International Journal of Arts and Sciences
3(2): 138 - 174 (2009)
CD-ROM. ISSN: 1944-6934

Determinants of Store Type Choice in the Food Market for Fruits and Vegetables

Alexander Staus, University of Hohenheim, Germany

Abstract: Store choice decisions in the food retailing industry have been widely discussed in the literature. The importance of pricing, quality and assortment is known, and the influence of sociodemographic variables is small. In this paper, a mixed multinomial logit model is used to study the relationship between specific attitudes of households and their store type choice for fruits and vegetables. The mixed logit model includes a random intercept for the different store types and therefore allows for individual taste variation. Household attitudes are about quality, freshness, environment, advertisement, organic food and prices. Additionally several sociodemographics and interaction terms are included. Household attitudes and the actual point of purchase show which of these attitudes influence store type choice, and assuming there is a true relation between these choices, an implied image order of store types can be established.

1. Introduction

Expenditures in the food market have risen in Germany in the last decades, but the ratio of food expenses to total private consumer spending has been slightly declining. In 1991 the share of food expenditures was 12.98%, and in the last ten years, the share of food in total expenses has stayed relatively constant at around 11%. In 1991, 114.2 billion euros were spent for food and soft drinks, and the figure rose to 144.5 billion euros in 2007.[1] While the share of food spending in relation to total available income has been slightly decreasing, the share of net income spent on food has been rather constant at a high level.[2] A few large retailers, as in most European countries, share the largest portion of the market. In Germany, six companies (Edeka, Metro, Rewe, Schwarz, Aldi and Tengelmann) share more than 75% of total revenues in the food market.[3]
Although the market has few competitors, the German grocery retail industry is highly competitive. Nielsen concludes in its European Pricing Barometer that Germany is the cheapest country in Europe to buy international grocery brand products (ACNielsen, 2005). They claim that this is "due to the dominance of hard discounters such as Aldi and Lidl who are keeping prices competitive there."
The retailers have implemented four distinct store types: discounters, supermarkets, small and large hypermarkets. These store types can be differentiated by different variables, like

[1] Calculations are based on the Genesis tables of the Federal Statistical Office, Germany: Code 81000-0119 and 81000-0120 (02.09.2008).
[2] The main difference between net income and total available income is the added transfer income such as social-security benefits, pensions, and alimony to the available income.
[3] The share of total revenues of 75% are own calculations based on data of EuroHandelsinstitut (2008).

assortment, price setting, service or store size. For some groceries there are specialized stores. Most retailers use more than one store type for their sales. The stores within a store type share usually many same characteristics, but nevertheless they can be at least a bit different within these characteristics. The consumers' decision to buy groceries is based on a dynamic decision behavior of 1. determining whether there is a need to go shopping or not, 2. deciding what purchases need to be made, and 3. choosing a particular store. Theory assumes that at the third decision, first a specific store type is chosen and then a specific store within this store type. Previous literature concludes, that several variables, like assortment, location and price among others, influence store and store type choice. This work considers specific consumer attitudes, measured by the GfK, towards quality, freshness, environment, advertisement, organic food and prices, and several sociodemographics. These attitudes and the actual point of purchase show, which of these attitudes influence store type choice, and assuming there is a true relation between these choices, an implied image order can be established.
In this paper, a mixed multinomial logit model is used to study the relationship between household attitudes and their store type choice for fruits and vegetables with panel data. The share of fruits and vegetables in total food expenses is around 22%.[4] The model allows for an intrinsic preference and helps to reduce several estimation problems.
The paper is organized as follows. Section 2 gives a summary of the store choice literature so far. Section 3 describes the theory, section 4 the model specification and section 5 the dataset. Section 6 presents the estimation results and section 7 concludes.

2. Previous Research of Store and Store Type Choice

In general one can distinguish between four main types of grocery stores: discounters, conventional supermarkets, and small and large hypermarkets. The store types can be differentiated by store size, service, assortment and price policy. Marion (1998) and Tordjman (1994) further distinguish between price- and service-orientated types. Discount stores are characterized by everyday low pricing, a narrow assortment with many private labels, and no service. Conventional supermarkets have high-low pricing, a broad assortment with middle and premium class brands, and some service. Finally, in Germany one can also distinguish hypermarkets, which can be split into small and large types. Hypermarkets usually have prices between the other two types (discounters and conventional supermarkets), a wide assortment with many brands and high numbers of private labeled goods. The difference between small and large hypermarkets is i.a. the store size: small hypermarkets are generally above 1500 square meters, whereas large hypermarkets are generally above 5000 square metres. Large hypermarkets are usually located outside the city center (EuroHandelsinstitut, 2005). A specialized store exists for fruits and vegetables (f&v), e.g. weekly farmer's markets. Specialized stores can be classified through a wide assortment

[4] Calculations are based on the Genesis tables of the Federal Statistical Office, Germany: Code 81000-0119 and 81000-0120 (02.09.2008).

within the offered commodity group, pricing between hybrid and high, good service and smaller store size than the other four store types.
Hotelling (1929) was one of the first to offer an explanation of why households prefer one site to another. In his model transportation costs was the only factor influencing the decision of an individual. Individuals, located uniformly distributed on the unit interval choose the closest location. Hotelling (1929) explains why two competitors of the same product choose the same location: in the middle of the unit interval at 0.5.
The following presents a literature survey, which distinguishes between static and dynamic models, and brand, store or store type choices of consumers.

Static models consider generally one time period, they are a snap-shot of current consumer decisions. In the brand, store or store type choice of consumers, static models might conclude more than one time period, but past choices do not affect current choices. Time plays no role in static models. Baumol & Ide (1956) developed a utility model where transportation costs, time- and distance-costs within the store, opportunity costs and assortment, all affected the store choice. In their theoretical model, a consumer only shops at one store if his expected net benefit from visiting the store is positive. Utility increases by the amount of different products the consumer is searching for and decreases by transportation costs, time- and distance-costs and opportunity costs. Amstutz (1970) invents a very complicated model with microsimulation of different producer- and retailer-stages added to the consumer sector. He calculated probabilities for the decision first “to shop”, then “to purchase” and then the “decision to talk about a brand”. The consumer visits the retailer “... towards whom he has the highest attitude.” In the 1960s and 1970s, many empirical articles appeared to identify the relevant variables of consumers brand or store choice. Kassarjian (1971) summarizes the brand choice literature for sociodemographic variables and concludes that sociodemographic variables explain only a small proportion of the variance of consumer shopping trips. Lindquist (1974) considers store image attributes of 26 different studies. He found out that assortment, quality, pricing and locational factors are of particular interest as image factors. Kassarjian (1971) and Lindquist (1974) summarize articles where separated products like coffee, tea or cigarettes are the focus of research in either consumer brand or store choice. Usually the choice was limited only to a few brands/products, and it included all possible shops (e.g. warehouses or furniture stores) rather than only grocery stores.
The factors influencing store image as a guideline for retailers were the main subject for researchers. By knowing about the relative importance of marketing variables or the location of a store, retailers could have an impact on consumer choice. Most studies from these years (1960s and 1970s) used some kind of correlation or devised experiments to test for significant relationships between the theoretical choice and personal factors. To measure store image, some multivariate methods have been used. Factor, cluster and discriminant analysis were popular methods within these studies. In the 1980s, researcher started using sophisticated econometric models to analyze the relation between store image characteristics and brand, store and store type choice.
Kumar & Leone (1988) use a regression model to analyze merchandising activities for disposable diapers that influence store switching. According to them, price promotions of one brand within one store may lead to store switching. Bhatnagar & Ratchford (2004) use a

regression model to analyze store type choice of 526 households in the US. They conclude that supermarkets are preferred by consumers who have to buy more than a threshold number of categories and therefore should have a broad assortment. Convenience stores are expected to carry specific goods (perishables, frozen foods and emergency goods) and food warehouses are preferred by heavy users. Carpenter & Moore (2006) use a regression model for 454 grocery consumers, surveyed by a questionnaire to analyze the choice of store type. Their findings: some store attributes like price, cleanliness, assortment and service are the most important factors for store type choice. Furthermore, they detect income as a significant variable for the choice of a specialized store type (the higher income, the more often a specialized store type is chosen) and household size as a significant predictor for the supermarket type. Smaller households prefer a supermarket, larger households prefer hypermarkets. Using a regression model with a few choice possibilities as the dependent variable is questionable.

Malhotra (1983) was one of the first to use a probit model for store choice in the disk record market. The important store image characteristics were variety and selection, personnel and service, price, and location. In the probit-study of Rhee & Bell (2002), shoppers are not driven by the location, but rather by the benefits of store-specific knowledge of assortment, layout and prices. Consumers who spent less per trip would rather switch to another main store. Fox et al. (2004) also used a probit model to estimate whether a specific retail format (grocery stores, drugstores and mass merchandisers) was visited or not, and included some marketing variables as well as demographic variables. Contrary to other studies, Fox et al. (2004) conclude that price has a very weak impact on retail format choice due to the "... difficulty in learning basket prices for use in shopping decisions." While promotions have a slight positive influence on the choice, assortment has the highest effect. Demographics are more or less unimportant for the consumers' decision in their study.

Arnold et al. (1983), Bell & Lattin (1998), Solgaard & Hansen (2003) and González-Benito et al. (2005) use a kind of logit model in their analysis. Arnold et al. (1983) conclude that locational convenience and low prices are the key determinants in the decision of the consumers to choose a store. For 12 different categories (e.g., bacon, butter, ice cream, sugar or soft-drinks), Bell & Lattin (1998) distinguish between small basket and large basket shoppers: small basket shoppers prefer high-low-pricing store types and large basket shoppers prefer every-day-low-pricing store types.

Most of the research was done in North America and the results are not generally transferable to the German market (Müller & Beeskow, 1982). This is due to the differences in city structure between Germany and the US, particularly in relation to the location and integration of the stores. Research in Europe has been conducted by Solgaard & Hansen (2003), who use a hierarchical Bayes model based on a logit model, and analyze 631 people from greater Copenhagen, who were asked to rate 21 store items on a 7-point scale. In this study, price level, assortment and distance are the most significant variables for consumer choice of store type; quality and service have no notable influence. González-Benito et al. (2005) analyze the spatial choice of consumers for different store types with a logit-type model in Spain. First, a consumer chooses the store type and then a particular store within that type.

