

Rommel Kai; Sagebiel, Julian

Article

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Rommel, Kai; Sagebiel, Julian

Analysis of consumer preferences in Germany for attributes of fast moving consumer goods with a discrete choice experiment

Abstract

The markets for Fast Moving Consumer Goods (FMCG) in Germany are determined by demographic change, the COVID-19 pandemic and new developments in mobility demand. The current state of research on consumer preferences indicates heterogeneous preference structures in the attributes for FMCG. While the perceived product quality and transaction costs strongly determine the willingness to pay for FMCG, it is important to examine the impact of other attributes such as production type and place of purchase on the willingness to pay. The main aim of this study is to estimate the willingness to pay for individual attributes of FMCG using a discrete choice experiment. The results confirm strong effects of product quality and transaction costs on willingness to pay. Sociodemographic factors such as age and housing situation also have a significant impact. The results contribute to insights in the literature and provide recommendations for retailers to adapt product portfolios to changing market conditions. The paper helps to specify the preference structures of consumer groups and to show the impact of socioeconomic variables on the willingness to pay for FMCG. This also enables a more precise assessment of inflationary effects.

Keywords: consumer behaviour, fast moving consumer goods, choice experiment, willingness to pay

1 Introduction

The International Standard Industrial Classification (ISIC) defines Fast Moving Consumer Goods (FMCG) (United Nations, 2008) and divides them into the food and near-food segments. The food segment includes non-alcoholic and alcoholic beverages and tobacco products. Products such as toiletries, cosmetics, detergents, cleaning agents, other hygiene products and pet supplies belong to the near-food segment (Kenton, 2021). Convenience products in the food sector are understood here to mean ready-made products and meals such as preserves, frozen food, complete meals for the microwave, baking

mixes, instant pudding and pouch soups. These products are ready to eat and only need to be thawed or heated depending on their condition.

Markets for FMCG are consumer packaged goods mainly for daily consumption that are bought at low prices and with a high inventory turnover (Kenton 2021). FMCG's food segment in Germany generates annual sales of over 200 billion euros, accounting for around 14% of total private consumer spending. Food products characterize the market for FMCG. The four largest groups Aldi, Schwartz, Rewe and Edeka account for around 70% of the market share, tendency towards further market concentration, reinforced by low margins (Henrich, 2019). In addition, there are two developments that are permanently changing the market for FMCG in the food sector. First, the importance of online consumption is growing in this market segment, although it underperforms compared to other economies (Henrich, 2019). However, the annual nominal growth rate of the entire FMCG market in the food sector is around 1.2% in 2021, well below the average value of the five previous years and shows growth potential (Statista, 2021a: 4). FMCGs have low profit margins but account for more than half of all consumer spending (Kenton, 2021). Second, organic food and regionally produced products are growing slowly but steadily. The market share of organic food doubled between 2006 and 2016 (Federal Environment Agency, 2019) and has continued to grow since 2019 (Global Organic Trade Guide, 2019). Between 2015 and 2019, the annual growth rate was 8.3% (Market Research Reports, 2021). At around 7.8%, the market share of organic FMCG is still far behind that of the conventional FMCG food segment. In particular, the vegetable and fruit segment is attractive to consumers with a total turnover of around €3.25 billion, which corresponds to 27.4% of the total market value (Market Research Reports, 2021). The market share for organic products in Germany is the largest in Europe at 11.4% of global organic sales, followed by France at 7.3% (Wunsch, 2020). Due to the increased importance of organic and vegetarian/vegan products as well as products without allergenic ingredients, it can be assumed that the importance of these market segments will continue to increase FMCG's market shares in the future. These factors, e-commerce and increased consumer quality demands may lead to further changes in market share and influence the relative importance of FMCG attributes in the food sector (Bogomolova et al., 2019). In addition, the sophistication of FMCG markets can influence purchasing behaviour, brand loyalty and perception of marketing measures (Sundstroem, Hjelm-Lidholm, 2019; Buckinx, van den Poel, 2005; Zarantonello et al., 2013).

The markets for FMCG in Germany are traditionally characterized by a dynamic and highly competitive market environment as well as a fast turnover of goods and are bought and consumed at short intervals (Henrich, 2019). The purchase is processed without any special information effort and at low transaction costs. The restrictions imposed by the COVID-19 pandemic are challenging the FMCG market. Across the German FMCG industry, sales increased between 2019 and 2020. At the beginning of the COVID-19 pandemic, private labels benefited first. Their share of sales increased from 74 to 77.5% during this period (Statista, 2022). FMCG sales in non-food retail in Germany have fallen significantly since 2018. Only online trade in this area has increased significantly since 2019, from 22.4 to 38.6 billion euros in 2021 (Statista, 2022). The use of FMCG is associated with a high consumption of resources due to the short sequence and regular purchasing activities in the entire value chain. Extensive distribution costs are incurred for food and beverages in particular, which are associated with negative external environmental and climate impacts. In addition, there are changes in consumer preferences caused by restricted mobility in an aging society, digitization and increasing online shopping opportunities (Ulbricht, Chervyakov 2015).

