.2.1 Substantive Findings Which Reinforce the Dirichlet Approach

 Erosion, the proportionate fall in repeat-purchase over time, differs little by weight of purchase. Lighter brand buyers have much lower repeat-purchase rates, but they do not appear to be more prone to erode than heavier buyers of the brand. This is consistent with the Dirichlet assumption that purchase incidence and brand choice are independent.

- (a) The average brand accounts for around 30% of buyers' category requirements.
 - (b) When a brand is the favourite brand it is bought about twice as often by its buyers compared with the average brand, and accounts for just over half of its buyers' category requirements.
 - (c) In terms of sales importance, the approximately one third of customers of a brand who treat it as their favourite, account for two thirds of a brand's sales.

These three findings are all well-predicted by the Dirichlet model.

- 3. At the individual level, behavioural and attitudinal loyalty-related measures show very little correlation. This is congruent with the definition of loyalty as a propensity to re-purchase, i.e. strongly-felt attitudes toward the brand are not seen as a necessary requirement for purchase or re-purchase.
- 4. Price-related promotions are used by existing customers of the brand. Buying a habitual brand once again does not increase the likelihood of buying that brand in the future; there is no learning, therefore promotions do not make customers more loyal.
- 5. Competitive brands do not segment the market. Within a category, brands which are similar, and even many of those which differ in physical formulation, tend to appeal to the same kinds of consumer. This is consistent with the lack of segmentation variables in the Dirichlet.

9.2.2 Substantive Findings Concerning Deviations from the Dirichlet

Deviations Over Time

 Over a year, repeat-purchase loyalty erodes by an average of 15%. The Dirichlet assumes that there is no decline in the repeat-buying rate over time, i.e. consumers' propensities to purchase different brands remain constant over time. This assumption provides an extremely good first-order description of buying in the short to medium term. Our finding here quantifies what practitioners have always "known"; in the medium to longer term, over a year or more, there is some erosion of repeat-buying.

The finding that, on average, erosion is 15% in a year (not 5% and not 50%) provides a benchmark for managers wishing to evaluate a "loyalty" scheme. Our findings that price promotions overwhelmingly attract previous buyers of the brand and that the product category studied with the lowest erosion (US detergent) had a very high level of promotional activity, suggests that promotions may play an important role in keeping customers coming back to a brand (in contrast to the common view that they often attract new buyers to a brand).

2. Erosion is lower for brand leaders. Although this finding specifically refers to brand leaders and not just large brands it is related to the concept of Double Jeopardy; bigger brands have more buyers who go on buying them for longer. In practice, this brand leader effect is probably related to distribution (the brand leader is always stocked in every retail outlet, but if one of the brands in your portfolio is a smaller brand your local store may suddenly cease to stock it).

High Share Effects

 For heavy brand buyers, a greater share of their category requirements are satisfied by the brand than the Dirichlet model predicts, i.e. they are more "loyal". 2. High preference for a favourite brand is a weak predictor of a brand's repeatpurchase erosion. If habits are set by the environment rather than as an internal act of decision by the shopper, then it is not surprising that we found a lack of relationship between loyalty to a single brand over time (the inverse of erosion) and preference for the brand.

9.3 Directions for Future Research

This thesis extends our knowledge of purchasing in frequently-bought markets and reinforces the view that brand loyalty can best be explained as a propensity to repurchase. We have also explored the idea that brand loyalty, the propensity to repurchase, can usefully be divided into two concepts: share of purchase (preference) and purchase over time. Further planned research which builds on the findings presented here will continue to focus on these two aspects of brand loyalty.