For the German market in particular, there have been articles about brand products and store images (Müller & Beeskow, 1982). The research is mostly done with factor, cluster or

conjoint analysis, or is of descriptive nature. Gutberlet (1987) concludes in general that assortment, pricing and location are insufficient to completely describe the activities of retail marketing. The product itself and other services become increasingly important. Bruchmann (1990) analyzes the ideal requirements of grocery stores: cleanliness, quality, pricing, assortment, and fresh produce are the main requirements. Furthermore, he detects an indirect effect of sociodemographic variables, such as age, household size and schooling. Arend-Fuchs (1995) gives a descriptive overview of choice over grocery store types: She asked 8,231 consumers about their choices and other characteristics. 45.4% of consumers use one store type, 44.1% use two different store types and 10.5% use three different store types. The average is therefore 1.65 different store types. Arend-Fuchs does not consider specialist retailers like e.g. those for fruits and vegetables, pastries, meat and drinks. Morschett et al. (2005) use a factor and a cluster analysis to distinguish between four dimensions of shopping motives in a major German city: scope, quality, price and time. For Japan, Fujino et al. (2008) get similar results: store quality, convenience, travel and price are the four shopping motive dimensions of consumers.

Dynamic models consider more than one time period, they take the sequence of choices into account. In choice decisions, time or the sequence is usually included through the lagged choice or some kind of loyalty factor. Harary & Lipstein (1962) used Markov chains to forecast consumer brand switching. Tietz (1975) notes that Markov chains can be used to explain the change of consumer behavior for different store types, although Armstrong & Farley (1969) showed six years earlier that "Markov chains proved to be of little value in forecasting customers' choice of a food store." At the same time, the first behavioral models of consumer store choice were developed. Heinemann (1976) gives an overview of the different approaches. He introduces the first incentive-contribution model for customer behaviour from Sprowls & Asimow (1962). The level of requirement, satisfaction and the searching process are the central issues for the consumer decision in their model. Heinemann (1976) describes other models (markov chains, transportation costs, utility, learning theory etc.) and presents a decision sequence of store choice as a process of five different cycles, following Blackwell et al. (1968): 1. realizing the reason for shopping, 2. searching through store options, 3. rating the different alternatives, 4. choosing a store, 5. post-rating the store. Internal (e.g., physiological, secure or social necessities) and some external variables (sociodemographic variables) are the basis for the analysis, but some are barely empirically observable.
Guadagni & Little (1983) wrote a fundamental article about coffee brand choices, using a logit model and first accounting explicitly for loyalty through a weighted average of past purchases. They conclude that brand loyalty, size loyalty and promotion are highly significant in choosing a brand. Bucklin & Lattin (1992), Bell et al. (1998), Chintagunta et al. (2001) and Erdem & Sun (2001) use a kind of logit model with different loyalty representations. Bucklin & Lattin (1992) found for liquid laundry detergents that the probability of visiting a store increases, when that store holds promotions. This holds only for households who visit more than one grocery store. Bell et al. (1998) assume that store choice depends only on total shopping costs, which include pricing and location. They distinguish between fixed and variable costs of shopping and use a basket of twelve product

categories (e.g. paper towels, soda, cereals, yogurt, cola, ice cream etc.): fixed costs include travel costs, the preference for one store and historical store loyalty, while the total amount paid in a store is the variable part. All variables are significant in their analysis. Chintagunta et al. (2001) use the lagged choice for loyalty on yogurt purchases. They conclude, that loyalty and display are important, while price, income and houshehold size are insignificant for brand choice. Also Erdem & Sun (2001) use a lagged choice for 6 different product categories (ketchup, peanut butter, liquid detergent, tissue, tuna and sugar). They found strong evidence for brand loyalty.
Papatla & Krishnamurthi (1992), Keane (1997) and Seetharaman et al. (1999) use a probit model, using some kind of loyalty variable, to explain brand choices. Papatla & Krishnamurthi (1992) include additionally a variety seeking and an inertia variable: all variables influence brand choice. Keane (1997) uses ketchup data and concludes that lagged purchase has a strong effect on current choices. Seetharaman et al. (1999) concludes for five different grocery categories the same as Keane (1997) - loyalty is significant. Leszczyc & Timmermans (1996), Reader & McNeill (1999) and Leszczyc et al. (2000) use a hazard model to account the time between shopping trips. Following Leszczyc & Timmermans (1996), demographics have nearly no influence to store-switching, but loyalty is important. Furthermore, timing of the next shopping trip depends on the previous shopping trip. Reader & McNeill (1999) concludes that loyalty is important for brand choice. Leszczyc et al. (2000) get similar results as Leszczyc & Timmermans (1996) for store switching behavior in 21 grocery stores.
As for the static models, most articles are based on the North American market. For Germany mainly multivariate methods were used. Diller et al. (1997) discover a strong relationship between brand and store choice, but only a small role of sociodemographic variables in brand or store loyalty. They use the market share as a loyalty factor. Jungwirth (1997) and Goerdt (1999) summarize several articles about brand and store loyalty: cleanliness, quality, pricing and assortment are important and sociodemographic variables are rather unimportant. In general Goerdt (1999) finds that consumers visit 8.0 different stores per quarterly period, but only 2.68 stores for each commodity group. Overall, consumers choose the stores that best suit their necessities.

Most of the inferential statistical work considers variables that can be modified by the retailer's themselve (mainly pricing, assortment, location, quality and service). The results are unclear: some studies conclude that price, quality and/or service are the main determinants of store or store type choice decision, while others find that those variables have little effect. Some researchers have tried to explain the brand/store/store type choice decision with sociodemographic variables, but in general they have detected only a small relationship or none at all. One reason for the different results could be that different products were analyzed, and some studies included more than one commodity group in their estimation. Brand or store loyalty variables can be generated in several ways. Whichsoever method was used, all lead to significant influence to the choice decisions. Despite the

disparate results so far, it seems safe to say that assortment[5], location and price play an important role in the store or store type choice decision. Past purchases or loyalty are also very important. Sociodemographic variables on the other side have only little or no influence on the decision of consumers.

3. Theoretical Background

The consumers' choice for a specific retail type is the "... output of a complex dynamic problem, where the consumer has to decide upon 1. how much to consume from each category, 2. how to organize the purchases into shopping trips over time, and 3. how to choose different store types." (Bhatnagar & Ratchford, 2004)
The first and second problem, "how much to consume from each category" and "how to organize the purchases into shopping trips over time", is utility-specific, and nearly not possible to determine. Tastes, health-factors, regions and other very personnel factors can give an answer to these questions, but are barely available or even unseizable. The store type decision by the retailer is a long-term decision and leads to an intensive competition in the food retailing industry (Fox et al., 2004). The focus in this paper is problem 3: "how consumers choose between different store types", which is from the retailers' point of view an essential decision (Müller-Hagedorn, 2005) and seldom discussed (Bhatnagar & Ratchford, 2004; Schmitz, 2007).
The consumer decision is based on a system of preferences and a sequence of choices. Store type choice can be analyzed in a framework of store and/or product choice. In the literature so far the results are not consistent. A large topic within the literature is the product-related decision behavior of consumers (Kreller, 2000). This means that shopping choice decisions are based at first on products. The product-related behavior is usually linked to purchases of different goods, not only of groceries. In many articles, shopping goods (e.g. clothes or furniture) and specialty goods (e.g. electronic goods) are usually included in this framework. It is possible that, even for groceries, the choice of a specific brand or a specific product itself is the first decision that a consumer makes.
Most authors conclude that the shopping-decisions are made sequentially and the first decision is the choice of a product. Leszczyc et al. (2000) assume specifically for groceries, that 1. a customer determines whether there is a need to go shopping or not, 2. the shopper may decide what purchases need to be made, and 3. the shopper choose a particular store. After the realization, whether there is a need to go shopping or not, which is, of course, the very first decision, also the choice of the products is the base for further decisions. In Leszczyc et al. (2000), next comes the choice of the store, similar to Diller et al. (1997), who see a strong relation between the brand or product choice and the store choice. Krafft & Albers (1996) say that the selected store type affects the buying behavior more directly than just the single store choice. Following Krafft & Albers (1996), store type choice is, knowing

[5] For different consumer goods Chernev et al. (2003), Chernev (2003), Iyengar & Lepper **(**2000), Schwartz (2006) and Sela et al. (2008) show through experiments that more variety not necessary implicate higher utility, but too much choice can lead to contrary results.

which products to buy, the second decision. González-Benito et al. (2005) support this result; they conclude that the consumers choose first a specific store type and then a single store within this store type.
Among the variety of different store types, which store type should a consumer choose to maximize his utility? Which variables influence store type choice? There are several factors which have to be considered.

3.1 Retailer determinants

Following previous research so far it can be summed up that specific retailer determinants influence store type choice. Assortment, location, price, promotion, quality and service are important factors, which the retailers can affect. So far, there exists a lot of research regarding retailer determinants of store or store type choice, e.g. Bucklin & Lattin (1992), Bell et al. (1998), Solgaard & Hansen (2003), Morschett et al. (2005) and Carpenter & Moore (2006). The spread of analyzed goods is huge: cereals, coffee, cola, ice cream, ketchup, liquid detergent, paper towels, peanut butter, soda, sugar, tissue, tuna, yogurt and many more. And the used methods do vary: multivariate, regression, hazard, logit or probit models. The degree of influence on choice is wide spread. Pan & Zinkhan (2006) get the following sequence in their meta study for a broad class of stores and products: assortment, service, quality, location and price. The sequence depends on the merchandise category or used method. The impact of service, quality and assortment on store choice is greater for specialty goods than for convenience goods (Pan & Zinkhan, 2006). Retailers have the possibility to customize their determinants (assortment, location, price, promotion, quality and service) to fit their customers best or to maximize profits. Research in that area is huge and not the scope of this paper.

