Managerial Uses of Descriptive Marketing Models - The Case of the Dirichlet

Andrew Ehrenberg

South Bank University

and

Byron Sharp

University of South Australia

Abstract

Descriptive modelling in marketing has been mistakenly derided as having little practical use - that managers need prescription not "mere description". This paper addresses this misunderstanding by documenting the application of one important descriptive model - the Dirichlet. Descriptive models, such as the Dirichlet, that reflect well-grounded patterns buyer behaviour, have a successful track record in being used to assist decision making and gain insight into the effects of marketing mix variables. Descriptive models may not always feature any marketing mix variables but they have allowed managers to make better decisions about these variables:

By providing benchmarks from which to assess the impact of marketing interventions.

By explaining the composition of sales increases/decreases.

By isolating and decomposing effects and causes.

Introduction

In this paper, we counter what is commonly said about *descriptive* models in marketing. These are models that do not seek to make causal inferences and often do not include marketing mix variables. These models, even models with well grounded assumptions concerning buyer behaviour, have been portrayed as merely descriptive, as providing no explanatory power (Rossiter 1994). Critics say that this means that descriptive theory offers little to marketing managers. A not uncommon perception seems to be that the proper job of models is to pop out an answer that completely solves the managerial problem, a bit like the way some 20ᵗʰ Century science fiction movies portrayed computers as being able to answer any question. Against this hopelessly unrealistic criteria, descriptive models (from Newton's laws of motion to marketing's Duplication of Purchase law) all come up wanting – they are seen to offer "mere description" rather than automatic solutions. However, against more real world criteria, descriptive models show great practical application, because they can offer reliable prediction, insight and explanation.

Descriptive Models - The Dirichlet Example

"*Descriptive* models seek to uncover marketing phenomena and to represent them . . . This is the classical task of science . . . Descriptive models without marketing decision variables. . . go back to the work of Ehrenberg (1959, 1988) . . and others" (e.g. the Dirichlet) (Little 1994)

Descriptive models describe observed relationships in the physical or social world. Ideally such models are simple and have been validated over a wide range of conditions. Newton's inverse-square law of gravity is a well known example. These simple models of empirical generalisations may sometimes be systematically integrated into more comprehensive descriptive models/theories (Hunt 1991) – the Dirichlet is an example in marketing (Ehrenberg 1993; Goodhardt et al. 1984). Descriptive models of consumers' buying behaviour, e.g., Hendry, first-order Markov, NBD, NBD-Dirichlet, etc., plus their more complex descendants (e.g., Bhattacharya et al. 1996; Sethuraman et al. 1999), receive little coverage in the marketing literature(East 1997; Foxall 1990 are noteworthy exceptions), let alone are they *used* by most academic modellers. The ways in which good descriptions of well-established marketing phenomena can, for example, provide decision-support and marketing insights does not yet seem to have been widely appreciated. Hence we briefly outline some key aspects by using the Dirichlet as a leading example. The Dirichlet is a model that incorporates a number of well established empirical generalisations concerning repeat-buying, it does so by assuming a particular stochastic distribution of consumers' purchase probabilities (Goodhardt et al. 1984).

Table 1 describes comparisons for half a dozen brand performance measures (BPMs), covering the top 8 brands in a dozen varied product-categories (from Ehrenberg and Uncles 2000) along with the Dirichlet model's

predictions. Such measures are continually tracked on a vast scale by the world's larger marketing research companies (e.g., ACNielsen, IRI, TNSofres, GfK, etc) and their clients

Table 1   Annual Observed and Theoretical Performance Measures
 (O = Observed; T = Theoretical Dirichlet predictions)

Brands (by share)	Brand Size		Loyalty-Related Measures						
		% buying	Purchases Per buyer T	% Buying 5+ times O	% Buying 5+ times T	100%-loyal O	100%-loyal T	Cat.Purch Per Buyer O	Cat.Purch Per Buyer T
A			3.9	24	25	22	16	10	10
B			3.5	21	20	16	13	11	11
C			3.1	16	17	11	11	12	12
D			2.9	13	14	11	10	11	12
E			2.8	19	14	12	9	12	12
F			2.8	11	12	10	9	12	12
G			2.9	11	12	9	9	12	12
H			2.6	13	13	7	9	13	12
Av. Brand			3.0	16	16	12	11	12	12

Three traditional patterns show up:
Market-shares and penetrations decrease greatly across brands, by up to 9-fold (900%).