Maintaining Market Share

It has already been established by Ehrenberg, Goodhardt and Barwise (1990), that if a company wishes to build market share, it must concentrate on increasing penetration (the number of buyers) rather than increasing purchase frequency. The development of an erosion of repeat-purchase measure allows us to look at how brands maintain their share. Within a particular market, brand shares may be stationary over time, but is this because the brand has very low/no erosion? Or is it because new/previous buyers are constantly being drawn to the brand? Low erosion can be due to customers buying the brand on a regular basis (but not necessarily giving a high share of purchase to that brand). Who buys during price promotions (previous light or heavy buyers)? Do brand leaders differ from lower-placed brands? If so, does this reflect different promotion/advertising strategies? In answering these questions can we find regular patterns?

Loyalty schemes usually aim to "increase customer loyalty". We propose new welltested measures for assessing such schemes; loyalty measures can be calculated for competitive offerings both before and after the scheme launch, or, if only post-launch data are available, the results from loyalty measures can be compared with model predictions. We can now also ask the questions: "How does the loyalty scheme affect share of purchase for the participating brand?" (i.e. does the share given to the favourite brand increase or vary significantly from model predictions?). "How does the scheme affect repeat-purchase over time?" (i.e. does repeat-purchase erosion fall for the brand?).

Brand loyalty is an important concern for both academics and practitioners. The research presented here suggests meaningful assumptions which can, and cannot, be made about brand loyalty. We propose a theoretically-grounded and empirically well-established approach to the study of brand loyalty which should stimulate and inform further studies in this area.

APPENDIX 1: THE NBD-DIRICHLET MODEL

The NBD-Dirichlet is a stochastic model of buyer behaviour which describes how frequently-bought branded packaged goods are purchased in established markets. It was developed by Chatfield and Goodhardt (1975) as an extension of earlier theories - the NBD-LSD repeat-buying models - which considered one brand (or item) in isolation. These earlier theories and the Dirichlet were developed in tandem with empirical research which identified common patterns of purchase for frequently-bought goods. Other researchers have also contributed to the theoretical development of the Dirichlet (Bass *et al.* 1976), and there has been a stream of papers which give practical applications of the theory and models (Goodhardt, Ehrenberg and Chatfield 1984⁹⁶; Ehrenberg 1988; Ehrenberg and Uncles 1997).

The theory underlying the Dirichlet is that there is a small set of interrelated assumptions which describe and predict the patterns of purchase incidence and brand choice for any market which is stationary, unsegmented and non-partitioned (Goodhardt, Ehrenberg and Chatfield, 1984). The value of this is that while individual buyers will have an almost infinite number of reasons for when and what brand they buy, their behaviour is sufficiently irregular so as to appear stochastic or "as if random" and so, in aggregate, can be successfully described by specific probabilities generated by a stochastic model such as the Dirichlet.

The usefulness of this model as a benchmark lies in the fact it has successfully characterised the detailed structure of consumer markets *in general* across a wide range of conditions - it therefore provides interpretative norms. The model can be used to describe and predict behaviour in almost any situation where there is choice and the opportunity for repeating the behaviour. For example, Dirichlet-type patterns have been found to occur for: approximately 50 different food, drink and other grocery products, including private labels; OTC medicines; gasoline; motor cars; TV programs and channels; store chains and

⁹⁶ The notation and commentary here are based on Goodhardt, Ehrenberg and Chatfield (1984).

shopping visits; in the UK, US, Japan and Germany; for different time periods (from one week to two years, for data from 1950-1996), and different data collection methods (Ehrenberg and Uncles 1997).

Model Specification

For a population of N consumers making purchases in a category with g brands, the Dirichlet model specifies probabilistically how many purchases each shopper makes in a particular time period and which brand is bought on each purchase occasion. The model therefore combines purchase incidence and brand choice. The model specifies the probability vector of the *i*th shopper making any specific combination $\{r_j\}$ of purchases of the j = 1 to g brands in a particular time period of length T. If we sum over the j = 1 to g brands, $\sum r_j = n_i$ is the total number of purchases of the product made by the *i*th shopper in that period.