The market for FMCG in Germany is with dynamic changes in the framework conditions, such as high market concentration and strong price pressure. However, the share of small consumer markets in demand coverage increased steadily since 2015 (Nielsen, 2018: 14). In 2019, rental of small shops in Germany has grown by 4.2 % (Boersenblatt, 2020). Since March 2021 revenues from retailers in Germany are mainly above the same month of the previous year (Destatis 2022a). Particularly, the food sector has slightly decreased between January 2021 and 2022 (Destatis 2022b). The market share of drug stores has slightly increased since 2018 except 2020 with a decrease of 0.5 % compared to 2019. Discounter show a decrease of market share from 44 % in 2019 to 42.2 % in 2021, whereas market shares of full-range provider increased during the same period (Lebensmittel Zeitung 2022).

Manufacturing and production types influence product characteristics such as regionality and supply chains due to the growing awareness of sustainability. Both attributes have an increasing impact on purchasing decisions (Angelez-Martinez et al., 2018). This development on the FMCG markets illustrates the increasing competitive pressure. Solutions to address these problems require a better understanding of consumer behavior. The aim of this study is to examine the effects of the various market changes for FMCG on the consumer preference structures for the properties of FMCG. To achieve this goal, we approach the method of discrete choice experiments (DCE) to examine the willingness to pay (WTP) for certain product properties. In addition, this approach enables the classification of social and

economic effects of purchasing behavior. A deeper knowledge of individual preference structures for these goods is crucial for the design of appropriate policies by local government and for the provision of better infrastructure. Further knowledge of consumer preferences enables companies in the supply chain to more efficiently absorb the WTP of selected target groups for individual attributes of FMCG and convert these financial resources into investments in marketing and innovation.

In this paper we first, discuss the relevant literature on FMCG markets and derive the attributes of FMCG for the empirical analysis in section 2. To determine the individual preference structure, we explain in Section 3 the DCE and the experimental design for determining the marginal WTP for changes in selected product properties of convenience products. In addition, the influences of socio-economic determinants such as consumer behavior and demographic data on the WTP are analyzed. In Section 4 we discuss the results of a conditional logit model and a mixed logit model including the WTP estimates. Finally, various implications, recommendations, limitations and conclusions are part of Section 5.

2 Markets and preferences for FMCG

Changes in market shares from different sales locations, such as discounters, drugstores, hypermarkets and supermarkets, can have an impact on consumer behaviour if the shopping environment influences buying behaviour (Nierobisch et al., 2017). In addition, there are increasing expectations from consumers about sustainable value chains and food compatibility (Siegfried, Zhang, 2021). Regionally sourced FMCG can thus become a purchasing-relevant feature that influences the cost structure of manufacturers and retailers (Angelez-Martinez et al., 2018). Younger generations may have a higher WTP for organic food and less packaging waste (Kamenidou et al., 2020). Moreover, Krystallis and Chryssohoidis (2005) point out different correlations between income and preferences for organic food.

Various factors drive consumer behaviour in FMCG markets such as frequency, novelty and sustainability of purchases, gender, brand value, social environment and customer loyalty. Bogomolova et al. (2019) note that there is little opportunity to increase consumer inventories and point to the need for ongoing marketing activities to increase the proportion of first-time buyers in the FMCG market segment, which accounts for around 5% of the items in the shopping cart. The individual perception of the shopping atmosphere and socio-demographic variables such as age, gender and income have a significant influence on purchasing behaviour (Nierobisch et al. 2017). Consumers react differently to

price changes. This determines the development of FMCG's market shares. Bogetic et al. (2016) analysed shoppers' preferences for store size and found that affordable prices and close proximity ranked highest among several other attributes. In addition to the distance the consumer travels to the store, the distance the food has travelled also determines FMCG purchasing behaviour. Grebitus et al. (2013) found a decreasing WTP with distance travelled. This indicates a preference for local food production. The variables brand loyalty, brand association and perceived quality have a significant impact on brand value (Mohan, Sequeira, 2015). The authors point to empirical evidence for the multidimensionality of brand equity in the FMCG markets for body wash, dry linen and packaged tea in India. The place of purchase is thus a determinant of consumer behaviour and WTP for FMCG. In addition, the brand experience in the flagship store has a strong influence on brand loyalty. The attributes of price, trust, brand name and perceived quality have a positive impact on FMCG purchases (Omogbe and Ogbeide 2013). Klein and Schmitz (2016) analyse the cross-format shopping behaviour of consumers in FMCG shopping. Their results illustrate the perceived status of the attributes of price, product and service quality, and store proximity, which differ between consumers' cross-format shopping patterns. In addition, price sensitivity dominates in cross-format shopping patterns. Improving existing business models with data on consumer expectations of certain product properties requires suitable empirical models.

The results of empirical research on FMCG illustrate different determinants of preferences for the attributes product quality, regional or organic production, place of purchase, distance and price. In addition, some sociodemographic determinants such as age and household income appear to have strong influences on individual WTP for FMCG. For our study design, it can be stated that the influences of the product attributes quality, regionality, sustainability, place of purchase and purchasing costs in the form of distance and price, which have been examined in previous research, have significant influences on the preference structure and purchasing behaviour. This data on the stated preferences for individual features of FMCG is useful for marketing measures to convert these preferences into company revenues. For further investigation, we formulate the following research questions on the interactions between individual characteristics, sociodemographic variables and the WTP based on literature findings:

1. How much are consumers willing to pay for individual attributes of FMCG such as product quality, type of store, regionality and distance to the point of purchase?

2. What are the correlations between socio-demographic variables and the WTP for individual attributes of the FMCG examined?
3. Does the perceived importance of local and organic products correspond to an additional WTP for local and environmentally friendly FMCG?