Most of the loyalty-related measures stay broadly the same across brands or decrease at most slightly (the "Double Jeopardy" phenomenon, (Ehrenberg et al. 1990)).

The average rate of buying the *category* by buyers of each brand however *increases* only a little from the smaller to larger brands (from 10 for Brands A to 13 for Brands H).

These descriptive patterns show what competitive markets are like. Their generalisability has been established empirically across more than 50 product categories and are predicted by the Dirichlet model, as shown. Such invariant findings have, over time, led to many decision-related marketing implications and insights (see Ehrenberg and Uncles 2000).   Descriptive models seem to become *explanatory* by link their underlying assumptions (see Goodhardt et al. 1984 for underlying assumptions of the Dirichlet) to different aspects of the market and of marketing, e.g., for Consumers, Brands, Marketing–mix inputs, and Managerial issues. Examples for the Dirichlet are briefly as follows:

A. For consumers
Dirichlet implications for experienced consumers are that they mostly have heterogenous but steady split-loyalty purchase propensities instead of each consumer being constantly buffeted around by various marketing inputs.
These purchase propensities (or probabilities) are usually "zero-order" and "as-if-random" (i.e., purchase feedback or learning will mostly have stabilised long ago with by now highly experienced consumer (e.g., Bass et al. 1984; Ehrenberg and Uncles 2000)).

Markets are unsegmented between competitive brands (but potentially segmented for subcategories or categories, e.g., cat food is bought by cat owners) (Kennedy and Ehrenberg 2000).

B. For brands

All loyalty-related measures as in Table 1 (e.g., Repeat-buying; 100% loyals; share of category requirements SCR; etc) tend to be highly correlated (r >0.9). They appear to measure the same thing, i.e., "*loyalty*". Loyalty exists but varies little between competitive brands.

In theoretical models like the Dirichlet, brands are by definition closely substitutable, i.e., undifferentiated except for their names and market-shares: Thus "Brands are Brands", or "The Commodity with a Name". This is also thought to be so *in practice* for directly competitive brands, because worthwhile competitive advantages are soon copied (see also Ehrenberg et al. 2000).

Functional differences occur *within* brands (pack-sizes, flavours, hatch backs etc). SKU-level product variants are again much the same for most brands. (Functionally different *sub-markets* also occur and are usually self-evident, e.g., Decaffeinated vs. regular coffee, moist vs. dry cat food, etc.) All this tends to be accommodated in the broad NBD-Dirichlet approach by allowing for the appropriate functional groupings of stock-keeping units (Singh et al. 2000).

Minor product or emotional differences can also occur between brands (e.g., The bottle-top or the car-door handle). But they are seldom advertised or featured on packs, or noticed by consumers until after they have chosen the brand in question (e.g.. Ehrenberg et al. 1997).

C. For the marketing-mix

The Dirichlet approach accommodates all such brand differences by generally expecting them to affect the brands' different penetrations (i.e., how many consumers have an item in their repertoires or consideration sets). But marketing inputs would seldom affect average purchase frequencies or other loyalty measures, since these tend to be steady from brand to brand or item to item, as in Table 1, except when penetrations are very high.

Advertising appears to be largely aimed at competing and hence similar brands. It is thought to act as publicity, largely to remind and reassure the experienced consumer and help to defend the brand's penetration, rather than having to persuade consumers to become more loyal (Mills et al. 2000).

Managers may nonetheless pursue loyalty-building aims (e.g., Loyalty cards, relationship marketing, etc). The Dirichlet findings then explain why such efforts do not work as expected (i.e., no major increases in loyalty, see Sharp and Sharp 1997).

D. For marketing management issues

The principal strategy implication stems from the near-steady state which is observed for most markets most of the time. Marketing has, therefore, mainly to maintain a brand's competitive position in the pecking-order – "running hard to stand still" – with only an occasional gain (a bonus) or loss, as discussed variously in our preceding references.