3.2 Sociodemographics

From a consumers point of view, Diller et al. (1997) and Goerdt (1999) show in their research that sociodemographic variables like gender, age, marital status, size of household or income have nearly no influence on the loyalty of store choice and therefore also nearly no influence on the store choice itself. If sociodemographics have no impact on the loyalty towards a store, consumers with the same sociodemographics do not visit more often one store, they switch between stores. The results of the analysis of variance of Diller et al. (1997) show, that the sociodemographics are significantly different for the characteristics of the loyalty of store choice, but the authors found no clear direction in their analysis. Fox et al. (2004) conclude with their hierarchical multivriate Tobit model that some sociodemographics have some influence on the visiting of stores. Bruchmann (1990) and Carpenter & Moore (2006) see a relation between sociodemographics and store type choice. For Bruchmann (1990), there exists an indirect effect of age, household size and schooling, and for Carpenter & Moore (2006), there exists an effect of income and household size. Nevertheless, most

authors see no or only a small relation between sociodemographics and store or store type choice. In this paper, age, income and gender are included to explain store type choice. What happens if store/store type choice and sociodemographics are examined from a different point of view? Retail strategies for decisions about store types or prices show very interesting results. The question for the retailers is which store type or which pricing strategy to choose. What determines the use of the different strategies? For "price" as the independent variable, Gauri et al. (2008) point out, that retailers prefer a HiLo or hybrid pricing strategy, if the average income or the density of a population in a trading area increases. HiLo prices are mainly found in supermarkets, while hybrid prices are more common in small or large hypermarkets. Therefore, an important factor for the retailers store type decision is the income of the consumers and the density of population. Retailers tend to choose supermarkets or hypermarkets with an increasing income of the population in their trading area.
Contrary to this statement the investigation of Gauri et al. (2008) with store type as the dependent variable shows some dilemma. With higher average income in the trading area of a retailer, the retailers choose more likely a large hypermarket and not a supermarket type. Combining both strategies (pricing and store type) as one dependent variable, higher income is not significant anymore. Other sociodemographics are not significant as well (Gauri et al., 2008). The retailers' view of store type choice is barely analyzed yet. Following Gauri et al. (2008) does not imply to have misspecified store types and their corresponding pricing strategies. The results are too vague and the topic needs further research, which is not the scope of this work. Nevertheless, the results give an interesting view to the other side of store type choice: the retailers.

3.3 State dependence versus heterogeneity

Consumers, facing the same set of alternatives and having the same characteristics may make different choices. Heckman (1981) introduced two possible explanations for this behavior. The first explanation is that past choices or experiences of consumers influence directly current choices. Even if characteristics of the chosen alternative or characteristics of the consumer change over time, the consumer might choose always the same alternative. Consumers, who did not experience this alternative in the past, with all characteristics being the same, might behave different on the current choice. Heckman calls this "true state dependence". Explanations for this behavior may be e.g. habit persistence or learning combined with risk aversion (one made choice gives one experience about its attributes and makes it a safe choice on later occasions) (Keane, 1997).
Another explanation is, that there are unobserved tastes, which influence the choices, and that these unobserved tastes are independent from the past choice. An existing correlation over time between the unobserved tastes seems for the researcher, as if past choices influence current choices. In this case there is "spurious state dependence", also termed as "heterogeneity".
To ignore either heterogeneity or true state dependence can lead to misspecification and therefore to biased estimators. Heckman (1981) points out that allowing for true state

dependence and not for heterogeneity, overestimates the grade of true state dependence and vice versa. The fact, whether there is spurious or true state dependence in a specific market, is important for decisions of firms about changing choice variables directly or indirectly.
Let us assume there are two alternatives A and B, among individuals can choose. Furthermore, let us assume there is no true state dependence for a specific group of individuals which choose alternative A. Changing the character of alternative B in favor of that group can lead to an increase of sales for that alternative (B). Some or all individuals of this group, first chose A, switch now to B. What happens if there is true state dependence for that group? True state dependence means, that changing the character of alternative B, does not necessarily affect the decision of the individual. The individuals have experienced alternative A and are loyal to that alternative in current and future choices. In this case the sales of alternative B will not increase.
Articles, dealing with spurious or/and true state dependence, suggesting specific procedures, are frequently published. Econometrically e.g. Heckman (1981), Heckman(1991), Lee (1997), Honoré & Kyriazidou (2000), Wooldridge (2000) and Honoré & Tamer (2006) give suggestions to handle the problem. Empirically there are several articles especially on the topics of recreation demand (Moeltner & Englin, 2004; Smith, 2005), vehicle choices (Mannering & Winston, 1985; Mannering et al., 1991; Train & Winston, 2007) and choices of brands of groceries (Guadagni & Little, 1983; Papatla & Krishnamurthi, 1992; Keane, 1997; Chintagunta et al., 2001; Erdem & Sun, 2001).
The used mixed multinomial logit model (MMNL) with random intercepts allows for heterogeneity. Unobserved tastes are absorbed by the random intercept. The MMNL explicitly accounts for correlations in unobserved utility over repeated choices by each consumer (Revelt & Train, 1998). But how can true state dependence be modeled? True state dependence is often linked to the term “loyalty” and there are several ways to introduce a loyalty factor: 1. An exponentially weighted average of past purchases, e.g. in Guadagni & Little (1983) or Smith (2005); 2. The lagged choice, e.g. in Mannering & Winston (1985), Chintagunta et al. (2001), Erdem & Sun (2001); 3. The number of previous consecutive purchases of the same choice, e.g. in Mannering et al. (1991), Papatla & Krishnamurthi (1992), Moeltner & Englin (2004), Olbrich & Windbergs (2007), Train & Winston (2007); 4. A dummy variable which is 1 if the previous choice is the same choice as the current choice, e.g. in Grover & Srinivasan (1987), Krishnamurthi & Raj (1991), Bucklin & Lattin (1992), Goldfarb (2006), Ramadurai & Srinivasan (2006).
Dick & Basu (1994) construct a framework of customer loyalty based on cognitive, affective and conative antecedents. Even if they conclude, that real loyalty is an outcome of more than just repeat purchases, still loyalty plays an important role in generating repeat purchases. Huddleston et al. (2004) say that repeat purchases may also be a proxy for spurious loyalty, which is based on a low relative attitude towards same choices. In this case, individuals “... are satisfied with the current choice, but willing to switch if ‘something better came along’.” (Huddleston et al., 2004). For Bloemer & de Ruyter (1997), the difference of true and spurious store loyalty is, that repeat visiting behavior is either based on a maximum amount of commitment or to no commitment at all, respectively. Commitment can be obtained through satisfaction about a store which is itself affected by the image of a store. Bloemer & de Ruyter (1997) conclude that there is a direct link between satisfaction and loyalty. To

distinguish between true and spurious store loyalty, the satisfaction is needed to be taken into account. The following framework in Table 1 shows four different types of consumer loyalty.

Table 1: A framework of consumer loyalty

	repeat patronage	
commitment	infrequently	frequently
low	no loyalty	spurious loyalty
high	latent loyalty	true loyalty

Source: Based on Diller et al. (1997), p 20

In this paper, the last two loyalty factors (the number of previous consecutive purchases of the same choice and a dummy variable which is 1 if the previous choice is the same choice as the current choice) are included separately in two models. Huddleston et al. (2004) conclude that it is difficult for consumers to define store loyalty. Store loyalty definitions were dominated by 1. consistent and frequent patronage, 2. spending the majority of dollars, and 3. referring to others (positive word-of-mouth). In the first two cases, the used loyalty factors in this paper are a good proxy.

3.3 Household attitudes

Apart from retailer determinants, sociodemographics and loyalty, there are other factors, influencing store type choice. Specific household attitudes, independent of retailer determinants and sociodemographics, might be important variables to explain household decisions in the food retailing industry. This paper considers attitudes about quality, freshness, pricing, advertising, environment and organic food, to estimate store type choice. These attitudes can be split into two categories: (a) quality, freshness, pricing and (b) advertising, environment, organic food. The variables of the first category (a) are mostly included in past research, but determined by the retailers. Instead of concluding, that quality, freshness and pricing, determined by the researcher, are important, this study distinguishes between the attitudes of households towards these variables. Individuals e.g. can have a high-quality preference, a low-freshness preference or do not care about pricing. These attitudes are not captured by the according retailer determinants and need therefore a closer examination, regarding, that not all households have the same preferences. Category (b)-variables were seldom considered yet. Attitudes about advertising, environment and organic food are probably important factors in store type choice. Store types are likely associated with different characteristics of these variables. The results can be interpreted threefold: 1. Is there an influence of specific household attitudes on store type choice, and how strong is the relationship between them? 2. Assuming there is a true relationship between some attitudes of consumers and their store type choice, which additional knowledge about the different store types does that implicate? The information can be used for the imaginary characteristics of the different store types (e.g. do consumers think that a discounter offers high-quality groceries?). 3. Is there a relation between the attitude variables? How is quality linked to price? Is there a connection between organic food, freshness and environment?

The analyzed commodity group is fruits and vegetables (f&v). There are five different store types for f&v: discounters, conventional supermarkets, small and large hypermarkets, specialized stores.

4. Model Specification

Logit models of different types have been widely used in store choice research. Instead of using a Multinomial Logit Model and assuming that all coefficients are fixed, the assumption of random coefficients helps to reduce several problems. The resulting model of modifying the fixed coefficients to random coefficients is called mixed multinomial logit model (MMNL). A widely used mixed logit model is based on random coefficients (Train, 2003), where the coefficients can vary over individuals.[6]

Problems of the Multinomial Logit Model - independence of time, taste variation and independence of irrelevant alternatives (IIA) - can be solved by using a MMNL.

First the MMNL explicitly accounts for correlations in unobserved utility over repeated choices by each consumer (Revelt&Train,1998). In the estimation of grocery store type choices, household attitudes, combined with some sociodemographics are included. Important choice-specific variables, such as assortment, location, quality or service, do not enter the model, and therefore unobserved utility is at hand. Allowing correlation over time is needed for a better estimation of the dataset, since it is very unlikely that there is no correlation of unobserved utility over time.

Second, allowing for intrinsic or overall preferences for one or another alternative can lead to better estimators as indicated by several articles (e.g. Chintagunta et al., 1991; Jain et al., 1994; Revelt & Train, 1998; Train, 1998; Layton & Brown, 2000; Batley et al., 2004; Chintagunta & Dube, 2005; Haan, 2005).

And third, a MMNL does not exhibit the IIA assumption, but it is highly flexible and can approximate any random utility model (McFadden & Train, 2000). In theory there are five alternatives of store type choices (discount stores, conventional supermarkets, small hypermarkets, large hypermarkets and specialized stores). In practice, households buy groceries also in other kind of shops, like mom-and-pop stores, gas stations, building centers and so on. Taking a subset of choices and not believing that the IIA holds for this subset, the MMNL provides better estimation results than the MNL.

In this paper, the MMNL is used with random coefficients for each grocery store type and with fixed coefficients for the household attitudes and the sociodemographics.