Socio-demographic parameters, market conditions and physical conditions are major factors influencing purchasing decisions. The current market size and the relatively low growth rates indicate further expansion potential. The main goals of this work are to estimate the WTP for certain attributes of selected FMCG and to identify the sociodemographic determinants of the preference structure. To test our hypothesis, we empirically examine the role of the attributes product quality, production type, accessibility, distance and price changes on the consumer purchasing process in FMCG markets using findings from the literature. The insights are needed to estimate the WTP for individual attributes and to support the transformation of revealed preferences for individual attributes into efficiencies in marketing.

3 Research model developments

DCEs are a widely used method to determine individual preferences for individual attributes. This method can be used to estimate the WTP for individual attributes of the product or service under study in hypothetical market situations. In addition, sociodemographic determinants of these values can be estimated. The main feature of DCEs is the breakdown of a product into individual attributes such as quality, types of ingredients, factors used in the production process, etc. To estimate marginal WTP, a monetary attribute such as cost or price is needed for individual attributes. Each attribute is specified at two or more different levels.

3.1 DCE Design

To create a hypothetical market situation, the DCE consists of two options that the respondent can select. Each option presents the product's attributes with randomly selected levels. In addition, a non-purchase option, also called an opt-out, can be used to account for non-purchase behaviour in hypothetical markets (Hensher et al. 2005, Campbell, Erdem, 2019). The profile of the attributes and levels results from the given conditions, e.g., the availability of purchase location and quality standards. We presented respondents with the attributes and levels using a predefined number of choice cards. Each choice card represents two or more product variations with the same attributes and with different

variations of the corresponding level. In an iterative process, the respondents selected the preferred alternative from given object configurations. The DCE is embedded in a standardized online questionnaire on attitudes towards FMCG and socio-demographic issues. The online survey was conducted in 2015 with respondents living in Germany. The respondents were specifically recruited by the market research institute *konkret*.

3.2 Attribute Selection

Each of the 407 respondents selected ten consecutive situations with a total of 4,070 choices. Using a DCE creates a hypothetical market for FMCG. This allows the estimation of the marginal WTP for individual attributes based on the different choices related to the corresponding prices of each option. The defined attributes presented in Table 1 reflect the results of the literature review in Section 2 and are considered relevant for consumer decisions. The first attribute, Product Quality, takes into account the perceived product quality based on the items used by Dodds et al. (1991) and the results of Bogomolova (2019) and Mohan and Sequeira (2015) and is confirmed by our own results of the questionnaire. Price and quality of durable goods play a major role for 45 to 55% of consumers. The proportion of consumers who care most about quality has increased over the years to 55% in 2019 (GfK 2019). The results of Dodds et al. (1991) indicate a strong correlation between price and quality. Therefore, in our study, we chose price and quality as two separate attributes. In addition, the type of provider determines the perceived quality; private labels and manufacturer brands are evaluated differently in Germany (HDE 2020). The quality attribute has the levels: premium, high-grade, standard, convenience and no-name product. Premium represents the highest quality level and no-name products the lowest level. No-name brands are not associated with high or average quality. The three levels in between represent gradations between the highest and the lowest level.

The second attribute, "Regional vs. organic production", is dichotomous and clarifies the assumption that this attribute leads to a perceived increase in utility (Angelez-Martinez et al., 2018, Bogomolova et al., 2019). Retailers see regionality and organic food as the most important trends in the FMCG markets (Lebensmittelzeitung 2020). We have therefore combined these two attributes in order not to overload the choice cards as the DCE's focus is on FMCG quality and delivery. For the third attribute, accessibility options, we used the results of a previous online survey of purchase frequency across different types of vendors: home delivery, available in retail stores, parcel collection stations, mobile shops, and malls. Attribute number four defines the "distance from store to home". The willingness to

drive to the place of purchase differs in relation to the driving distance. Around 34% of consumers prefer distances to the place of purchase of 10 km or less (Statista 2021b). To examine this distance more closely for heterogeneity, we use the following levels: very small (about 0 kilometres), 0.5 kilometres, less than 3 kilometres and 3 or more kilometres. This classification is based on findings in the literature such as Bogetić et al. (2016) and Grebitus et al. (2013) assumes a negative correlation between benefit and distance from business to place of residence. The level 0 kilometres means a very short distance between the consumer's destination and the point of purchase, for example in multi-family houses with shopping facilities. The final attribute, Price Increase Percentage, has levels of plus 30%, plus 20%, plus 10%, 0%, and minus 10%. The price attribute is standard in DCE and is required for calculating the marginal WTP for individual attributes in relation to a predefined standard product design. Other studies, such as You and Choi (2022) and Vecchi et al. (2022) use price differentiations in the range of plus and minus 25% (You, Chen, 2022) or in multiple intervals of 5%.

Table 1: Attributes and levels

Attribute	Levels
Product Quality (Pqual)	Premium, High Grade, Standard, Convenient, Original Brands/No-Name
Regional or Ecological Production (Prod)	Yes, No
Access Options (Acop)	Home delivery, Available in store (super market, to-go store), Package pick-up station, Mobile store (grocery cart on wheels), Shopping centre
Distance from Store to Home (Dist)	0 km, 0.5 km, < 3 km, > 3 km
Price Increase in % (including delivery) (Pinc)	+ 30%, + 20%, +10%, 0%, -10%

A choice card consists of two generic alternatives and a no-purchase option. The generic alternatives were described with the help of attributes and differ in the characteristics of their attributes (Table 2).

