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The impact of travel time savings on shopping location choice or how far do people go to shop cheaply?

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1. Abstract

The determinants of store choice have always been a key topic in the marketing and especially retailing literature. It is clear that not only the consumer's perception of directly store related criteria like pricing, quality or market positioning strategy but also the store location itself affects store choice substantially. Different studies demonstrated this in the past but were not focussing on the implied willingness to pay for travel time reductions on the way to the store.

In this work two independent shopping location choice stated preference surveys are brought together to estimate a joint shopping location choice model. One was conducted in 2004, the year of the market entry (2004) of the German discounters Aldi and Lidl in Switzerland, for which customers were interviewed in the tri-national Basle region in three supermarkets, one in Switzerland, Germany and France each. The other survey was conducted in Göttingen, Germany 2006. Both surveys focus on the weekly food shopping trip which is very common in both countries and are composed of two parts: In the first part people were asked about their shopping behaviour in general. In the German case, the stated preference questionnaire was handed and filled out directly in the store. In the Swiss case the respondents filled it out at home and returned by mail.

Overall 2447 (1608 in Göttingen, 839 in the region of Basle) decisions were obtained and are the basis for the estimations. The descriptive analysis of the data shows large differences in the valuation of the different variables trough the respondents, especially concerning distance and price. Therefore the model includes socio-demographic variables in non-linear functions as well as different interaction terms. Focussing on the willingness to pay for travel time reductions, the impact of income, distance and other variables are examined and identified.

As these values diverge strongly between the different study regions and persons a qualitative assessment of the difference leads to the recommendation of possible improvements in modeling using different kinds of market segmentations like latent class models. Furthermore the hypothesis of Louviere *et al.* (2001) of preference homogeneity between countries cannot be confirmed.

2. Introduction and Motivation

In Switzerland 16.5% (Mikrozensus, 2005) of all trips have the purpose shopping and represent therefore, as in other countries, a substantial share of the volume of traffic. Transport planning has always been interested in identifying and understanding the variables which determine shopping travel behaviour. Thus, the Swiss study of value of travel time savings (VTTS), conducted by König, Axhausen und Abay (2004), analysed shopping location choice data and reported unexpectedly high values for those from early experimental stated preference (SP) experiments, which were finally not included in the main study. Therefore, a study focusing only shopping travel was conducted which represent one part of data analysed in this paper.

In 2006, a methodically comparable survey was conducted in Göttingen (Germany). This shopping location choice survey offered the opportunity to check the unexpected Swiss results and to account for possible differences and test the conclusion of Severin *et al.* (2001) who hypothesized stability of retail shopping choice over time and across countries.

However, in qualitative interviews which were conducted during the Swiss survey, supermarket managers who know the retail market practice in both countries point out that different valuation of consumer goods as well as distance seem to be likely and could possibly provide an explanation for the obvious differences between the retail industries in both countries:

In Switzerland, the two largest retailers Migros and Coop, both with high quality standards, dominate the market with shares of 37% and 36% (ACNielsen, 2007) respectively. Although the German discounter Aldi has entered the Swiss market in 2005 the discounters still play a subordinate role. In Germany, in contrast, discounters have substantial market shares. Due to the restrictive information policy of the German discounters Aldi and Lidl, the precise market share of the discounters is not known. However, according to the estimates of TradeDimensions for Lebensmittelzeitung (2007) the market share for the two discounters is 22%, which shows a more pronounced price awareness in the German food market.

3. Literature Review

This Section is subdivided in three parts. Firstly, the retail literature is reviewed with a focus on variables which influence the shopping choice. The second part discusses examples of previous studies which searched for consistency of retailing shopping choices over time and across countries. The third part briefly reviews the concept of random utility theory for the estimation of joint models from different datasets.

Early shopping location choice models are based Huff's (1964) aggregate level analysis including distance to stores and size of stores as independent variables. In the following Huff's approach was generalised to models that use survey data and take further variables into account. Bell *et al.* (1998) separate households first between large and small basket shoppers and found that large basket shoppers are more price sensitive. Moreover, distance to the store, the previous experience in the store and advertised specials are equally important for both groups. Sinha (2000) concludes from his revealed preference data that the accessibility and the perception of the price/performance ratio are the main influences in shopping location choice. Knox *et al*. (2000) showed the strong influence of loyalty in the retail sector. With a neuronal network approach Davies *et al*. (2001) segmented the consumers into three groups and found that they perceive the importance of several store attributes differently.