The theoretical framework can be derived from utility-maximizing behavior of individuals (McFadden, 1974). In general an individual i choose among J alternatives of grocery store types the j'th alternative at purchase occasion t that maximizes the utility

$$U_{ijt} = \alpha_{ij} + \beta' \mathbf{x}_{ijt} + \varepsilon_{ijt}$$
$$i = 1,...,N; t = 1,...,T; j = 1,...,J, \qquad (1)$$

[6] The coefficients can vary additionally over time or just over time, but the focus here is on variation over individuals.

where $\mathbf{x}_{ijt}$ is a [K x 1] vector of observed attributes of the households and β is the fixed coefficient vector. α_{ij} is the random constant, which represents the intrinsic preference of household i for store type j. The constants are different for every single household, but do not change over time. The random term ε_{ijt} is iid with type I extreme value distribution, independent of α_{ij} and $\mathbf{x}_{ijt}$. The random coefficient α_{ij} varies for each consumer with density $f(\alpha \mid \theta)$. The distribution of the random coefficient vector α_i is assumed to be normal, even if other distributions like lognormal, uniform, triangular or any other form is possible. α_i can be divided into a population mean α and a individual deviation η_i, which is distributed with mean zero and variance-covariance matrix W. The utility can be decomposed into

$$U_{ijt} = \alpha_j + \eta_{ij} + \beta' \mathbf{x}_{ijt} + \varepsilon_{ijt} \tag{2}$$

A variance of zero for the random coefficient vector means for the model that it becomes standard logit. The probability that individual i chooses alternative j on purchase occasion t conditional on α_i:

$$\Pr(j \mid \alpha_i, \mathbf{x}) = \frac{\exp(\alpha_{ij} + \beta' \mathbf{x}_{ijt})}{\sum_{k=1}^{J} \exp(\alpha_{ik} + \beta' \mathbf{x}_{ikt})}, \tag{3}$$

which is the logit function $L_{ijt}(\alpha_i)$. Now let j(i,t) denote the alternative that individual i chose in time period t. The conditional probability of individual i's observed sequence of choices is the product of standard logits (Revelt & Train, 1998):

$$S_i(\alpha_i) = \prod_{t=1}^{T} L_{ij(i,t)t}(\alpha_i). \tag{4}$$

The researcher cannot estimate α_i, but its distribution $f(\alpha_i \mid \alpha, W)$. The probability for choosing alternative j in equation (3) is conditioned on the constant α_i and therefore needs to be integrated over all possible values of α. The likelihood or unconditional probability for the sequence of choices is the integral of the product over all values of α:

$$P_i = \int S_i(\alpha_i) f(\alpha_i) d\alpha_i \tag{5}$$

This is a weighted average of the products of the logit formula with different values of α. The name mixed logit is derived from the term "mixed function" for the weighted average of various functions and the term "mixing distribution" for the density (Train, 2003). For the log-likelihood function the log has to be taken and the sum over all individuals:

$$LL = \sum_{i=1}^{N} \ln P_i \tag{6}$$

The model in total is:

$$LL = \sum_{i=1}^{N} \ln \int_{-\infty}^{+\infty} \left(\prod_{t=1}^{T} \left(\frac{\exp(\alpha_{ij(i,t)} + \beta' \mathbf{x}_{ij(i,t)t})}{\sum_{k=1}^{J} \exp(\alpha_{ik} + \beta' \mathbf{x}_{ikt})} \right) \right) f(\alpha_i) d\alpha_i \tag{7}$$

This mixed logit model allows random taste variation, correlation in unobserved factors over time and unrestricted substitution patterns (Train, 2003). Taste variation maybe also understood as "heterogeneity", where unobserved tastes influence the choices, and these unobserved tastes are independent from past choices. Loyalty is included in two ways, the number of previous consecutive purchases of the same choice and a dummy variable which is 1 if the previous choice is the same choice as the current choice and can be included in the independent variable part x_{ijt} in equation (3).[7]

The random coefficients can differ between the choices, that means that $\alpha_{ij} \neq \alpha_{ik} \forall j \neq k$, where j,k can be discount stores, conventional supermarkets, small or large hypermarkets or specialized stores. The random coefficients are not restricted to have the same sign for the whole population. Since they can be either positive or negative, a Normal distribution is used for all random coefficients. To identify the model, the discount store is taken as the base category, so all coefficients for that choice are normalized to zero. This leads all coefficients to interpret relative to discounters.

The log-likelihood function of the MMNL in equation (7) has no closed-form expression due to the inclusion of random coefficients. The multi-dimensional integral contains four dimensions and cannot be solved analytically. To maximize the likelihood in equation (7) the literature suggests numerical integration methods like adaptive quadrature or simulation. The resulting estimator is called Maximum Simulated Likelihood (MSL). In this paper, 200 Halton sequences are taken for every household to simulate the integral of equation (7). Halton sequences are one of the most popular quasi-random types (Hess et al., 2003) and were first introduced by Halton(1960). Halton sequences are structured such, that one sequence fills in the gaps of the previous sequence. This property leads to negatively correlated draws and therefore reduces the variance in the simulated log-likelihood function. Furthermore this characteristic of the Halton sequence ensures a better coverage of the multi-dimensional area of integration than random draws. With this better coverage, fewer draws need to be taken than with pseudo-random numbers, and this reduces computational time. For discrete choice models Train (2000) and Bhat (2001) show, that 100 Halton draws provide better accuracy than 1000 pseudo-random draws do.

5. Data and Hypotheses

The data is based on the GfK ConsumerScan household panel dataset. It contains a representative sample of more than 12000 households between 1st January 2002 and 30th

[7] A problem of modeling true state dependence is the first decision of a consumer, also known as the "initial conditions problem". If past choices affect current choices, there is still an initial choice which can not be influenced by a past choice. Usually the researcher does not observe the first choice, but starts somewhere in the middle of the process. In this case the initial choice can not be assumed as exogenous. Wooldridge (2005) shows an econometric solution of the initial conditions problem. Goldfarb (2006) points out, that the initial conditions problem is "... partially alleviated by the law of large numbers." Here, due to the law of large numbers and the generated loyalty variables, the initial conditions problem is not accounted for in the model (see also Train & Winston (2007)).

June 2006 to determine the buying behavior of households and individuals. The households collect their purchases of convenience goods by the so called Electronic Diary (GfK, 2009). The households sent their data weekly to the GfK. Aim of the GfK is the continuous collection of all purchases of these households, with focus on fast moving consumer goods. The dataset is an unbalanced panel, since households differ in their number of shopping trips. Attitudes towards different themes are answered by the householder who is responsible for the shopping trips. The included attitude variables are about: advertising impact, environment, freshness orientation, organic food, pricing and quality orientation. Due to the amount of data, purchases before the 1st January 2006 were dropped, leaving 13,085 households with 358,255 purchases recorded. A random sample of 1300 households is taken for estimation and a random sample of 700 households for validation.

5.1 Household attributes

The households answered several questions of different issues.The means of the attributes for the estimation sample are presented in Table 2.

Advertising impact
There is a positive advertising impact for 19% of the households and for 55% a negative impact. Most food retailers did not invest in commercials or outdoor advertising before 2007. Usually the food retailers distribute flyers in mailboxes, printing their current offers. Only recently, Edeka, Lidl and Rewe started huge marketing campaigns. In 2006, the CMA (Centrale Marketing Organization of German Agricultural Industries) was responsible for most marketing activities of German farmers. They supported mainly meat and fruits and vegetables with a lot of commercials and outdoor advertising. Which store types could gain from these adverts, and are there effects of the distributed flyers? As mentioned above, a few retailers started to broadcast commercials in the last years, especially Edeka, Lidl and Rewe, but also Real and Kaufland. In 2006, nearly no retailer broadcasted commercials.

Organic food
26% of the households like organic food while 54% do not like organic food. Revenues of organic food have risen to 5.3 billion euros in 2007 after 4.6 billion euros in 2006 (Euro-Handelsinstitut, 2008, p 342). Bien & Michels (2007) and Niessen (2008) list the market shares of organic food for different store types. In 2003, specialized stores, like organic food shops, bakeries or butchers have the largest share in the market, followed by general food retailers (supermarkets, small and large hypermarkets) and discounters (Niessen, 2008). Discounters grew fast in the organic food market and have now for many commodity groups the largest market share (Bien & Michels, 2007).
Research, regarding store type image related to organic food, does not exist yet. Hackert-Wilberg & Holzer (2007) ask if organic food will be split into good and bad. This could have an indirect effect on the store type image regarding organic food. Dienel & Reuter (2007) see discounters as very organic price attractive, while specialized stores have a huge advantage regarding the assortment. Supermarkets, small and large hypermarkets are located in between

these two variables. Seck & Brückner (2008) ask 1002 consumers about their preferred store to buy organic food. 77% prefer supermarkets, 62% discounters, 58% the weekly farmer's market, 54% prefer bakeries, 51% butchers and 41% prefer organic food shops. The question "whom do you trust most regarding organic food" shows the opposite. 49% trust most the organic butcher, 46% trust organic food shops, while only 10% trust supermarkets and 8% trust discounters. An online survey of Dialego (Dialego, 2008) shows similar results: consumers trust most in organic food shops, followed by supermarkets and discounters. Women buy more often organic food than men, and more women prefer organic food shops (Dialego, 2008; Seck & Brückner, 2008). Similar, TNS-Infratest (2007), sees a high affinity for organic food by women and consumers of 50 years and older. Which is the preferred store type for households who like or dislike organic food? Do women prefer a specialized store type for organic food?

Environment
27% care about the environment, while 63% do not care. Following Seck & Brückner (2008), 37% of consumers see a positive contribution to climate protection, buying organic food. Which is the preferred store type or store for households with different environment attitudes, and are there similarities to the organic food hypotheses?

Freshness orientation
Freshness is important for 28% and not important for 29% of the households.
For 64% of consumers freshness is an important aspect of organic food (Seck & Brückner, 2008). Which is the preferred store type or store for households with different freshness attitudes, and are there similarities to the organic food hypotheses?

Pricing
48% are very price-conscious, 32% are price-conscious, 15% are not price-conscious and even 5% are not price-conscious at all. As for the variable income, it can be followed Hupp & Schuster (2000), Marion (1998) and Tordjman (1994) for the associated price order of store types. Are store types with lower prices the preferred store type for price-conscious households?

Quality orientation
22% of the households have a high quality orientation and 38% have a low quality orientation. High quality is not automatically obtained through high prices and vice versa, but from a consumers' point of view, this can hold. Having in mind, this must not be true for every grocery, this is the best hypothesis. The price order of Hupp & Schuster (2000), Marion (1998) and Tordjman (1994) can be transformed into a quality order. Are store types with higher quality the preferred store type for households with a high quality orientation and vice versa?

5.2 Sociodemographics

The averaged sociodemographic summary statistics over both samples (estimation and validation) are presented in Table 3. 70% of the average purchaser of a household are female, compared to 51% females of the population in Germany. This bias is due to the different allocation between money earning (more men) and shopping (more women). The average householder is approximately 50.6 years old, compared to 43 years in the population, and the average household net income is 2225 euros, compared to 2787 euros in the population. The average householder is older than the average age in the population, since i.a. children usually do not the shopping in a household. Average income in the dataset is beneath the population mean, i.a. due to generated classes in the dataset.