Table 2: Choice Example

Attribute	Product A	Product B	No purchase
Product Quality	High Grade	Standard	
Regional or Ecological Production	Yes	No	
Access Options	Shopping centre	Available in store (supermarket)	
Distance from Store to Home	0 km	< 3 km	
Price Increase in % (including delivery)	10 %	10 %	
I choose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The statistical design of the DCE, i.e., the arrangement of the attributes and expressions in the respective alternatives, was created with the software package NGene (ChoiceMetrics, 2012). For this purpose, we have chosen a so-called efficient design that minimizes the standard errors of the parameters to be estimated for a multinomial logit model (d-efficiency criterion) (Rose and Bliemer, 2008). The weightings of the individual feature levels used here were derived from the results of our own online survey as well as from the literature analysis and the available statistics. The priors⁸ were selected based on the results of a preliminary study conducted in September 2014 with 100 respondents. We excluded implausible combinations and dominant alternatives. Table 2 shows an example of a choice situation. The levels in the Product A and B columns were randomly selected from the defined attributes.

3.3 Model Description

The respondents are assumed to maximize utility, and each alternative i can be represented in a utility function U_i ⁹.

⁸ A Prior is the expected value of a parameter. These values are necessary in non-linear models to calculate the variance-covariance matrix and to minimize diagonal elements.

⁹ In economic theory, a utility function is a function that assigns numerical values to different bundles of goods. Utility functions merely order different bundles of good by its attractiveness. The utility function can

$$U_i = A_i\beta + \epsilon_i = V_i + \epsilon_i \quad (1)$$

where A_i is a vector with the attribute levels in alternative i ($a_{1i}, a_{2i} \dots$), and β is a vector of associated parameters, interpreted as utility weights. The term ϵ_i is a random component that captures all effects on utility that cannot be described by observed variables. The observed part of utility $A_i\beta$ is denoted as V_i . In the random utility model, the respondent chooses the alternative with highest utility. The assumption that the ϵ_i are identically and independently distributed (iid) and follow an extreme value Type I distribution leads to the conditional logit model (McFadden, 1974).

$$Prob(j) = \frac{\exp V_j}{\sum_{i=1}^n \exp V_i} \quad (2)$$

Equation 2 shows the probability to choose alternative j , conditional on $A_i\beta$. This non-linear expression of probabilities has two main alternatives: firstly, the probability is always between zero and one. Secondly, marginal effects of attribute changes on the choice probability are not constant, providing a more realistic shape of consumer behaviour. Using the maximum likelihood method (Train, 2008), the parameters β can be estimated. The maximum likelihood values are those where the estimated probabilities are closest to the actual choices.

In our theoretical model of choice, we assume that total utility from a FMCG is the sum of the utilities from each attribute plus a constant utility. For example, the utility for a FMCG can be written as:

$$U_{FMCG} = \beta_n + \beta_1 Pqual + \beta_2 Prod + \beta_3 Acop + \beta_4 Dist + \beta_5 Pinc + \epsilon_i \quad (3)$$

where U_{FMCG} represents utility a respondent receives from this specific configuration of the FMCG, β_n represents the utility increase or decrease of a FMCG in its base configuration compared to no consumption, and the remaining β parameters represent the utility derived from the corresponding attributes. For each option presented in the choice set, the respondent chooses the option that provides the highest level of utility. To increase the number of observations, each respondent was asked to make this choice ten times with different values of the attributes.

take various functional forms, but the most commonly used one is a linear-in-attributes specification (Train, 2008: 200).

Discrete choice regression models can be used to analyze the data (McFadden, 1974). The choice made by respondents serves as the dependent variable and the attribute levels are the independent variables used to explain the choice. The logit model is used to model choice probabilities, which in its simplest formulation as a conditional logit model provides the following formulation.

$$Prob(\text{choose } FMCG) = \exp(U_{FMCG}) / \sum(\exp(U_i)) \quad (4)$$

where $i = (1,2,0)$ is an index for the different options A (1), B (2) and no option (0).

The β parameters can be estimated using the maximum likelihood method. The estimated parameters can then be transformed into WTP values by dividing the parameters for the non-cost attributes and vehicle type by the cost attribute parameter. The WTP is the marginal rate of substitution between the attributes and the additional costs, and reflects the maximum amount a respondent is willing to pay for a one-unit increase in an attribute. Since different people are expected to have different preferences (the assumption in the conditional logit model are homogeneous preferences), we extend the model to a mixed logit model, which allows us to study preference heterogeneity.¹⁰

4 Results

This section presents the results of the descriptive part of the questionnaire on the one hand and the results of the model estimation and the WTP calculation on the other. Based on the results of the literature review in Section 2, we included the relevant socioeconomic determinants in the analysis.

4.1 Personal data

Almost 80% of those surveyed stated that they separate waste very often or often, and over 62% avoid waste. At around 72%, consumers visit discounters most frequently to buy FMCG. Around 57% buy FMCG in large supermarkets and 48% buy very often or often in small supermarkets. Smaller grocery stores and weekly markets are visited very often or often much less frequently at around 14% or 23%, whereas more than 36% shop very often or often in specialist shops. Table 3 illustrates the descriptive results of the interviews.

¹⁰ For the sake of brevity, the authors will not explain the statistical model and estimation procedure in detail. Instead, the authors refer the reader to Hensher et al. (2014) for a general explanation of DCEs and estimation.