Arnold *et al*. (1980) were the first to compare retail choices over time and space. They found stable choice parameters in four quarterly sets of Toronto supermarket choice data, while the parameters were neither equal over time, across US cities nor different countries. Severin *et al.* (2001) argued that the observed variation over data sets might have been due to scale parameter differences. They were able to corroborate the hypotheses that consumer preferences change slowly over time and modern consumers make retail tradeoffs and choices in similar ways. However, differences in choice model parameters for different countries were observed, but could have been associated with differences in random component variances in different datasets.

The Random Utility Theory postulates that consumers have observable and unobservable preferences or utilities for retailing options like stores or shopping centers:

The total utility U_{ij} is then:

$$U_{ij} = V_{ij} + e_{ij} \tag{1}$$

where U_{ij} is the utility of the alternative j for consumer i, with V_{ij} as the explainable component of utility and e_{ij} as the random component. The assumption that the errors are independent and identically distributed Gumbel random variates, leads to the well-known and widely used MNL choice model. If V_{ij} can be expressed as an additive indirect utility function

(V_{ij} = ΣX_{ij} b_j), the probability that consumer *i* will choose alternative *j* is given by the following MNL expression for the choice probabilities:

$$P_{ij} = \frac{\exp(\mu X_{ij} \beta_k)}{\sum_k \exp(\mu X_{ik} \beta_k)} \tag{2}$$

where X_{ij} is a vector of individual and alternative characteristics, b_j is a vector of parameters and μ is a scale (or location) parameter that is inversely proportional to the error variance. Thus, μ plays a key role in comparing sources of choice data and testing parameter invariance, as shown in Ben-Akiva *et al.* (1990) and Swait *et al.* (1993).

In particular, in a single source of data the scale parameter μ cannot be identified and is arbitrarily assumed to be one. Equation 2 reveals that this assumption does not affect the utility orders in individual data sources; still, the values of scale parameters may differ significantly between data sets. This matters because μ is inversely related to the random component variance ($\mu^2 = 6\pi^2/\sigma^2$). Thus, different scale parameters imply different data source variability, and while μ cannot be identified in a single data source, ratios of μ's (or variance-scale ratios) can be estimated relative to an arbitrary reference source. In turn, this implies that comparisons of MNL model parameters from different sources of preference and choice data (e.g., different times and places) must take into account potential differences in variances of error components.

4. Survey data

4.1 Swiss Survey

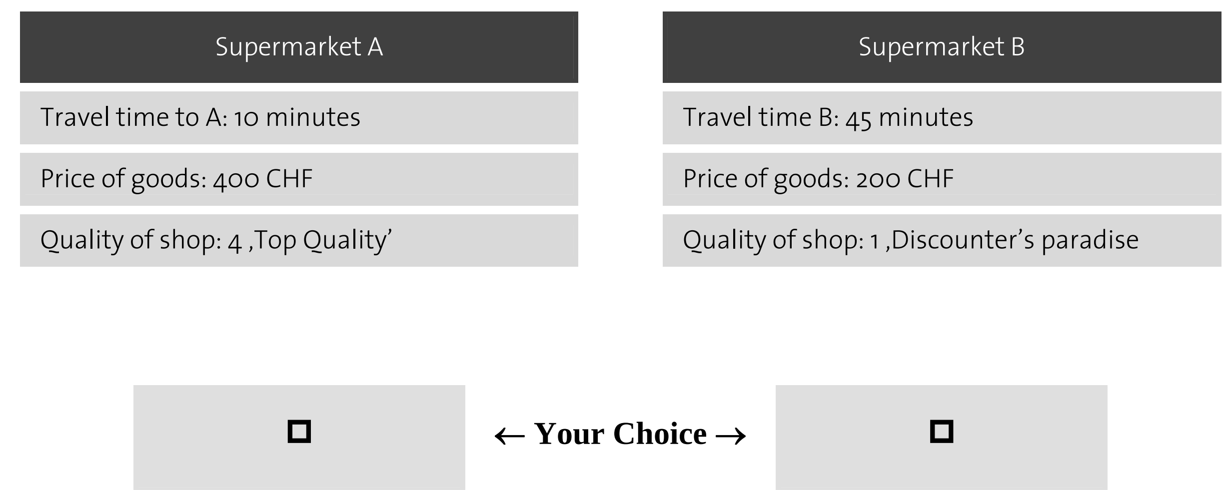
4.1.1 Survey Area

The survey was conducted at supermarkets in the tri-national region of Basle, one in each country. To obtain a contrasting sample, locations with different clientele and price level were chosen; however the supermarkets had to provide the wide range of products which satisfies the demand of typical weekly shopping tour. On two Saturdays 386 Swiss costumers of M-Park Dreispitz (CH) (Migros), Marktkauf Weil am Rhein (Germany) and Géant St. Louis (France) were interviewed when they were queuing for the cash desk. Since answering stated preference scenarios needs some time and concentration the interviewee received a prepaid envelope with a more detailed questionnaire containing the stated preference experiments. 110 persons returned complete questionnaires generating 839 stated preference cases.