5.3 Store and store type choices

Table 4 shows the store type choices in the dataset. Nearly 50% of all purchases are done in discounters. Large hypermarkets have a share of nearly 18%, followed by supermarkets with 14%, small hypermarkets with 11% and specialized stores with around 8%.

6. Estimation results

The IIA assumption in the standard logit model is tested with the Hausman test. The null hypothesis states, that the difference in the estimated coefficients of the full model compared to a model where one of the outcomes is excluded, is not systematic. For store type choice, the null hypothesis can be rejected and therefore the IIA does not hold. The assumptions of a standard logit model are affected and therefore a standard logit model should not be used. Different parameters compare the quality of the models: Likelihood ratio index, Akaike information criterion, Schwarz criterion and the right prediction share of the estimates in the validation sample. Five different models are estimated. The basic model (M1), where only the household attributes are used to explain consumers' choice. Additionally a random constant is estimated, solving some estimation specific problems, and allowing for an intrinsic preference for one or another alternative. The dummy loyalty model (M2) extends the basic model by a loyalty variable. Loyalty is represented by a dummy variable, which is 1 if the previous choice is the same choice as the current choice. The sum loyalty model extends the basic model by a loyalty variable. Loyalty is represented by the number of previous consecutive purchases of the same choice. The results of the sum loyalty model are much worse than for the corresponding dummy model. The sum loyalty model predicts around 15% correctly, compared to around 50% for most other models. Therefore the output of the sum loyalty model is omitted. It can be concluded, that the dummy loyalty model is superior to the sum loyalty model. The next model is the sociodemographic model (M3), which extends the basic model by the three variables age, gender and income. The sociodemographic interaction dummy loyalty model (M4) extends the sociodemographic

model by some interaction terms. Age, gender and income are each multiplied with organic food and pricing. A dummy loyalty variable is included.
The estimation results are presented in Table 5. The first three models, M1, M2 and M3 show similar results for most coefficients. Models M1, M2 and M3 are used for the discussion of most variables. The interaction terms discussion is based on model M4.
There are 44571 observations. The likelihood ratio index is between 0.221 for the basic model M1 and 0.244 for the dummy loyalty model M2. The likelihood ratio index of the sociodemographic model M3 is 0.226 and of the interaction model M4 0.232. AIC and SC show both a preference for the loyalty model M2. The socioeconomic model M3 comes second and M1 is third in terms of AIC and SC. Model M4 predicts better than the other models, 53.6% are correctly predicted. The basic model M1 predicts 52.6% correctly, M3 predicts 50.2% correctly and the loyalty model predicts only 35.3% correctly, even less than the chance criterion, which is 49.6%.
The standard deviations of all random coefficients are highly significant. At least in two out of the first three models, the constants are also significant, but for several estimates with large deviations. This complicates the preference interpretation. Taking only the significant estimates of the random coefficients, the following intervals are possible: Supermarkets are preferred by 17% to 32%, small hypermarkets are preferred by 8% to 33%, large hypermarkets are preferred by 29% to 39%, and specialized stores are preferred by 9% to 14% of consumers. Accounting these intervals, discounters are preferred by 71% to 84% of consumers. The preference order, taking the preference averages and starting with the most preferred store type, is then discounters, large hypermarkets, supermarkets, small hypermarkets and specialized stores. This represents exactly the purchasing occasion order in the dataset.
Supermarkets and specialized stores are the preferred choice for consumers with a high quality orientation. The estimates show no significant difference between these two store types. Small hypermarkets follow in the preference of the consumers, next are large hypermarkets. Discounters are the least choice for high quality orientated consumers. The following quality order, starting with the lowest quality, arises: discounters, large hypermarkets, small hypermarkets, and supermarkets or specialized stores.
Regarding freshness, discounters are the preferred choice, compared to supermarkets, large and small hypermarkets. Only specialized stores are more preferred by consumers with a high freshness orientation. Additionally specialized stores are disliked by the opposite consumer group (low freshness orientation). The latent freshness image order, starting with the lowest image, is then: supermarkets, large or small hypermarkets, discounters and specialized stores. One could expect that in the consumers perception freshness and quality are similar for f&v, but this is not the case. Freshness is indeed one aspect of quality, but not the same.
The results for advertising impact are heterogeneous for every store type. The CMA was responsible for the marketing strategies of German farmers. They supported i.a. fruits and vegetables with a lot of commercials and outdoor advertising, but no specific store type could gain from their marketing compared to other store types for f&v.
Specialized stores and supermarkets are the preferred store type by consumers who care about the environment. There is no significant difference between these estimates. All store

types are avoided by consumers who do not care about the environment, compared to discounters. The latent environment image of store types, starting with the lowest image is therefore: discounters, supermarkets or specialized stores.
Organic food is highly preferred in specialized stores compared to discounters by both consumer groups: those who like and those who do not like organic food. Curious is the result, that supermarkets are disliked by both consumer groups. A similar result is detected for freshness. It appears that there is a relation between freshness and organic food, regarding supermarkets and specialized stores, and also a relation between environment and organic food regarding specialized stores. An implied image order for organic food, beginning with the lowest image, is: supermarkets, discounters and specialized stores. Large hypermarkets are the preferred store type by consumers who do not like organic food. Females who do not like organic food, dislike specialized stores. Women do not prefer a specialized store if they like organic food. With increasing income, organic food orientated consumers dislike supermarkets most, followed by large hypermarkets, compared to discounters.
There are several significant coefficients for pricing:
- Consumers who are not price-conscious at all, for
  - small hypermarkets: positive
  - specialized stores: positive
- Consumers who are very price-conscious, for
  - supermarkets: negative
  - small hypermarkets: negative
  - large hypermarkets: positive
  - specialized stores: negative

Large hypermarkets have therefore, as assumed a latent low price image, but they have even a lower price image than discounters. Specialized stores have the highest price image, followed by supermarkets or small hypermarkets. With increasing age, supermarkets are the preferred choice of consumers who are not price-conscious at all and of those who are very price-conscious. The coefficient is much larger for those who are not price-conscious at all. It seems that price is not the most important factor with increasing age for f&v. Very price-conscious females avoid large hypermarkets. With increasing income, very price-conscious consumers dislike specialized stores, but prefer supermarkets most, followed by large hypermarkets.
Age, gender and income influence store type choice, even if the influence is small. With increasing age, specialized stores and supermarkets are preferred. It seems that with increasing age, store types with higher implicit quality are visited for f&v. Since even for very price-conscious consumers, with increasing age, supermarkets are the first choice, it looks like, that price is not the most important factor for f&v. Females prefer large hypermarkets and visit less often supermarkets and specialized stores than males do. Therefore, females prefer a lower price store type with huge assortment, followed by discounters. Supermarkets are the preferred store types for consumers with increasing income.
The loyalty dummies are significant for all store types: the weakest loyalty is towards small hypermarkets and specialized stores, followed by supermarkets and large hypermarkets,

compared to discounters. There is no significant difference between small hypermarkets and specialized stores.

7. Summary and Discussion

144.5 billion euros are spent for food and soft drinks in 2007. This is around 11% of total expenses of an average household. Around 22% of food expenses are went into f&v.
The food market in Germany is shared by a few retailers, the six largest food retailers share more than 75% of total revenues. The retailers have implemented four distinct store types: discounters, supermarkets, small and large hypermarkets. These store types can be differentiated by different variables, like assortment, price setting, service or store size. For some groceries there are specialized stores. Most retailers use more than one store type for their sales. The stores within a store type share usually many same characteristics, but nevertheless they can be at least a bit different within these characteristics. The consumers' decision to buy groceries is based on a dynamic decision behavior of 1. determining whether there is a need to go shopping or not, 2. deciding what purchases need to be made, and 3. choosing a particular store. Theory assumes that at the third decision, first a specific store type is chosen and then a specific store within this store type. Previous literature concludes, that several variables, like assortment, location and price among others, influence store and store type choice. This work considered specific consumer attitudes, measured by the GfK, towards quality, freshness, environment, advertisement, organic food and prices, and several sociodemographics. These attitudes and the actual point of purchase show, which of these attitudes influence store type choice, and assuming there is a true relation between these choices, an implied image order can be established. The dataset is based on 1300 households, who reported their entire purchases between January and June 2006. The used mixed multinomial logit model for store type choice for fruit and vegetables includes random coefficients, which try to capture the not included variables in the model. The model allows for an intrinsic preference and helps to reduce several estimation problems, like e.g. the IIA. The difference in the random coefficients estimates allow for preference intervals towards the different store types. The preference order, starting with the most preferred store type, is then discounters, large hypermarkets, supermarkets, small hypermarkets and specialized stores. Comparing this with the number of purchasing occasions, the same sequence order can be seen.
Discounters have the lowest quality and the lowest environment image for f&v, but are average at the other variables. Loyalty towards discounters is strongest. Supermarkets have a good quality and environment image, but are avoided by consumers with a high freshness and a high organic food orientation. They have a high price image, but are preferred with increasing age. Supermarkets are avoided by females and by consumers with increasing income. Loyalty towards supermarkets is weaker than towards discounters and large hypermarkets, but stronger than towards small hypermarkets and specialized stores. Small hypermarkets have a higher quality image than discounters and large hypermarkets, but a lower quality image than the other two store types. A low freshness image and no significance for environment or organic food. Price image is in the middle of the five store

types. Sociodemographics are not significant for small hypermarkets and loyalty is the weakest along with specialized stores. Large hypermarkets are preferred by high quality orientated consumers compared to discounters, but are avoided by this consumer group compared to all other store types. They have a significant lower freshness image, but are first choice for very price-conscious consumers, which give it the implicit lowest price image. This store type is preferred by females and has the strongest loyalty, after discounters. Specialized stores are the first choice of consumers with a high quality, a high freshness, high organic and high environment orientation. The image of specialized stores is therefore quite good. This image goes hand in hand with a high price image: very price-conscious consumers visit less often specialized stores compared to discounters. With increasing age, specialized stores are the most preferred store type, but not for females, where specialized stores are avoided. Loyalty towards specialized stores is weak.
Several issues have to be considered.
The households reported their purchases by their own. Due to the self-observation, one can expect some changes in behavior and therefore some bias in the estimation results. The different models, M1 to M4 for store type choice, estimate many coefficients, which are similar within one variable. On these estimates can be relied on. Contrary, there are also several diverging coefficients within one variable. For some, only one model shows significance, for others, even if two or three models estimate a significant influence, the estimates diverge immense. On which estimate can then be relied on, if at all? Therefore at least the strong diverging estimates have to be taken with caution.
Loyalty is approximated by either a dummy variable, which is 1 if the previous choice is the same choice as the current choice, or by the number of previous consecutive purchases of the same choice. The dummy loyalty model is superior to the sum loyalty model. Loyalty is in most models strongest towards discounters at store type level or several discount stores at store level. The intention to capture true loyalty by a dummy variable is rather unlikely. It can just represent, that visiting one store type at one time, increases the probability to visit the same store type next time. Discounters have the highest share of purchasing occasions, therefore it is likely, that loyalty towards discounters is strongest. It can be concluded, that spurious loyalty is strongest towards discounters, followed by large hypermarkets and supermarkets, specialized stores and small hypermarkets. This order represents mostly the frequented number of visits and not implicitly high commitment. True loyalty can not be captured by just the revealed point of purchase, without further information of the consumer.