Table 3: Personal data

Variable	Mean	S. D.
Household member	2.2	1.2
Female = 46.2%, male = 53.8%		
Age	46.2	85.5
Available net income per month: < 1,000€ = 11.2%, 1,000 – < 2,000€ = 24.6%, 2,000 - < 3,000€ = 28.6%, 3,000 - < 4,000€ = 18.7%, 4,000 - < 5,000€ = 9.0%, ≥ 5,000€ = 8.1%		
Expenditure basic needs: < 750€ = 34.2%, 750 – < 1,500€ = 31.8%, 1,500 - < 2,500€ = 5.8%, 2,500 - < 3,500€ = 1.1%, ≥ 3,500€ = 0.6%		

The characteristic of fresh food is the most important, with around 87.5% indicating a high or very high preference, followed by the characteristic of food quality with around 81.5% (Table 4). In addition, regional products are important or very important for the majority (around 57%). A low price is important for around 62%. 49.5% have a high preference for fair trade FMCG and around 36% indicated a high importance for organic food.

Table 4: Attitudes towards features of FMCG

Feature	Frequency	Feature	Frequency
Freshness	87.8 %	Premium quality	26.2 %
Quality	81.5 %	Wide range of products	77.0 %
Regionality	56.9 %	Time flexibility	68.3 %
Low price	62.2 %	Frequency of in-store purchases: at least once a week	94.3 %
Fair trade	49.5 %	Frequency of permanent online purchase	33.0 %
Organic food	36.4 %		

Consumers rate premium quality as low at 26.2%. 77% of those surveyed indicated a high preference for a wide range of products and good accessibility. Temporal flexibility is important for 68.3%. More than 94% of respondents buy FMCG at least once a week. 33% of respondents buy FMCG online sometimes, often or very often. The share of online shopping in Germany in total sales rose from 8.0% in 2017 to around 11.2% in 2021 (Online Monitor 2018, 2022). Other features of the questionnaire are: fair trade, free from additives, convenience and longevity. The reported importance for these attributes is between 36 and around 58%.

4.2 Model results

We estimated the models using the statistical software Stata and the user-written command `mixlogit` (Hole, 2007a). In order to model the observed preference heterogeneity, interaction terms with the sociodemographic variables and the constant were formed. The constant measures the impact of the "Don't Buy" option and reflects the attractiveness of the alternatives compared to the option of not buying either product. The total share of the non-call option is 33.2%. The interactions then provide information about the extent to which the sociodemographic variables have an influence on attractiveness. The two attributes product quality and access options were dummy-coded, i.e., a new variable was created for each attribute that takes the value 1 if the attribute is named in the alternative and otherwise has the value zero. One category serves as a reference, the parameter values of the other categories are to be interpreted in relation to the reference. A positive parameter value means that the benefit of the product with this characteristic is higher than the benefit of the reference category, *ceteris paribus*. The characteristic curve that achieves the lowest benefit was selected as a reference. Thus, the parameters estimated in the model for the other terms are positive, i.e., they represent improvements that make interpretation easier. The regional/organic dichotomous variable takes on the value 1 if the product is regional/organic. A positive parameter value then implies a positive effect of a regional/organic product on the utility value. Since none of the expressions are relevant for the non-purchase alternative, the values here were coded as -1. Thus, the constant can be estimated without distortion. The attributes of distance and price premium were included linearly in the utility function. In this case, a negative parameter means that greater distances and price premiums have a negative impact on the utility. Since not all decision-relevant variables can often be queried in surveys, models that depict unobserved preference heterogeneity via correlation structures of the confounding variables are often used to evaluate DCE (Sagebiel, 2011; Train, 2008).

Since the existence of unobserved preference heterogeneity cannot be ruled out in this study either, we estimated several models that explicitly model preference heterogeneity. With the mixed logit model, we assume that the parameters of the attributes are normally distributed. That is, we assume that preferences within our sample are normally distributed. The estimated parameters are the mean and standard deviation of this normal distribution. A high significant standard deviation implies the presence of unobserved preference heterogeneity. Table 4 shows the results of the conditional logit model (without unobserved preference heterogeneity) and the mixed logit model with parametric preference heterogeneity. In both the conditional logit model (column 2 in Table 4) and the mixed logit model (columns 3 and 4 in Table 5), all coefficients are significant at least at the 10% level. The constant has a positive sign in both models, which means that the respondents would tend not to buy either product. However, the value of the constant depends on the coding of the attributes and is therefore not interpretable per se.

Table 5: Results of the Conditional Logit and the Mixed Logit model

	Conditional Logit	Mixed Logit	
		Mean	Standard Dev.
<i>Interactions</i>			
Constants	4.220*** (8.65)	4.300*** (7.45)	
Gender (1= Male)	-0.350*** (-4.94)	-0.554** (-2.39)	
Age	0.0117*** (5.95)	0.0169** (2.57)	
Rent	-0.433*** (-5.68)	-0.670*** (-2.66)	
Income	-0.0315*** (-3.06)	-0.0563* (-1.73)	
Product Quality (Reference: Convenient)			
Premium	0.375***	0.463***	0.435***