4.1.2 Survey design

The SP-scenarios were defined by the variables travel time, price of goods and quality of supermarket in four grades (Figure 1), which in the literature were regularly significant for shopping destination choices

Figure 1 Design of the stated-choice experiments



The experimental design aims to create situations whose attribute values are not or only marginally correlated and which are on the other hand intuitive and realistic for the respondent. Table 1 presents the range of values employed. The implied travel time-cost trade-offs range from -270 CHF/h to 400 CHF/h.

Table 1 Experimental Design, Swiss Survey

	Variable	Values
Supermarket A	Travel time	5, 10, 15, 20 [min]
	Quality	'Top Quality' (4) [Globus, Jelmoli] ,Good Range – Good quality'(3) [Migors Coop, Géant]
	Price	60, 130, 200, 300, 400 [CHF]
Supermarket B	Travel time	for revealed TT< 15 minutes: 10, 20 [min] for revealed TT 15 < x <30 Minuten: 20,30,40 [min] (Zone 2) for revealed TT >30 Minuten30, 45 [Min] (Zone 3)
	Quality	,Discounter's Paradise' (1) [Denner, Aldi, Lidl] ,Wide range - small prices' (2) [Marktkauf, Kaufland] ,Good Range - Good quality'(3) [Migros, Coop, Géant]
	Price (factor)	for Quality 1 0,5/0,66 for Quality 2 or 3: 0,66/0,8/0,9

To uncouple the quality variable from a specific supermarket chain, it was pre-coded with four generic categories. To make it not too complicated for the respondents each quality category itself was described by mentioning comparable well-known supermarkets. Besides this the interviewees had to indicate relevant socio-demographic information such as sex, household size and income and personal assessments of quality factors of shopping location choice like friendliness of staff or range of local products.

4.2 German Survey

The German dataset consists of interviews that were carried out among 405 respondents in the city of Göttingen in May 2006. Göttingen is a mid-sized city of 130,000 inhabitants with a large proportion of university students (24,500 students).The interviews were carried out by graduate students during a course on retail marketing. The sample points were located across the city. However, 8.1 % of the interviews were held on university premises. As the following table indicates, there is a bias in the age proportion resulting from the sample points in the dataset, over representing the share of university students.

From a choice analysis perspective the interviews consisted of two parts:

4.2.1 Revealed Preferences

The respondents were asked for their preferred shopping destination for groceries in Göttingen, generating a set of revealed choice outcomes. In addition to their preferred shopping destination respondents were also asked for their home address, allowing for an estimate of individual one way travel distances to each alternative. The revealed choice data was then enriched with information on actual retail floor space of each alternative. However, for the analysis in this paper, only the information on the preferred supermarket is used.

4.2.2 Stated Preferences

Additionally, each respondent answered four choice experiments generating about 1600 stated choice cases. The profiles of the choice experiments consisted of 5 labelled alternatives that represented the most important grocery retail chains in Göttingen: Real, Kaufland and Herkules are large grocery retail chains with varying emphases on non-food categories. Their retail floor space is fairly large by German standards. Aldi and Lidl are discount retail chains that are characterized by relatively small retail spaces (about one third of Real, Kaufland and Herkules), less choice variety, basic store designs and less branded, but fast moving consumer goods (FMCG). In fact, Aldi does not distribute any branded FMCG. Aldi and Lidl are known for their aggressive pricing. Kaufland and Herkules are economically fairly successful, whereas Real is struggling with serious image problems that result from a spoilt meat scandal.

The stated choice experiment used six independent variables, four of which where quantitative variables and two were categorical variables. The variables reflect the three most important marketing instruments in retailing: Price, location and product assortment are expected to be the most influential factors for the customers' choice of their preferred shopping destination for groceries. The respondents were asked for their preferred destination for their weekly grocery purchase depending on the variables of the five alternatives described in the experiment.