References

ACNielsen (2005). European Pricing Barometer.

Amstutz, A.E. (1970). Computer Simulation of Competitive Market Response. The MIT Press.

Arend-Fuchs, C. (1995). Die Einkaufsstättenwahl der Konsumenten bei Lebensmitteln. Frankfurt a.M.: Dt.Fachverlag.

Armstrong, J.S. &Farley, J.U. (1969). A Note on the Use of Markov Chains in Forecasting Store Choice. Management Science, vol.4, reprinted.

Arnold, S.J., Oum, T.H., & Tigert, D.J. (1983). Determinant Attributes in Retail Patronage: Seasonal, Temporal, Regional, and International Comparisons. Journal of Marketing Research, vol. 20 (2), 149-157.

Batley, R., Toner, J., & Knight, M. (2004). A Mixed Logit Model of UK Household Demand for Alternative-Fuel Vehicles. International Journal of Transport Economics, vol. 31, 55-77.

Baumol,W.J. & Ide, E.A. (1956). Variety in Retailing. Management Science, vol. 3 (1), 93-101.

Bell, D.R., Ho, T.-H., & Tang, C.S. (1998). Determining Where to Shop: Fixed and Variable Costs of Shopping. Journal of Marketing Research, vol. 35, 352-369.

Bell, D.R. & Lattin, J.M. (1998). Shopping Behavior and Consumer Preference for Store Price Format: Why "LargeBasket" Shoppers Prefer EDLP. MarketingScience, vol. 17, 66-88.

Bhat, C.R. (2001). Quasi-random maximum simulated likelihood estimation of the mixed multinomial logit model. Transportation Research Part B, vol. 35, 677-693.

Bhatnagar, A. & Ratchford, B.T. (2004). A model of retail format competition for non-durable goods. International Journal of Research in Marketing, vol. 21 (1), 39-59.

Bien, B. & Michels, P. (2007). Verbrauchertrend Bio – Aktuelle Entwicklungen der Verbrauchernachfrage in Deutschland. Bio Fach Conference.

Blackwell, R.D., Miniard, P.W., & Engel, J.F.(1968). Consumer Behavior. NewYork: Holt, Rinehart & Winston.

Bloemer, J. & de Ruyter, K. (1997). On the relationship between store image, store satisfaction and store loyalty. European Journal of Marketing, vol. 32 (5/6), 499-513.

Bruchmann, K. (1990). Werte und Betriebsformenpräferenzen. PhD thesis, Universität Erlangen-Nürnberg.

Bucklin, R.E. & Lattin, J.M. (1992). A Model of Product Category Competition Among Grocery Retailers. Journal of Retailing, vol. 68, 271-293.

Carpenter, J.M. & Moore, M. (2006). Consumer demographics, store attributes, and retail

format choice in the US grocery market. International Journal of Retail & Distribution Management, vol. 34 (6), 434-452.

Chernev, A. (2003). Product Assortment and Individual Decision Processes. Journal of Personality and Social Psychology, vol. 85 (1), 151-162.

Chernev, A., Mick, D.G., & Johnson, M.D. (2003). When More Is Less and Less Is More: The Role of Ideal Point Availability and Assortment in Consumer Choice. Journal of Consumer Research, vol. 30 (2), 170-183.

Chintagunta, P., Kyriazidou, E., & Perktold, J. (2001). Panel data analysis of household brand choices. Journal of Econometrics, vol. 103 (1-2), 111-153.

Chintagunta, P.K. & Dube, J.-P. (2005). Estimating a Stockkeeping-Unit-Level Brand Choice Model that combines Household Panel Data and Store Data. Journal of Marketing Research, vol. 42 (3), 368-379.

Chintagunta, P.K., Jain, D.C., & Vilcassim, N.J. (1991). Investigating Heterogeneity in Brand Preferences in Logit Models for Panel Data. Journal of Marketing Research, vol. 28 (4), 417-428.

Dialego (2008). Bio-Nahrungsmittel. OnlineReport.

Dick, A.S. & Basu, K. (1994). Customer Loyalty: Toward an Integrated Conceptual Framework. Journal of the Academy of Marketing Science, vol. 22 (2), 99-113.

Dienel, W. & Reuter, J. (2007). Bio-Erfolg durch Profilierung – Bio-Category-Management. Technical report, Öko Strategie Beratung Reuter and Dr.Dienel.

Diller, H., Goerdt, T., & Geis, G. (1997). Marken-und Einkaufsstättentreue bei Konsumgütern. Arbeitspapier no.58, Universität Erlangen-Nürnberg.

Erdem, T. & Sun, B. (2001). Testing for Choice Dynamics in Panel Data. Journal of Business & Economic Statistics, vol. 19 (2), 142-152.
EuroHandelsinstitut (Ed.). (2005). Handel aktuell 2005/2006. EHI Retail Institute.

EuroHandelsinstitut (Ed.).(2008). Handel aktuell 2008/2009: Struktur, Kennzahlen und Profile des internationalen Handels (1ed.). EHIRetailInstitute.

Fox, E.J., Montgomery, A.L., & Lodish, L.M. (2004). Consumer Shopping and Spending across Retail Formats. Journal of Business, vol. 77, 25-60.

Fujino, A., Ohba, M., & Yamamoto, H. (2008). Store Choice Orientations and Intertype

Shopping Behavior toward Grocery Stores. Journal of Japan Industrial Management Association, vol. 58 (6), 459-464.

Gauri, D.K., Trivedi, M., & Grewal, D. (2008). Understanding the Determinants of Retail Strategy: An Empirical Analysis. Journal of Retailing, vol. 84 (3), 256-267.

GfK (2009). Homepage of the GfK Group: Gesellschaft für Konsumforschung. Retrieved July 2009 from http://www.gfk.com/group/company/index.en.html.

Goerdt, T. (1999). Die Marken- und Einkaufsstättentreue der Konsumenten als Bestimmungsfaktoren des vertikalen Beziehungsmarketing. Diller, Hermann.

Goldfarb, A. (2006). State Dependence at Internet Portals. Journal of Economics & Management Strategy, vol. 15 (2), 317-352.

González-Benito, Ó., Munoz-Gallego, P.A., & Kopalle, P.K. (2005). Asymmetric competition in retail store formats: Evaluating inter- and intra-format spatial effects. Journal of Retailing, vol. 81, 59-73.

Grover, R. & Srinivasan, V. (1987). A Simultaneous Approach to Market Segmentation and Market Structuring. Journal of Marketing Research, vol. 24 (2), 139-153.

Guadagni, P.M. & Little, J.D.C. (1983). A Logit Model of Brand Choice Calibrated on Scanner Data. Marketing Science, vol. 2, 203-238.

Gutberlet, W. (1987). Erfolgreiches Handelsmarketing aus der Sicht einer regionalen Handelsgruppe. Frankfurt a.M./NewYork: Campus.

Haan, P. (2005). State Dependence and Female Labor Supply in Germany: The Extensive and the Intensive Margin. Discussion Paper, DIW Berlin, no. 538.

Hackert-Wilberg, T. & Holzer, C. (2007). Bio-Markenstudie Teil1: Marken im Bio-Fachhandel. Technical report,Wertmarke Hamburg.

Halton, J.H. (1960). On th efficiency of certain quasi-random sequences of points in evaluating multi-dimensional integrals. Numerische Mathematik, vol. 2, 84-90.

Harary, F. & Lipstein, B. (1962). The Dynamics of Brand Loyality: A Markovian Approach. Operations Research, vol. 10, 19-40.

Heckman, J.J. (1981). Heterogeneity and State Dependence. In S.R. (Ed.), Studies in Labor Markets (pp. 91-139). Chicago: University of Chicago Press.

Heckman, J.J. (1991). Identifying the Hand of the Past: Distinguishing State Dependence from Heterogeneity. American Economic Review, vol. 81 (2), 75-79.

Heinemann, M. (1976). Einkaufsstättenwahl und Firmentreue des Konsumenten. Betriebswirtschaftlicher Verlag Dr. Th. Gabler, Wiesbaden.

Hess, S., Polak, J.W., & Daly, A. (2003). On the Performance of the Shuffled Halton Sequence in the Estimation of Discrete Choice Models. European Transport Conference 2003.

Honoré, B.E. & Kyriazidou, E. (2000). Panel Data Discrete Choice Models with Lagged Dependent Variables. Econometrica, vol. 68, 839-874.

Honoré, B.E. & Tamer, E. (2006). Bounds on Parameters in Panel Dynamic Discrete Choice Models. Econometrica, vol. 74, 611-629.

Hotelling, H. (1929). Stability in Competition. The Economic Journal, vol. 39, 41-57.

Huddleston, P., Whipple, J., & Van Auken, A. (2004). Food store loyalty: Application of a consumer loyalty framework. Journal of Targeting, Measurement and Analysis for Marketing, vol. 12 (3), 213-230.

Hupp, O. & Schuster, H. (2000). Imagegestützte Positionierung von Einkaufsstätten als Ansatzpunkt zu einer Verbesserung der Wettbewerbsfähigkeit des Lebensmitteleinzelhandels in Deutschland. Jahrbuch der Absatz-und Verbrauchsforschung, vol. 46 (4), 351-371.

Iyengar, S.S. & Lepper, M.R. (2000). When choice is demotivating: can one desire too much of a good thing? Journal of Personality and Social Psychology, vol. 79 (6), 995-1006.

Jain, D.C., Vilcassim, N.J., & Chintagunta, P.K. (1994). A Random-Coefficients Logit Brand-Choice Model Applied to Panel Data. Journal of Business & Economics Statistics, vol. 12, 317-328.

Jungwirth, G. (1997). Geschäftstreue im Einzelhandel. Gabler Verlag, Deutscher Universitätsverlag, Wiesbaden.