	(4.55)	(4.44)	(3.18)
High Grade	0.558***	0.705***	0.490***
	(6.55)	(6.62)	(4.02)
Standard	0.271***	0.346***	0.109
	(3.18)	(3.49)	(0.49)
Original Brand	0.377***	0.426***	0.384***
	(4.71)	(4.35)	(2.84)
Access Options (Reference: Pick-up Station)			
Home Delivery	0.508***	0.513***	0.630***
	(5.03)	(4.06)	(4.03)
Available in store/Supermarket	0.743***	0.969***	0.556***
	(9.65)	(9.82)	(6.13)
Mobile Store	0.271***	0.216**	0.628***
	(3.77)	(2.33)	(6.42)
Shopping Centre	0.485***	0.523***	0.774***
	(6.26)	(5.11)	(7.94)
Regional/Ecological	0.337***	0.360***	0.706***
	(6.83)	(5.09)	(9.54)
Distance	-0.0675***	-0.113***	0.143***
	(-3.26)	(-4.26)	(2.58)
Price Increase	-0.415***	-0.554***	
	(-20.90)	(-20.37)	
Respondents	407	407	
χ^2	685.4	862.5	
Log Likelihood (Null)	-4471.4	-4128.6	
Log Likelihood	-4128.6	-3697.4	

Values in Brackets, * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Chi Square value: $p < 0.01$

A positive sign means that respondents would not buy either of the two products if both products tend to have negative characteristic values. This (non-purchase) effect is weaker for male participants, who are younger, rent their homes and have higher incomes. The dummy coded attribute Product Quality has the phrase Convenient as a reference. The positive signs of the other attributes indicate that convenience products are the least useful. The attribute quality ($\beta=0.558$) offers the highest benefit, followed by Private Label ($\beta=0.377$) and Premium ($\beta=0.375$) and finally Standard ($\beta=0.271$). All standard deviations of the terms other than Standard were significant and similar to the mean, indicating high preference heterogeneity.

The attribute Access Option had the expression Time-independent Packing Station as a reference category. The positive coefficients mean that the other terms give more utility than the reference. Respondents were most likely to shop at a grocery store or supermarket ($\beta=0.743$). Next best options are home delivery ($\beta=0.508$) and mall ($\beta=0.485$), followed by mobile delivery ($\beta=0.271$). A time-independent packing station is the least preferred option. For this attribute, too, the high and significant standard deviations indicate preference heterogeneity, partly to the effect that the sign of the coefficient is reversed for some respondents. The standard deviations are above the mean for the attributes shopping center and mobile supply in particular; Some respondents would prefer a packing station that is not dependent on time to a mobile supply and shopping center. The coefficient of the attribute Regional/Organic is significant and positive. The corresponding standard deviation is also significant and relatively high. Therefore, the majority of respondents prefer to buy those products, but this is not the case for all. The distance also plays a role. Respondents prefer shorter distances, but the significant but rather low standard deviation suggests that distance is not relevant for some respondents.

As expected, the price premium is significant and negative. Therefore, respondents prefer to buy products at a lower price, all things being equal (Bogetić et al., 2016). Overall, the results indicate that high product quality generates the highest benefit and convenience products the lowest benefit. The respondents prefer to shop in grocery stores or supermarkets and most respondents prefer to buy regional or ecological products. To answer our first research question, it makes sense to calculate the WTP values for each attribute. This is the marginal rate of substitution between an attribute and its price. In other words, it is the monetary value for an improvement in a quality that the respondent is willing to pay without being made worse off or better off. We calculate the WTP by dividing the attribute coefficient by the price coefficient. In this DCE, the price is the percentage increase (decrease) of

the current price. Therefore, we interpret the WTP values as percentage values. Table 6 shows the WTP values and confidence intervals for all attributes and characteristics.

The confidence intervals were calculated using the method of Krinsky and Robb (1986, 1991), whose non-parametric approach to calculating the WTP has advantages over the more commonly used delta method (Hole, 2007b). The attributes that seem to have the biggest impact on WTP are access options and product quality. Respondents are willing to pay 13 % more for a high-quality product than for a convenience product. For deli standard and private label products, the additional WTP is between 6 and 8 % compared to a convenience product. In addition, those surveyed are willing to pay almost 18 % more when shopping in a supermarket than when buying at a packing station that is independent of the time. The WTP is about 9 % higher for home deliveries and malls. Those surveyed would pay almost 4 % more for mobile supply. The additional WTP for regional/organic products is 6.5 %. A distance of more than three kilometers results in a negative WTP of 8.2 %, i.e., respondents would pay this premium if they could purchase the product in their immediate vicinity. If one compares a non-regional/organic convenience product that can be bought at a pick-up station more than three kilometers from home with a regional/organic (6.5 %) high-quality product (12.7 %) in a shop or supermarket (17.5 %) in close proximity (8.2 %), the additional WTP is approximately 44.7 %.

A retailer can therefore charge up to 45 % more for products with these characteristics. Price, product quality and easy availability are the strongest drivers for FMCG purchases, what corresponds with several studies such as Bogetić et al. (2016), Mahalingam (2012), Klein, Schmitz (2016) and Pallavi, Shashidhar (2015). The non-buying effect shown in Table 5 indicates that younger, higher-income male renters tend to buy more FMCG. For this specific constellation, we can confirm that some socio-demographic variables determine the overall WTP for FMCG. In addition, high estimates for the coefficient of the attribute Regional/Organic indicate strong influences of this attribute on the WTP. The high importance of regional origin (approx. 67 %) underlines this status. Consumers reported an additional WTP for local and eco-friendly FMCG of 6.5 %. Compared to the WTP for all other attributes except mobile store, this value is relatively low.