Table 2 Experimental Design, German Survey

Price in EUR	Choice variety	Travel time (min.)	Time spent in store (min.)	Number of items per category	Freshness
60 €	Very large	5	20	2	Above average
55 €	Large	10	25	3	Below average
45 €	Limited	15	35	5	
40€	Very limited	20	40	8	

From these variables 25 orthogonal choice profiles were generated. No restrictions were placed on the profiles. I.e. for instance price aggressive firms were allowed to be the most expensive alternative in a profile.

5. MNL Analysis and Results

In this section the results of the estimations are presented. First, the two dataset are modelled and analysed separately. In a second step, a joint estimation allowing different scale parameters for each dataset accounts for preference homogeneity which is tested by the likelihood ratio test proposed by Swait and Louviere (1993).

5.1.1 Separate datasets

Swiss Survey

During the stepwise modelling of the data, different formulations were tested. Whenever the inclusion of an additional variable in terms of significance was successful, it remained for the further process. The best model contains several interaction terms for the perception of price, as well as the valuation of the supermarket quality, which was simplified by joining the levels 1 and 2 to below, and 3 and for 4 to upper average:

$U_i =$

β_p * (Income./Average Income)$^{\varepsilon Inc}$ * (Distance/Average Distance)$^{\varepsilon Dist}$ * (1 + $\beta_{ND;Price}$* D_{ND}) * Price

+ β_{TT} * Travel Time

+ β_Q * Dummy ‘better Quality’ [3]

+ β_{ASC} * Constant

The dummy variable D_{ND} identifies respondents who stated that their preferred shop is a conventional supermarket and not a discounter. The highly significant value of the corresponding parameter of -0.57 indicates a more than 50% lower perception of costs for conventional supermarket shoppers. The formulation of the elasticity of the cost and the travel time parameters was adapted from the study by Mackie *et al.* (2005), which analysed a number of UK value of time studies and showed that the cost parameter depends on the trip distance and the income of the respondent. With this formulation it can be shown that the valuation of cost decreases for persons with an income above average and vice versa. According to the value of $\varepsilon_{Inc,}$ persons with a 50% higher income than average value cost 25% less. If the travel time has additional influence on the perception of cost cannot be stated with enough statistical significance. However, a small tendency toward a stronger perception for smaller distances seems reasonable.

Table 3 Model results Swiss stated preference survey

Model charactristics	N	839			
	L (0)	-581.55			
	L (β)	-492.67			
	Adjusted ρ^2	0.14			
Parameter		Unit	Coeff.	t-Test	Sign
	Travel time	Min	-0.024	4.73	y
	Price of goods	CHF	-0.023	6.42	y
	Upper average Quality	-	1.48	3.78	y
	Constant	-	-1.28	-3.50	y
	ε_{Inc}	-	-0.42	2.50	y
	ε_{Dist}	-	-0.078	1.55	n
	Dummy for Non-Discount Preference	-	-0.57	7.80	y
	VTTS for other Costumer	CHF	149.51		
	VTTS for Discount Costumer	CHF	64.27		
	Elasticity Price Discount Shopper	CHF	-1.86		
	Elasticity Price others	CHF	-0.80		
	Elasticity Travel Time	CHF	-0.43		

The value of travel time savings differs strongly between the two costumer segments and is only caused by the different perception of prices. In contrast, travel time seems to be valued in the same way: An estimate with relevant interactons terms showed no significant differences.

German Survey

The German survey incorporates more variables: Additional to the Swiss survey, variables describing the range of non-food articles, the range of product per category and the time needed to fill the basket define the situation. In addition, the respondent had to decide not only between two but five alternatives. A minor difference occurs in the definition of the quality: Whereas in the Swiss survey quality is defined as overall store quality, here the fresh produce is the focus..

Additionally, the utility function includes inertia variables for the preferred retail chain whose values indicate a certain costumer loyalty. In the socio-demographic part of the survey the respondents were asked which store they normally prefer for their weekly shopping trip.

$$
\begin{aligned}
U_i = \;& \beta_p \; * (1 + \beta_{D,Price} * D_D) * \text{Price} + \\
& \beta_{TT} \; * (1 + \beta_{D,TT} * D_D) * \text{Travel Time} + \\
& \beta_R \; * \text{Range} + \beta_{ST} \; * \text{Shopping Time} + \\
& \beta_Q * \text{Dummy 'better Quality'} + \\
& \beta_{NF} * \text{'Non-Food-Choice'} \\
& \beta_{IN,i} * \text{Dummy}_{,i} \text{ 'Inertia preferred shop'} \\
& \beta_{ASC,i} * \text{Constant}_{,i}
\end{aligned} \qquad [4]
$$