There are five distributional assumptions in the theoretical model: the incidence of product purchase is specified as a mixture of two distributions, brand choice is covered by another two distributions and there is a final assumption concerning how the product incidence and brand choice assumptions are related.

Purchase Incidence

(i) Successive purchases for each individual shopper (i) appear as if random, and are assumed to be independent with a constant mean rate μ, in a particular time period (the minimum time period should not be shorter than the usual minimum inter-purchase period - a week for most grocery products, however longer time periods - a year or more, can be specified). The number of purchases n, made in each of a succession of equal non-overlapping periods of relative length T follows a Poisson distribution with mean μ,T.

191

(ii) Average purchasing rates are assumed to vary among consumers
(consumer heterogeneity), i.e. there are light, medium and heavy category
buyers. The average purchasing rates of individuals vary according to a
Gamma distribution with the following density function:

$$\frac{e^{-\mu^{KM}}\mu^{K-1}}{(M K)^{K}\Gamma(K)}$$

In practice this distribution is often skewed (a reverse J-shape) with many categories having large numbers of light buyers.

These two assumptions in combination give rise to a Negative-Binomial Distribution (NBD) for the number of purchases of the product made by all individuals in time period of length T, with mean MT and exponent K. The indexing by time enables predictions to be made for different length time periods.

Brand Choice

In terms of brand choice each buyer is assumed to have a set of propensities for buying each of the available brands which are expressed as a set of probabilities. We assume a mixture of two probability distributions, to give the number of purchases, r, which an individual shopper makes of a particular brand, given that s/he makes n purchases in total. The distributions are :

- (iii) Each buyer's probability, $(p_j)_i$, of buying brand j from j = 1, ..., g brands is constant over time and follows a multinomial distribution M(r | p, n). Brand choices at successive purchases are assumed to be independent. In practice consumers often purchase from a portfolio of around three brands (e.g. with probabilities of purchasing over time of 0.6, 0.3, 0.1). This implies that the probabilities of purchasing other brands are more-or-less zero.
- (iv) The distribution of such probabilities, $(p_j)_{ij}$, among shoppers follows a

"Dirichlet" type of multivariate Beta Binomial distribution $D(p \mid \alpha)$. Here $D(p \mid \alpha) = C p_1^{\alpha_1 - 1}, \dots, p_g^{\alpha_g - 1}$ for g stores, where the α are proportional to the stores' market shares and where they sum to the parameter, S, and C is a scaling coefficient which is a function of the α . When there are only 2 brands in the market (g = 2) this reduces to the Beta Binomial Distribution.

(v) Since the model is for unsegmented markets, it is assumed that the above statistical distributions are independent of each other, i.e. the average purchase frequency distributions and the brand choice probabilities over different consumers are distributed independently over the population.

By grouping terms we obtain the compound distribution for the number of purchases an individual makes of each of the g brands in a period of time T:

 $[M(\mathbf{r} | \mathbf{p}, \mathbf{n}) \hat{\mathbf{p}} D(\mathbf{p} | \alpha)] \hat{\mathbf{n}} [P(\mathbf{n} | \mu) \hat{\mu} G(\mu | \mathbf{MT}, \mathbf{K})]$

Where M, D, P and G denote the Multinomial, Dirichlet, Poisson and Gamma distributions, respectively.

A further assumption is that all brands are able to compete with each other, i.e. all brands are equally available. This assumption is not always valid, for example store label brands will only be available within a particular store group. This limited retail distribution means that store brands have lower penetration rates and hence marginally higher buying frequencies than predicted (Ellis and Uncles 1991).