Kassarjian, H.H. (1971). Personality and Consumer Behavior: A Review. Journal of Marketing Research, vol. 8, 409-418.

Keane, M.P. (1997). Modeling Heterogeneity and State Dependence in Consumer Choice Behavior. Journal of Business & Economic Statistics, vol. 15 (3), 310-327.

Krafft, M. & Albers, S. (1996). Verbund von Produkt-und Betriebsformenwahl beim Einkaufen in der City, in Subzentren und auf der „grünenWiese“ in: Handelsforschung 1996/97, (pp. 125-143). Gabler: Wiesbaden.

Kreller, P. (2000). Einkaufsstättenwahl von Konsumenten. Gabler Verlag, Deutscher Universitäts-Verlag, Wiesbaden.

Krishnamurthi, L. & Raj, S.P. (1991). An Empirical Analysis of the Relationship between Brand Loyalty and Consumer Price Elasticity. Marketing Science, vol. 10 (2), 172-183.

Kumar, V. & Leone, R.P. (1988). Measuring the Effect of Retail Store Promotions on Brand and Store Substitution. Journal of Marketing Research, vol. 25, 178-185.

Layton, D.F. & Brown, G. (2000). Heterogeneous Preferences Regarding Global Climate Change. The Review of Economics and Statistics, November 2000, vol. 82 (4), 616-624.

Lee, L.-F. (1997). Simulated maximum likelihood estimation of dynamic discrete choice statistical models: some Monte Carlo results. Journal of Econometrics, vol. 82 (1), 1-35.

Leszczyc, P.T.L.P., Sinha, A., & Timmermans, H.J.P. (2000). Consumer store choice dynamics: ananalysis of the competitive market structure for grocery stores. Journal of Retailing, vol. 76 (3), 323-345.

Leszczyc, P.T.L.P. & Timmermans, H.J.P. (1996). An unconditional competing risk hazard model of consumer store-choice dynamics. Environment and Planning A, vol. 28 (2), 357-368.

Lindquist, J.D. (1974). Meaning of Image. Journal of Retailing, vol. 50, 29-38.

Malhotra, N.K. (1983). A Threshold Model of Store Choice. Journal of Retailing, vol. 59, 3-21.

Mannering, F. & Winston, C. (1985). A Dynamic Empirical Analysis of Household Vehicle Ownership and Utilization. RAND Journal of Economics, vol. 16 (2), 215-236.

Mannering, F., Winston, C., Griliches, Z., & Schmalensee, R. (1991). Brand Loyalty and the Decline of American Automobile Firms. Brookings Papers on Economic Activity. Microeconomics, 1991, 67-114.

Marion, B.W. (1998). Competition in Grocery Retailing: The Impact of a New Strategic Group on BLS Price Increases. Review of Industrial Organization, vol. 13, 381-399.

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior. Frontiers in Econometrics. Academic Press.

McFadden, D. & Train, K. (2000). Mixed MNL Models for Discrete Response. Journal of Applied Econometrics, vol. 15, 447-470.

Moeltner, K. & Englin, J. (2004). Choice Behavior Under Time-Variant Quality: State Dependence Versus 'Play-It-By-Ear' in Selecting Ski Resorts. Journal of Business and Economic Statistics, vol. 22 (4), 214-224.

Morschett, D., Swoboda, B., & Foscht, T. (2005). Perception of store attributes and overall attitude towards grocery retailers: The role of shopping motives. International Review of Retail, Distribution & Consumer Research, vol. 15 (4), 423-447.

Müller, S. & Beeskow, W. (1982). Einkaufsstättenimage und Einkaufsstättenwahl. Jahrbuch der Absatz- und Verbraucherforschung, vol. 28, 400-426.

Müller-Hagedorn, L. (2005). Handelsmarketing (4ed.). Kohlhammer.

Niessen, J. (2008). Öko-Lebensmittel in Deutschland: Möglichkeiten und Grenzen der Tracking-Forschung auf dem Markt für Öko-Lebensmittel (1ed.). Kovac, J.

Olbrich, R. & Windbergs, T. (2007). Zur Beziehung zwischen Markentreue, Einkaufsstättentreue und Erfolg im Einzelhandel in: Shopper Research-Kundenverhalten im Handel, (pp. 61-86). Dt.Fachverl.

Pan, Y. & Zinkhan, G.M. (2006). Determinants of retail patronage: A meta-analytical perspective. Journal of Retailing, vol. 82 (3), 229-243.

Papatla, P. & Krishnamurthi, L. (1992). A Probit Model of Choice Dynamics. Marketing Science, vol. 11 (2), 189-206.

Ramadurai, G. & Srinivasan, K.K. (2006). Dynamics and Variability in Within-Day Mode Choice Decisions. Transportation Research Record, 1977, 43-52.

Reader, S. & McNeill, F. (1999). Hazard-rate modeling of store-switching behaviour. Environment and Planning A, vol. 31 (8), 1353-1370.
Revelt, D. & Train, K. (1998). Mixed Logit With Repeated Choices: Households' Choices Of Appliance Efficiency Level. The Review of Economics and Statistics, vol. 80 (4), 647-657.

Rhee, H. & Bell, D.R. (2002). The inter-store mobility of supermarket shoppers. Journal of Retailing, vol. 78, 225-237.

Schmitz, G. (2007). Einkaufsmotive als Einflussgrössen der Betriebstypenwahl im Lebensmitteleinzelhandel: Eine theoretische und empirische Analyse zur

Nutzungswahrscheinlichkeit von Lebensmittel-Discountern in: Shopper Research – Kundenverhalten im Handel, (pp. 39-60). Dt.Fachverl.

Schwartz, B. (2006). Anleitung zur Unzufriedenheit: Warum weniger glücklicher macht (1ed.). Ullstein Tb.

Seck, E. & Brückner, C. (2008). Ökobarometer 2008. Technical report, Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz.

Seetharaman, P.B., Ainslie, A., & Chintagunta, P.K. (1999). Investigating Household State Dependence Effects across Categories. Journal of Marketing Research, vol. 36 (4), 488-500.

Sela, A., Berger, J.A., & Liu, W. (2008). Variety, Vice, and Virtue: How Assortment Size Influences Option Choice. Journal of Consumer Research, vol. 35, 941-951.

Smith, M.D. (2005). State dependence and heterogeneity in fishing location choice. Journal of Environmental Economics and Management, vol. 50 (2), 319-340.

Solgaard, H.S. & Hansen, T. (2003). A hierarchical Bayes model of choice between supermarket formats. Journal of Retailing and Consumer Services, vol. 10, 169-180.

Sprowls, R.C. & Asimow, M. (1962). A Model of Customer Behavior for the Task Manufacturing Corporation. Management Science, vol. 8 (3), 311-324.

Statistisches Bundesamt (2008a). Federal Statistical Office, Germany. https://www-genesis.destatis.de/genesis/online/logon.

Statistisches Bundesamt (2008b). Statistisches Jahrbuch 2008. Wiesbaden.

Tietz, B. (1975). Die Grundlagen des Marketing – Erster Band: Die Marketing-Methoden. Verl. Moderne Industrie.

TNS-Infratest (2007). Die Zielgruppe für Bio-Lebensmittel.

Tordjman, A. (1994). European Retailing: Convergences, Differences and Perspectives. International Journal of Retail and Distribution Management, vol. 22, 3-19.
Train, K. (1998). Recreation Demand Models with Taste Differences Over People. Land Economics, vol. 74, 230-239.

Train, K. (2000). Halton Sequences for Mixed Logit. Economics Working Papers E00-278, University of California at Berkeley.

Train, K. (2003). Discrete Choice Methods with Simulation. Cambridge University Press.

Train, K. & Winston, C. (2007). Vehicle Choice Behavior And The Declining Market Share Of U.S. Automakers. International Economic Review, vol. 48 (4), 1469-1496.

Wooldridge, J.M. (2000). A framework for estimating dynamic, unobserved effects panel data models with possible feedback to future explanatory variables. Economics Letters, vol. 68 (3), 245-250.

Wooldridge, J.M. (2005). Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity. Journal of Applied Econometrics, vol. 20 (1), 39-54.

Table 2: Means and standard deviations of the household attributes for 1300 households of the estimation sample

	Variable	Mean	Std.dev.
advertising impact	no	.55	.497
	indifferent	.26	.438
	yes	.19	.393
environment	do not care	.63	.483
	indifferent	.10	.302
	do care	.27	.445
freshness orientation	low	.29	.454
	medium	.43	.494
	high	.28	.449
organic food	do not like	.54	.498
	indifferent	.20	.401
	do like	.26	.437
pricing	not price-conscious at all	.05	.210
	not price-conscious	.15	.356
	price-conscious	.32	.466
	very price-conscious	.48	.499
quality orientation	low	.38	.486
	medium	.40	.490
	high	.22	.411

Source: Own illustration

Table 3: Average summary statistics of some sociodemographic variables

Variable	Definition	mean	population mean[a]
Gender	gender of householder / in population Male=0; Female=1	0.70	0.51
Age	age of householder / in population 11 age classes (7.12 = 50.6 years)	50.6	43
Income	net Income of household (in Euro) 15 income classes (7.40 = 2225 Euro)	2225	2787

[a]: Based on data of the Federal Statistical Office Germany Statistisches Bundesamt (2008b) for 2006, the homepage (Statistisches Bundesamt, 2008a) and their press releases.