In difference to the Swiss data set no interaction between the perceptions of price and income or travel time is apparent. The relevant terms are not significant and are therefore excluded. One possible reason for the insignificance of the income interaction might be the small variability of income in the sample. The consumer segmentation into two groups, in contrast, works well here too. Interacted with the valuation of travel time and price of the basket, both segmentation parameters are highly significant and show substantial differences between the groups: Costumers, who in real life prefer to shop at discount stores, value travel time more than 60% less and prices more than 40% more than others. Interestingly, the time one has to spend in a shop collecting items and queuing for the cash desk is valued around half as much as the time in traffic.

The product range is effect coded. Therefore, the parameters account for differences to the mean of the sample. Contra-intuitively the offer of non food items is not valued much; alternatives with the attribute “very limited” are even preferred. However, interpreting this finding one should keep in mind that we defined the situation as a typical weekly grocery shopping trip which does not necessarily include non food items.

A wide range of products within the food segment in contrast is appreciated. According to the linear formulation of the variable the extension of choice by one product for a given segment is valued at two minutes of travel to the supermarket. Another important determinant is the offer of high quality fresh produce which is modelled as a binary dummy variable. The comparison of the value of 0.58 with other parameters leads to the conclusion that the availability of high class fresh products is rated as very important. The logistics efforts retailers and even discounters take upon themselves to offer fresh products of high quality confirms this.

The analysis of the consumer loyalty reveal interesting finding. While the variables for Aldi, Lidl and Herkules have all positive and significant parameters, Kaufland and Real costumers seem to be less constrained in their store choice. From observation it is known that at least Real has a brand definition problem whose impact can be shown here.

The dummy coded alternative specific constants account for all additional alternative specific utility that cannot be allocated to other variables. However, except for Lidl, no chain seems to influence the decision in a statistically significant way. In comparison to 'Real', the fact that an alternative is branded as 'Lidl' leads to a slightly smaller value of the utility.

Table 4 Model results German stated preference survey

Model charactristics	N		1608		
	L (0)		-2587.98		
	L (β)		-2212.76		
	Adjusted ρ^2		0.14		
Parameter		Unit	Coeff.	t-Test	Sign
	Travel time	Min	-0.042	6.86	y
	Price of goods	CHF	-0.057	12.3	y
	Dummy for Discount Preference, TT	-	-0.66	2.06	y
	Dummy for Discount Preference, Price	-	0.44	2.08	y
	Choice	-	0.08	6.68	y
	Upper average Quality of fresh goods	-	0.58	15.89	y
	Time in shop	Min	0.02	5.28	y
	Non Food offer "very limited"	-	0.16	3.45	y
	Non Food "limited"	-	0.03	0.56	n
	Non Food "wide"		-0.17	2.72	y
	Non Food "very wide"		0.02	n.c.	-
	ASC Aldi	-	0.11	1.30	n
	ASC Herkules	-	-0.04	-0.41	n
	ASC Kaufland	-	0.06	0.67	n
	ASC Lidl	-	-0.26	-2.82	y
	ASC Real	-	0.00		fixed
	Inertia Aldi		0.82	4.47	y
	Inertia Herkules		1.56	7.90	y
	Inertia Kaufland		0.21	0.81	n
	Inertia Lidl		0.85	3.37	y
	Inertia Real		-0.41	-1.14	n
	VTTS for Discount Costumer	CHF	16.17		
	VTTS for others	CHF	69.38		
	Elasticity Price Discount Shopper	CHF	-3.43		
	Elasticity Price others	CHF	-2.38		
	Elasticity Travel Time Discount Shopper	CHF	-0.14		
	Elasticity Travel Time	CHF	-0.42		

5.1.2 Joint estimation

The common variables of the two SP-surveys are price, travel time and, since the quality levels in the Swiss dataset were aggregated to only two levels, quality. Therefore, we restricted in a first attempt the parameters of those three variables to be the identical, but allowed different scale parameters for each dataset. The comparison of the separately estimated parameters provides a first indication of preference homogeneity over the two datasets. However, due to possibly different scale parameters from different choice models, a direct comparison of parameters is inappropriate. Nevertheless, the characteristic of the scale parameter as a constant multiplier of the utility function implies that the ratio of parameters within a dataset is unaffected by different scales. The value of travel time saving (VTTS) is directly calculated by such a ratio. Therefore preference homogeneity can be tested by comparing these values. Through the rearrangement of the scale formulation a latter characteristic can be worked out: the ratio of the parameters of the separate models which are forced to be identical in the joint estimation should be the same for all pairs.