Table 6: Willingness to Pay and confidence intervals

	WTP (%)	Confidence Interval	
		lower limit	Upper limit
<i>Product Quality (Reference: Convenient)</i>			
Premium	8.4	4.6	12.1
High Grade	12.7	9.0	16.6
Standard	6.3	2.9	9.6
Original Brand	7.7	4.3	11.3
<i>Access Options (Reference: Pick-up Station)</i>			
Home Delivery	9.3	4.8	14.3
Available in store/Supermarket	17.5	14.2	21.3
Mobile Store	3.9	0.8	7.3
Shopping Centre	9.4	6.0	12.9
Regional/Ecological	6.5	4.2	9.0
Distance (from 0 to over 3km)	-8.2	-12.0	-4.2
Confidence Interval calculated with the Krinsky & Robb Method			

5 Discussion and conclusion

The conditional logit model and the mixed logit model show price awareness. In supermarkets and shopping centers, the preferences for availability are particularly high. Consumers are willing to pay extra for mobile shops, but at a relatively low level. The influences of sociodemographic variables are limited, but income, gender, and housing situation significantly affect FMCG consumption behavior, as shown in Table 4. Furthermore, attitudes towards the importance of regional and environmentally friendly products correspond to additional WTP for regional and environmentally friendly consumer goods, but at a relatively low level. With the start of the COVID-19 pandemic and restrictions in Germany and other countries since March 2020, preferences for the properties examined have changed due to legal restrictions and fear of contagion. The purchase frequency in supermarkets and shops is still relatively high as long as food and beverages are exempt from access restrictions. Additionally, the

direct and indirect macroeconomic impacts of the COVID-19 pandemic have increased the pressure on retailers in FMCG markets to make structural changes.

First, the federal government has put together an extensive financial aid package to avoid mass unemployment and mass bankruptcies due to the restrictions imposed by the COVID-19 pandemic. In order to finance these investments, the government must increase the public debt. Combined with rising energy prices since 2020, this led to a rise in the consumer price index (CPI) of more than 5% in 2022 (inflation.de 2022), compared to less than 0.5% before 2019. Second, global production and supply chains have changed significantly for a variety of reasons, including rising resource prices due to scarcity and political instability in some regions. These changes result in additional costs and price volatility (ET Brand Equity 2022). These impacts at the micro and macro levels, caused directly and indirectly by the COVID-19 pandemic, have not changed the conditions in the FMCG markets but have reduced the opportunities for traders to innovate. Although the survey began ahead of the COVID-19 pandemic, the results show that retailers are able to respond to additional market pressures in the form of fluctuating commodity prices and restricted market access. The intense growth of food and beverage delivery services since 2017, and especially since the COVID-19 pandemic, indicates a major shift in FMCG consumption patterns. As early as June 2020, around 40 % of consumers in Germany had reduced their purchases in stores and shopping centers. Around 22 % used online delivery services and more than 80 % will continue this behavior after the pandemic is over (PWC 2020). Around 88 % are satisfied with online consumption of food and beverages, leading to an increase in online retail market share from 0.8 % in 2015 to 1.4 % in 2020. The forecast for online groceries is around 10% by 2024.

The results of our models, first show a strong preference for higher product quality over a convenient reference and for access options other than a pickup station. Second, the key demographic group of young male participants with higher incomes and higher rents is more likely to purchase FMCG with higher product quality and availability in supermarkets. This supports the results of Bogomolova et al. (2019) who point to the need to target younger and educated consumers. In addition, men with children are a target group for discounters (Mintel 2021). Applying the results of our study to the specific situation of FMCG during the COVID-19 pandemic shows that mobile stores are of comparatively little importance. This makes it difficult to implement the necessary restrictions during pandemics, as many consumers prefer to buy in-store. Furthermore, high price sensitivity (Table 3) combined with a relatively strong preference for proximity to purchase location (Table 4) may be enough to drive growth

rates of online food and beverage delivery services. Obviously the COVID-19 pandemic will be a multiplier for this effect.

Here, too, the price segment of FMCG is decisive. Only in higher price segments does demand have high price elasticity and thus demand falls relatively sharply as a result of a price increase. The FMCG examined in this study are in the lower price segment with low price elasticity of demand (Huang et al. 2017). The inflation rate in Germany has been over 7 % since April 2022, and the consumer price index (CPI) has risen by around 10% since the beginning of the year (Destatis 2022a). Household inflation expectations for the next twelve months point to an inflationary trend. Expected values of just over 8 % (Beckmann, Schmidt 2022) show that private households have high expectations. From an economic point of view, the expectation of rising inflation alone leads to an increasing demand for money with a corresponding inflationary effect. Losses from high inflation have a greater impact on the expected inflation rate than gains from inflationary effects. This applies in particular to consumer durables (Vogel et al. 2009). Inflation effects on FMCG buying behavior have implications for strategic marketing. In the following section, we discuss appropriate combinations of attribute levels with the highest WTP.