Model Estimation

The model is parsimonious in its input requirements. It is necessary to estimate the mean rate of purchasing, M, and the exponent, K, of the NBD. The Dirichlet component has one parameter, S, (sometimes called the "switching" parameter). S is the sum of the values of α s in the model S = Σa_j , and reflects how diverse buyers are in their brand

choices. This parameter can be estimated from: (a) two measures relating to the whole market: overall patronage or market penetration and the average shopping frequency of shoppers, and (b) these same two measures for each, or any, of the itemised brands. There are no closed algebraic formulae, so the estimation of the model's parameters is essentially arithmetic. S is estimated iteratively for each brand and the brand S values are then combined to form an average (weighted by market share) for the category. This procedure, and that for the K parameter, below, are now calculated simply using *BUYER* (1989) software developed by Mark Uncles.

The K parameter is calculated by fitting the NBD to the distribution of purchases for the total category. The "mean and zero" method of estimation is normally used. This method is most appropriate when the distribution is "reverse J-shaped", i.e. there are a large number of light buyers (and this is the method used in the *BUYER* software package). An alternative method when the distribution is more "humpbacked" would be to use mean and moments method (use of this alternative method would slightly alter the precise value of the predictions, but the experience of Uncles and Hammond (1995) suggests the differences are minor and the substantive conclusions do not alter).

The K and S parameters are characteristic of the category and can be interpreted as reflecting the heterogeneity or diversity of consumers. K reflects the extent to which individual product purchasing differs from the overall mean, M. S is calculated for each brand and reflects how much individuals differ from each other in their propensities to buy that brand. If S is large, the variance is near-zero, and there is minimum diversity - everyone has a similar propensity to buy the brand. If S is small, then there is more individual variation in the propensity to buy the brand.

Justification of Assumptions

Assumption (i) of a Poisson process with a mean μ_i for the *i*th individual's purchases of the category over time is supported by the observation that purchase incidence is a zero-order process, i.e. independent of the incidence of previous purchases, and so irregular that it can

be regarded as if random. There is also more direct evidence, e.g. it has been found in empirical studies that the observed variance is equal to the mean (as in Poisson theory) (Ehrenberg 1959; Chatfield and Goodhardt 1973; Dunn, Reader and Wrigley 1983)

Assumption (ii) of a Gamma mixing distribution for the values of μ_i is based on the view that the average buying rate in one category is independent of the rates of buying for other categories and that for an individual the proportion of their total grocery shopping that they give to one category is independent of their total rate of buying all categories. There is strong theoretical support for this assumption, at least at the brand level (Goodhardt and Chatfield 1973). At the category level, Goodhardt, Ehrenberg and Chatfield (1984, p. 626) justify the Gamma assumption as follows:

"If for different product classes, P, Q, R, S, etc. (like toothpaste, breakfast cereals, canned soup, etc)

(1) the average purchase rate of P is independent of the rates for other products Q, R, S, ..., and

(2) P's proportion of a consumer's total purchasing, namely P/(P + Q + R + S +...), is independent of her total rate of purchasing all the products, then it can be shown, following a similar characterization for *brands* (e.g. Goodhardt and Chatfield, 1973; Chatfield 1975), that the distribution of the mean

rates of purchase of P must be Gamma."

In practice, there will be a small correlation in purchase rates across categories, e.g. large families are likely to be heavy buyers of several products (e.g. detergent, cereals, washing-up liquid, etc.).

The assumption of a multinomial distribution for brand choice (iii), depends on stochastic buying behaviour at the individual level being irregular but stationary in the medium term. In practice individual consumers will have reasons for their purchasing behaviour; mostly these reasons rest on habit, but variety seeking, specific one-off needs, the considerations of different household members, advertisements and displays all play their part. However, in aggregate these reasons appear to be irregular, so can be modelled by an "as-if random" stochastic process.

If we assume an unsegmented market, where the multinomial choice probabilities for each individual are fixed over time, the mixing distribution of the brand choice probabilities across individuals must take the Dirichlet form (assumption (iv)) (Goodhardt, Ehrenberg and Chatfield 1984); the proportion of purchases given to any particular brand is independent of the way in which the remaining purchases are distributed between the other brands.