It is often thought when comparing competing brands that any *deviations* from the descriptive norms would or should be the prime interest – e.g., the norms being something to "beat" and to "make your brand grow". But the O-T deviations for established brands as in Table 1 seem generally small or not surprising or very consequential (e.g., that that particular brand has patchy distribution). In practice the loyalty-related measures are mostly "just right", as Bhattacharya (1997) has put it.

An interpretative parallel to such near-steady market structure is again provided by gravity: What overwhelmingly matters when we walk on the earth, fly in aeroplanes, or play ball, is that gravity is approximately constant, i.e., $g \cong 32$ ft/sec^2 near the surface of the earth. But it is predictably a little higher down a mine and a little lower up a mountain, and with other tiny variations. But mostly both fact and theory say that gravity is pretty much constant. And similarly for buyer behaviour: the facts and the descriptive models say that loyalty measures hardly vary from brand to brand other than directly with market share (Double Jeopardy Ehrenberg et al. 1990), and this can have numerous managerial and conceptual marketing applications, as we have noted.

Well-grounded descriptive models (i.e., knowledge based on empirical generalisations of invariance) thus can play the classic role of building-blocks for predictive and explanatory theory (Hunt 1991) and for decisions.

They can provide both managers and academics with benchmarks to interpret and to help in assessing the impact of marketing decisions on brand performance measures. Without this, it seems difficult to make sense of the vast volumes of marketplace data that are available today.

Practical Applications

We now briefly list some of the many practical applications of the "descriptive" Dirichlet-model which have been reported and which go beyond "mere" description (e.g. that in Table 1 35% of households had bought brand B 3.6 times in that year):

(i)   *Brand Audits:*
        Re-evaluating the performance of individual brands, i.e. tracking studies. (Many hundreds of cases have been covered, usually showing that each brand is "normal" but also pinpointing and explaining any exceptions).

(ii)   *Extensions to New Conditions*:
        Extensions of the model to other years, countries, or categories (eg Uncles and Hammond 1995; Uncles and Ellis 1989; Wright et al. 1998).
The first marketing question when being faced with such a previously unknown market is: What is this market like? The simplest solution is by benchmarking: Is this "new" data like all or any of the other markets which I already know or does it differ (and if so, how and why)?

(iii)   *Market Partitioning*
Using the known patterns (eg the Duplication of Purchase law) to identify clusters of brands. These clusters have been found to usually be associated with functional brand differences (e.g. decaff and regular coffee; leaded and unleaded gasolene; luxury cars). Understanding which brands compete with which, and who they sell to is the typical goal of many segmentation, U&A, and clustering studies, here made easy by using well-based benchmarks.

(iv)   *New Brands*
It is now known that new brands in fact gain near-instant loyalty (Ehrenberg and Goodhardt 2000; Wright and Sharp 1999). This now allows managers to make realistic predictions of the repeat-purchase rates they should expect their new brand to obtain very quickly, and so this can be monitored against early repeat-purchase data.

(v)   *Dynamic Brands or Markets*
Short-term advertising responses; seasonalities, stock-outs, promotional blips, longer-term trends, etc. are being covered (e.g., Ehrenberg et al. 1994). The question is how do the dynamics work causally – more buyers, more per buyer, more heavy buyers or 100%-loyal ones, and so on?

And other major issues have been tackled, such as (vi) *Cannibalisation* (e.g., Lomax et al. 1996), (vii) *Brand or Line Extensions,* (viii) *Price Sensitivities* (Scriven and Ehrenberg 1999), (ix) *Loyalty Programs* (Sharp and Sharp 1997), (x) *Subscription markets* (Sharp and Wright 1999). In all cases, the studies have compared and evaluated what happened with what could be expected, i.e. the known "descriptive" empirical and Dirichlet benchmark.

Conclusion

The systematic and thoughtful depiction of marketing phenomena usually leads to many insights, decision-support, and informed action and evaluation, as in other scientific and engineering endeavours.

The key point of "why-orientated" descriptive modelling such as the Dirichlet is that it can show how and why sales increase when they do increase. From this we can learn.
Good descriptive models:
Provide insights and predictable benchmarks for evaluating change,
Are simple, with few or invariant parameters,
Have a long track-record of published replications and applications,
Help us slowly to learn about causes and their effects.
As in many other areas of engineering, models which successfully describe generalisable marketing phenomena first show us what, where, how, and how much. But they can then also help in deciding what to do and why.

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