5.1 Strategic implications

The results of the choice experiment show several significant effects of the attribute features compared to the fixed reference. This heterogeneity, combined with the socio-economic characteristics of age and rent, reveals strategic potential for FMCG companies to optimize product design and access options. Certain combinations of attribute levels and socioeconomic variables significantly determine the WTP. Together with the results of related studies such as Bogomolova et al. (2019) several strategic implications for FMCG offerings are highlighted here. At 12.7 %, the WTP for the second highest level of the product quality attribute (high quality) is almost twice as high as the WTP for the next level (standard). These results are consistent with Sundstroem and Hjelm-Lidholm (2019). They recommend HR management to identify customer motivations and preferences for product attributes. Macroeconomic conditions, especially inflation, reduce the remaining WTP for additional attributes such as higher quality and regional or organic production. This limited pricing flexibility requires constant study of consumer preferences and expectations to maximize the conversion of WTP to revenue. The additional WTP for organic or regional products is comparatively low at around 6.5 %, but with potential for marketing measures. Growing share of local businesses and products supported by the impact of

the COVID-19 pandemic; 23 % of consumers in Germany have been using local shops since the beginning of 2020 and only 61 % of consumers are satisfied with the labeling of origin on products (Mintel 2021).

In agreement with the results of Angeles-Martinez et al. (2018), FMCG providers should market this attribute in combination with other highly preferred attributes. Some retailers in the FMCG market invest large sums annually, for example in TV advertising. In the group of retailers with the highest annual investments, only a few companies, such as Ferrero and Henkel, increased their investments between 2019 and 2021 (xadspoteffects 2019, 2021). This contrasts with the results of our study, which indicate potential for higher investment. When combining the attributes and levels described in Chapter 4, high-quality FMCG that are regionally or organically produced and available in close proximity add up to almost 45 % additional WTP. Although there is some overlap in economic evaluation when each WTP value is accumulated, this additional sales per unit can be used to fund targeted marketing to increase customer retention, product placement and frequency of purchase. Such financial measures are necessary to take advantage of the limited opportunities to expand the customer base (Bogomolova et al., 2019) and to create customer loyalty that is strongly determined by the attributes of price, perceived quality, trust and brand name. Around 71 % of companies invest 2 % of total sales in investments to increase customer loyalty. Customer attitudes towards brand loyalty have changed. In addition, the impact of the COVID-19 pandemic and the rising CPI increase the need for additional investments in customer and brand loyalty (Oszi 2021). In order to translate the results and findings into coherent measures, the following recommendations can be derived from the findings:

1. Discounters and other retailers should intensify targeted marketing tools to increase brand loyalty and awareness of quality branded and organic food. Despite the increasing share of the respective market segments in Germany in recent years, the results show an additional WTP for these brands.
2. Targeted investments in supermarket locations in urban centers with a high proportion of young, high-income tenants are successful in large cities. In medium-sized cities and rural areas, retailers should take more risks when investing in these target groups outside of large cities. However, the continued rise in CPI and related consumer expectations, discussed here, are worsening the investment climate.

5.2 Limitations

Our study shows a strong heterogeneity between the characteristics of selected FMCG in Germany. However, the results are subject to some limitations. First, although the study examined FMCG in general, the authors cannot rule out heterogeneity within the FMCG group. Therefore, our results show the preference structure for FMCG in general, without distinguishing between FMCG groups such as food, drink, and durable goods. Further research should examine whether preference structures differ between FMCG groups. Second, additional socioeconomic parameters should be included in the choice experiment to test whether characteristics such as household size, living space structure, and diet style determine the WTP for selected attributes of FMCG. Third, the design of the choice experiment used in the study reflects specific buying situations. However, further applications of choice cards should include other attributes such as different labels for organic and regional production and distribution as well as travel costs to the point of sale. Furthermore, the study of consumer behavior in FMCG markets is driven by more than the maximum number of attributes and levels covered by choice experiments.

This limitation requires interdisciplinary approaches to identify psychological and institutional determinants of consumer behavior in FMCG markets. Finally, the model results represent consumer preferences in the study period 2015 and 2016. The results of our study underscore the increased vulnerability of the FMCG markets due to the COVID-19 pandemic and can be broadly compared to more recent studies as presented in Sections 4 and 5.1. However, recent developments in the COVID-19 pandemic are associated with fundamental changes in consumer mobility, market access and the financial strength of retailers. This requires a detailed study of the impact of these new conditions on the structure and persistence of consumer preferences for FMCG.

Subjects

The study meets the ISM rules approved by the German Research Foundation (DFG) to ensure good scientific practice. Before participating in the study, each test person was informed about the anonymous use of the data.

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Author/s

Prof. Dr. Kai Rommel received his doctorate in agricultural economics at the Faculty of Agriculture and Horticulture of the Humboldt University of Berlin. Between 2000 and 2007 he habilitated at the Chair of Economics, in particular Environmental Economics at the Brandenburg University of Technology Cottbus in Economics, Energy Economics and Environmental Economics. He then worked as a strategist for energy economics at Energie Baden-Württemberg AG. Since March 2010 he has been Professor and since 2014 Vice President for Research at the International School of Management in Dortmund. He manages third-party funded projects in the field of municipal finance and regularly publishes in peer-reviewed journals.



Dr. Julian Sagebiel is an environmental and agricultural economist, working as a PostDoc at the German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig. There he works on valuation of natural capital using choice experiments and other revealed and stated preferences methods. From 2009 to 2013, he worked as a research assistant at the Department of Cooperative Science at the Humboldt-Universität zu Berlin. After working at Technische Universität Berlin and IÖW Berlin, he spent 1.5 years at the Department of Economics at the Swedish University of Agricultural Sciences in Uppsala, Sweden.