The final assumption, independence of purchase incidence and brand choice, is backed by empirical evidence that market shares are very similar for light, medium and heavy category buyers (Ehrenberg 1972/1988; Ehrenberg and Uncles 1997).

The Additive Property

An important property of the model is that any two brands can be combined together to form a "superbrand" (with a market share which is the sum of the two individual market shares), without affecting the specification of the model. The additive property means that many small brands can be grouped into an "all other brands" category, and it also helps to explain why the model is applicable when a brand consists of many different flavours or pack sizes and is bought at different retail outlets.

Validation of the Model

As we have described, retail grocery stores and many individual manufacturers routinely collect and analyse purchasing data from consumer panels. With the Dirichlet we are not dealing with abstract or normative assumptions; if the assumptions for a particular brand or category are not valid then a comparison of actual purchasing data with model predictions will reveal deviations. Isolated deviations can point to a growing or failing brand or to failures in distribution (or errors in data collection). For example, if there was

brand segmentation based on different types of shopper buying different brands (e.g. heavy category buyers buying Brand A and light category buyers buying Brand B), the values for brand patronage and loyalty variables for different brands would show systematic deviations from the model predictions which are based solely on the brand's market share.

Consistent deviations under different conditions have been shown to be rare (see for example the wide range of conditions under which the model holds, Ehrenberg and Uncles 1997). But where deviations exist they can indicate important generalities (e.g. marginally higher buying frequencies than predicted, because of lower penetration rates, for store brands (Ellis and Uncles 1991)); or opportunities to quantify new "laws", e.g. in this thesis we have demonstrated that the erosion of repeat-purchase loyalty (under a variety of conditions) is around 15% a year.

The order of the model (zero-order) and distributional properties are well-known and widely accepted (Bass *et al.* 1984; Dunn, Reader and Wrigley 1983; Morrison and Schmittlein 1988). In principle, alternative models might be applicable, e.g. a conditional NBD (Morrison 1969), or we might consider non-parametric specifications of heterogeneity (e.g. Reader and Uncles 1988; Reader 1993), but these alternatives do not have either the generalisable or the parsimonious appeal of the NBD-Dirichlet. A direct comparison of parametric and non-parametric methods in a store choice study showed a negligible improvement in fit from using the mass point estimation method (Reader and Uncles 1988). From a practical point of view it is not felt that the additional computation and loss of generality of the findings justifies the use of non-parametric alternatives.

The Dirichlet model assumes stationarity over the analysis period, i.e. we assume that aggregate market shares remain broadly constant. This does not mean that there cannot be variability in the data. Underlying these stationary market shares there is advertising activity, price promotions, etc., but on average, and in aggregate, such marketing activity serves to stabilise market shares, and so a stationary model is well-suited to explaining brand behaviour over the medium term. In practice, the Dirichlet largely holds for near-

stationary and even fairly non-stationary markets (see Ehrenberg and Uncles 1997 for a list of markets where the model has been shown to fit). The Dirichlet can also be used in dynamic situations, where deviations from model fit can be used to pinpoint the cause of the non-stationarity (e.g. whether a sales "blip" is due to extra buyers or a higher frequency of purchase by existing buyers).

With regard to the goodness-of-fit, studies of packaged goods markets have shown consistently that there is generally an extremely good correlation between observed values and model predictions, and a lack of consistent bias for most model measures.⁹⁷ Bearing in mind the advantages of parsimony that the Dirichlet brings, we are seeking a "generally good fit" across many sets of data (different categories, countries and time periods). This is in contrast to the "best fit" which might be achieved in OLS regression using only one set of data, but where the model produced need not be a good fit for any other set of data.

⁹⁷ There are some small but consistent biases regarding sole brand buyers and the results in this thesis point to a couple more consistent biases - (i) the over-prediction of the repeat-buying rate in the medium to longer term, (ii) the under-prediction of purchase frequency (and hence SCR) for heavy brand buyers.

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