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# A hierarchical Bayes model of choice between supermarket formats

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## Abstract

A model of consumer's choice between different supermarket formats is developed. Three formats are considered, conventional supermarkets characterized by high-low pricing, wide assortment and some service, discount stores characterized by every-day-low-pricing, narrow assortment and no service, and hypermarkets, characterized by a pricing policy somewhat in between the two other formats, large assortment and some service. The model is developed within the framework of the multinomial logit model that has been widely used in retailing but also strongly criticized. Problems involved in using this framework is discussed, and a random coefficients logit model is suggested to remedy these problems. The model is estimated as a hierarchical Bayes model, and the estimated parameters are compared to the estimates of a standard logit model. The importance of the choice determinants is assessed by analyzing direct- and cross-choice elasticities. Input for this research is provided by data from a survey of grocery shopping in the greater Copenhagen metropolitan area.

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## 1. Introduction

Understanding the nature of competition among supermarkets is an important area of research in retailing. The supermarket market, in particular, offers the opportunity to study retail competition based on price formats, assortments, and service levels. The grocery retail market is thus in many Western countries dominated by a few supermarket groups each operating a set of store chains primarily differing in pricing policy, assortment and service level, and with a fairly large common set of products and brands.

Grocery supermarket formats are subject to a wide range of variation, (refer to [Kahn and McAlister, 1997](#); [Levy and Weitz, 2001](#)), but in this paper we will distinguish between three major formats that we consider span the range of variations in many markets. Conventional supermarkets characterized in general terms by high-low pricing, broad assortment, and some service; discount supermarkets characterized by every-day-low-pricing, narrow assortment and no service, and hypermarkets characterized by a pricing policy somewhat in between the two other formats, wide assortment, and low service. These three formats compete for

the major shopping trips of households, and constitute the supermarket market ([Marion, 1998](#)).

In the positioning of grocery retail stores, price, apparently plays the decisive role, and a much more important role than in the positioning of products and brands. Indeed, 90% of all retail advertising in Europe is price related, and 70% is exclusively on price ([Corstens and Corstens, 1995](#)). This seems to indicate that store choice primarily is motivated by utility considerations rather than by hedonic considerations and that grocery shopping is a functional activity, where consumers' perception of price plays the major role. In a study of consumers' perceptions of grocery retail chains [Solgaard \(2000\)](#) thus observed that although discount chains are rated very poorly compared to other supermarket formats on a whole range of store values except one, namely, good prices (in all 21 value aspects were rated), discount chains at the same time are growing and gaining market share.

The growing interest in inter-format competition in grocery retailing is reflected in a number of recent papers. [Lal and Rao \(1997\)](#) investigate the factors contributing to the success of every-day-low-pricing by analyzing the competition between supermarkets through a game theoretic analysis of a market consisting of time-constrained customers and cherry pickers. [Bell and Lattin \(1998\)](#) link consumer preference for shopping in every-day-low-pricing stores versus high-low-price

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stores to the expected dollar size of the household's shopping basket. Bell et al. (1998) demonstrate how every-day-low-pricing and high-low-pricing stores present shoppers with a trade-off between fixed and variable costs of shopping, and show that high-low-price stores can offer lower total costs for small baskets, while every-day-low-price stores offer lower total costs for large baskets. Finally, Galata et al. (1999); explore the nature of segmentation in store choice behavior where competing supermarkets offer every-day-low-price and high-low promotional price formats. They show contrary to previous research that supermarkets with different price formats may not induce extensive store-format switching among consumers. In this paper we take another look at consumers' choice between different grocery store formats, and investigate the sensitivity of this choice to changes in the consumers' perceptions of the price level, and other variables that influence their decision of which type of store format to patronize. We analyze choice behavior in a Danish setting.

Against this background it is the objective of this paper to model the store choice decision of supermarket shoppers so as to be able to investigate the sensitivity of the store choice decision to changes in shopper's perceptions of the choice determinants. An additional objective is to discuss problems involved in operationalizing store choice models, using the framework of the multinomial logit model, and to suggest alternative model specifications to remedy the identified problems. The multinomial logit model has been widely used in store choice modeling, but also strongly criticized. The primary motivations for rejecting the multinomial logit model in the study of store choice behavior have been the desire to avoid the independence from irrelevant alternatives (IIA) property, and to avoid the assumption that the coefficients of the variables that enter the model take the same values for all consumers.

The remainder of the paper is organized into five sections. Section 2 provides an outline of the store choice process and of the determinants of choice. Section 3 discusses problems involved in operationalizing models of store choice using a standard logit framework, and presents a random coefficients logit specification to describe household store choice behavior. The model is operationalized and estimated as a hierarchical Bayes model. Section 4 describes the choice setting and the database utilized to estimate the model. The results of empirical estimations of the model are presented in Section 5. The results are discussed in Section 6.

## 2. Store choice and its determinants

We assume that a consumer's choice of a preferred store format is based on the perceived utility that s/he

derives from the store format. In principle the utility emerges based partly on what the consumer perceives s/he receives partly on what the consumers perceives s/he gives. What the consumer receives is in retailing terminology often denoted the store's service output (Bucklin, 1966; Bucklin et al., 1996). To receive the service output the consumer will, however, incur some costs, i.e., spend a certain amount of her/his own resources in the form of time and money (Blackwell et al., 2001). Since both resources are scarce we assume that the consumer will try to direct her/his resource consumption toward the store that is perceived to maximize her/his utility, i.e., offering the greatest service output per spend resource unit in the eye of the consumer. This value-for-money perspective (e.g., Chang and Wildt, 1994; Monroe, 1990; Abbott, 1955; Hansen, 2001; Sweeney and Soutar, 2001) naturally does not exclude, that some consumers may emphasize service output over 'costs' and select a conventional supermarket or a hypermarket, while others may emphasize 'costs' over service output and prefer to shop in a discount store or hypermarket.

The assessment of the service output is based on the consumer's own experiences with the various store formats. The literature identifies a number of different store values as being potentially significant for the consumer's evaluation of stores, such as merchandise assortment, merchandise quality, service in general, personnel, store lay-out, convenience, cleanliness and atmosphere (Mazursky and Jacoby, 1985; Hildebrandt, 1988; Blackwell et al., 2001; Levy and Weitz, 2001; Bucklin et al., 1996, Finn and Louviere, 1996). The costs that the consumer might incur are determined by the price level and use of time and money resources for transportation to and from the physical store, i.e., a function of the store's location or distance from most often used starting point, (e.g., home or work). A few comments on store values and costs follow.

The overall assessment of a store termed *store image* is a function of the service output offered, of advertising and promotion campaigns as well as of the pricing strategies selected by the store. Since Martineau (1958) store image has constituted a major field of research within retailing, see also Lindquist (1974-75). In the following we consider the importance of the specific store values constituting image rather than the concept per se. For references regarding store image see Peterson and Kerin (1983), Zimmer and Golden (1988), Keaveney and Hunt (1992), Haugtvedt et al. (1992), and Chowdhury et al. (1998).

Store location has received much attention in research on store choice and for good reasons. Bell et al. (1998) refer to industry research in the US that indicates that location explains up to 70% of the variations in the choice of grocery store. Refer also to Stanley and Sewall (1976), Verhallen and de Nooij (1982), Engstrøm and

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