Table 4: Grocery store type choices of the estimation sample for fruit and vegetables

	f&v
Discounter (in %)	49.57
Supermarket (in %)	14.12
Small hypermarket (in %)	10.80
Large hypermarket (in %)	17.56
Specialized store (in %)	7.95
Total purchases	44571
Number of average purchases per household:	
Total	34.29
Discounter	17.00
Supermarket	4.84
Small hypermarket	3.70
Large hypermarket	6.02
Specialized store	2.73

Source: Own illustration

Table 5: Store type choice estimation results for fruits and vegetables

attitude	characteristic	store	M1	M2	M3	M4
variable		type	basic	loyal	socio	inter
quality	low	sm[a]	0.243 (0.226)	-0.274 (0.200)	0.788*** (0.214)	0.121 (0.216)
		small[b]	-0.259 (0.195)	0.254 (0.209)	-0.983*** (0.211)	-0.959*** (0.251)
		large[c]	-0.286 (0.214)	0.009 (0.175)	-0.916*** (0.190)	0.055 (0.222)
		spec[d]	-0.512 (0.308)	-0.502 (0.262)	-0.612* (0.286)	-1.515*** (0.372)
	high	sm	1.355*** (0.261)	1.404*** (0.262)	1.566*** (0.252)	1.751*** (0.289)
		small	0.280 (0.271)	0.909*** (0.239)	1.084** (0.328)	0.656* (0.270)
		large	0.505* (0.235)	0.896*** (0.222)	0.290 (0.220)	0.343 (0.261)
		spec	1.176*** (0.299)	1.733*** (0.265)	1.827*** (0.267)	1.579*** (0.338)
freshness	low	sm	-0.811** (0.272)	-0.949** (0.284)	-1.187*** (0.279)	-0.092 (0.284)
		small	-0.689* (0.291)	-1.358*** (0.336)	-0.286 (0.287)	0.331 (0.420)
		large	0.622* (0.245)	-0.302 (0.219)	-0.039 (0.276)	0.219 (0.302)
		spec	-0.437 (0.485)	-1.597*** (0.364)	-1.648*** (0.382)	-2.193*** (0.591)
	high	sm	-0.439 (0.249)	-1.361*** (0.194)	-1.104*** (0.188)	-1.509*** (0.253)
		small	-0.713*** (0.199)	-0.299 (0.205)	-0.843*** (0.233)	-0.708* (0.296)
		large	-0.736** (0.238)	-0.529** (0.186)	-0.795*** (0.192)	-0.090 (0.236)
		spec	0.595** (0.225)	0.964*** (0.216)	0.410 (0.221)	0.423 (0.311)
adverts	no	sm	0.286 (0.243)	-0.258 (0.220)	-0.761*** (0.217)	0.270 (0.239)
		small	-0.007 (0.188)	-0.716** (0.211)	0.099 (0.214)	0.298 (0.314)
		large	-0.136 (0.251)	0.148 (0.212)	0.073 (0.220)	-0.355 (0.299)
		spec	-0.214 (0.249)	0.206 (0.221)	0.157 (0.248)	0.255 (0.296)

	yes	sm	-0.561* (0.254)	0.151 (0.231)	0.344 (0.227)	0.749** (0.256)
		small	0.168 (0.238)	-1.618*** (0.251)	-0.323 (0.231)	0.428 (0.349)
		large	-0.507* (0.259)	-0.453 (0.244)	-0.038 (0.260)	-0.606* (0.301)
		spec	0.701** (0.273)	-0.566* (0.251)	-0.015 (0.297)	1.942*** (0.378)
environ	not care	sm	-1.166*** (0.304)	-1.063*** (0.272)	-1.229*** (0.322)	-0.138 (0.393)
		small	-0.471 (0.352)	0.273 (0.378)	-0.621* (0.315)	-1.119* (0.498)
		large	-0.587* (0.253)	-0.605** (0.225)	-1.125*** (0.273)	0.647 (0.344)
		spec	-0.814* (0.326)	-1.906*** (0.308)	-0.438 (0.325)	0.209 (0.516)
	care	sm	1.124** (0.372)	-0.233 (0.296)	0.562 (0.305)	1.217** (0.384)
		small	-0.364 (0.366)	0.329 (0.393)	-0.113 (0.336)	-0.944* (0.479)
		large	-0.339 (0.278)	-0.226 (0.240)	-0.528 (0.279)	0.501 (0.370)
		spec	0.374 (0.333)	1.016** (0.319)	0.938** (0.311)	1.179** (0.501)
organic	not like	sm	-0.223 (0.299)	-0.566** (0.219)	-1.550*** (0.270)	5.767*** (1.324)
		small	-0.708** (0.242)	0.312 (0.212)	-0.286 (0.244)	-0.649 (1.388)
		large	1.105** (0.325)	0.386 (0.211)	0.976*** (0.263)	3.478* (1.658)
		spec	1.431** (0.495)	2.146*** (0.361)	1.276*** (0.354)	0.415 (2.222)
	like	sm	-1.550*** (0.347)	-1.134*** (0.299)	-2.254*** (0.362)	5.384** (1.849)
		small	-0.272 (0.266)	-0.003 (0.244)	0.219 (0.335)	-1.788 (1.784)
		large	-0.560 (0.301)	0.220 (0.267)	-0.685* (0.297)	4.794* (2.029)
		spec	2.448*** (0.467)	1.705*** (0.347)	0.869* (0.363)	1.611 (2.609)
price	not pc at all[e]	sm	-0.537 (0.387)	-1.647*** (0.351)	0.738* (0.358)	-1.503*** (0.343)
		small	2.214*** (0.447)	2.221*** (0.489)	-0.002 (0.418)	-6.553 (3.880)

		large	-0.284 (0.322)	0.713* (0.316)	-0.014 (0.351)	-3.729 (4.131)
		spec	1.053** (0.348)	1.687*** (0.378)	0.820 (0.425)	-4.077*** (0.617)
	pc	sm	-0.166 (0.223)	-0.836*** (0.240)	0.590* (0.255)	-0.418 (0.267)
		small	1.184*** (0.295)	-1.992*** (0.307)	0.474 (0.254)	1.036** (0.298)
		large	0.040 (0.280)	-0.443 (0.237)	0.138 (0.240)	-1.210*** (0.261)
		spec	0.354 (0.305	0.412 (0.314)	0.266 (0.333)	-0.086 (0.391)
	very pc	sm	-1.081*** (0.256)	-1.521*** (0.254)	-0.711** (0.242)	3.666*** (0.877)
		small	-0.257 (0.280)	-0.987** (0.290)	-0.066 (0.251)	-1.121 (1.593)
		large	0.046 (0.244)	0.638** (0.217)	1.167*** (0.245)	-0.954 (1.087)
		spec	-1.814*** (0.286)	0.150 (0.319)	-0.710* (0.323)	3.222 (1.802)
loyalty dummy		sm		-1.241*** (0.121)		-1.252*** (0.122)
		small		-1.501*** (0.125)		-1.495*** (0.128)
		large		-0.714*** (0.106)		-0.684*** (0.107)
		spec		-1.491*** (0.138)		-1.516*** (0.140)
age		sm			0.100** (0.033)	0.125 (0.075)
		small			0.060 (0.043)	-0.123 (0.080)
		large			-0.066 (0.036)	-0.272 (0.146)
		spec			0.204*** (0.041)	0.436** (0.135)
gender		sm			-0.694** (0.242)	1.289 (0.933)
		small			0.324 (0.211)	0.237 (0.735)
		large			0.458* (0.220)	-0.166 (0.620)
		spec			-0.638* (0.295)	1.984 (1.214)

income		sm			0.163*** (0.034)	0.021 (0.074)
		small			0.053 (0.053)	0.118 (0.067)
		large			-0.035 (0.030)	-0.020 (0.089)
		spec			-0.030 (0.033)	-0.234* (0.116)
age-organ	not like	sm				-0.145 (0.089)
		small				0.162 (0.110)
		large				0.004 (0.147)
		spec				0.145 (0.141)
	like	sm				-0.084 (0.105)
		small				0.010 (0.119)
		large				-0.100 (0.156)
		spec				-0.010 (0.157)
age-price	not pc at all	sm				2.849** (1.055)
		small				0.508 (0.328)
		large				0.232 (0.377)
		spec				0.819 (0.497)
	pc	sm				0.213 (0.174)
		small				0.073 (0.199)
		large				0.170 (0.916)
		spec				-0.062 (0.117)
	very pc	sm				0.143* (0.068)
		small				-0.046 (0.114)

		large				0.105 (0.078)
		spec				-0.161 (0.129)
gen-organ	not like	sm				-1.457 (0.958)
		small				1.039 (0.863)
		large				-0.163 (0.697)
		spec				-3.598** (1.321)
	like	sm				-0.432 (1.036)
		small				0.110 (0.923)
		large				0.509 (0.692)
		spec				-0.827 (1.280)
gen-price	not pc at all	sm				-0.785 (0.907)
		small				1.186 (1.149)
		large				-2.202 (1.337)
		spec				-0.742 (1.189)
	pc	sm				-0.375 (0.311)
		small				1.391 (0.834)
		large				-1.297 (0.782)
		spec				-0.816 (0.543)
	very pc	sm				-0.676 (0.478)
		small				0.985 (0.744)
		large				-2.045*** (0.541)
		spec				-0.639 (0.783)

inc-organ	not like	sm				-0.372*** (0.096)
		small				-0.298** (0.100)
		large				-0.377*** (0.105)
		spec				0.243 (0.134)
	like	sm				-0.756*** (0.131)
		small				0.122 (0.149)
		large				-0.578*** (0.146)
		spec				-0.110 (0.161)
inc-price	not pc at all	sm				0.881* (0.362)
		small				0.211 (0.195)
		large				0.462** (0.151)
		spec				1.185*** (0.232)
	pc	sm				0.217 (0.126)
		small				0.194 (0.143)
		large				0.372 (0.262)
		spec				-0.386 (0.218)
	very pc	sm				0.388*** (0.086)
		small				0.169 (0.106)
		large				0.182* (0.079)
		spec				-0.422*** (0.114)
constant		sm	-2.046*** (0.529)	-1.241** (0.460)	-0.551 (0.665)	-4.959*** (1.217)
		Std. de	2.137*** (0.125)	2.672*** (0.162)	3.023*** (0.192)	2.143*** (0.128)

	small	-1.553**	-0.614	-2.633***	-1.811
		(0.500)	(0.487)	(0.682)	(1.218)
	Std. de	3.517***	2.934***	1.895***	1.978***
		(0.305)	(0.225)	(0.125)	(0.152)
	large	-1.146*	-0.838**	-1.004	0.266
		(0.548)	(0.306)	(0.571)	(1.912)
	Std. de	-2.071***	2.518***	3.283***	2.840***
		(0.114)	(0.131)	(0.208)	(0.171)
	spec	-3.315***	-3.453***	-3.335	-8.611***
		(0.862)	(0.521)	(0.847)	(2.152)
	Std. de	3.036***	2.415***	3.023***	2.046***
		(0.239)	(0.166)	(0.239)	(0.169)
Log likelihood		-43921.502	-42584.594	-43645.597	-43264.860
Likelihood ratio index[f]		0.221	0.244	0.226	0.232
AIC[g]		89283.000	86689.178	88971.191	89169.714
SC[h]		95038.356	92764.288	95685.776	99721.212
Right Prediction		0.526	0.353	0.502	0.536
Chance criterion		0.496			
Observations		44571			

Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001

[a] sm: conventional supermarket, [b] small: small hypermarket, [c] large: large hypermarket

[d] spec: specialized store, [e] pc: price-conscious.

[f] The log-likelihood value of the constant-only model is -56362.286.

[g] AIC: Akaike information criterion, [h] SC: Schwarz criterion