As a first test if the preference homogeneity condition is satisfied, the comparison of the VTTS in both datasets may give a first indication. We see that the value for Swiss discount costumers (64.27 CHF/h) is in the same range as the value for discount averse costumers in Germany (69.38 CHF/h) and conclude that in a joint estimation the common parameters for travel time and price must describe the valuation for Swiss discount costumers and German non discount costumers. By combining the two utility functions given in Table 3 and 4 this requirement is fulfilled straightforwardly.

Comparing the ratio of third mutual variable "Quality" with price or travel time leads to the assumption that quality is not homogenously rated in both datasets: Analysing the ratio of the parameter values of travel time and price in the separate models one expects a larger scale parameter for the German dataset. But since the quality parameter for the German dataset is much smaller, the preference homogeneity for this variable may not be assumed further on. In this context it has to mentioned, that the definition of 'quality' differs in both survey which is a possible reason for this difference.

The model performance of the joint estimation can be compared with that of the separate models with a χ^2-test (Swait *et al.* 1993). The degree of freedom equals the sum of mutual parameters, in this case two. The critical value for the α=0.05 significance level is 5.99. The associated value for the joint estimation is $-2\ [(L^{SS} + L^{GS}) - L^{joint}\ ]=7.96$ and is significant at the α=0.01 level. Therefore, it must be assumed that between the groups Swiss discount costumers and German 'normal' costumer a certain preference inequality is present. Considering that we allowed costumer segmentation the hypothesis of stability in retail shopping choices across countries, stated by Severin *et al.* (2001), must be rejected at least for the case for Switzerland and Germany.

Table 5 Model results joint model

		Swiss survey		German survey	
Model charactristics	N	2447			
	L (0)	-2587.98			
	L (β)	-2212.76			
	Adjusted ρ^2	0.14			
Parameter		Swiss survey		German survey	
		Coeff.	t-Test	Coeff.	t-Test
	Travel time	-0.025	7.10	-0.025	7.10
	Price of goods	-0.034	7.75	-0.034	7.75
	Upper average Quality	1.47	3.82	-	-
	Constant	-1.29	3.51	-	-
	ε_{Inc}	-0.42	2.5	-	-
	ε_{Dist}	0.07	1.62	-	-
	Dummy for Non-Discount Preference	-0.57	7.61	-	-
	Dummy for Discount Preference, TT	-	-	-0.66	2.02
	Dummy for Discount Preference, Price	-	-	0.44	2.08
	Choice	-	-	0.05	4.97
	Upper average Quality of fresh goods	-	-	0.35	6.52
	Time in shop	-	-	-0.01	4.40
	Non Food offer “very limited”	-	-	0.10	3.21
	Non Food “limited”	-	-	0.02	0.55
	Non Food “wide”	-	-	-0.1	2.6
	Non Food “very wide”	-	-	-0.02	-
	ASC Aldi	-	-	0.067	1.28
	ASC Herkules	-	-	-0.02	0.41
	ASC Kaufland	-	-	0.035	0.67
	ASC Lidl	-	-	-0.155	2.64
	ASC Real	-	-	0	-
	Inertia Aldi			0.489	3.72
	Inertia Herkules			0.926	5.27
	Inertia Kaufland			0.126	0.80
	Inertia Lidl			0.507	3.02
	Inertia Real			-0.243	-1.12
	VTTS for Discount Costumer		68.38		16.14
	VTTS for others		157.88		68.38
	Elasticity Price Discount Shopper		-1.81		-3.39
	Elasticity Price others		-0.79		-2.36
	Elasticity Travel Time Discount Shopper		-		-0.14
	Elasticity Travel Time		-0.43		-0.41
	Scale Parameter		(fixed) 1.00		1.67

The analysis of the different elasticises leads to the assumption that the inequality in preference may be due to the perception of price than travel time: Whereas the response on changes of travel times in both datasets have the same magnitude, changes in prices result in different choice shifts. One possible explanation for this may be seen in the different income levels in the two datasets.

However, an income interaction with the perception prices will account for such effects. Unfortunately, the income distribution in the German data set is unsatisfactory to provide statistical evidence for such an assumption. Since the Swiss estimation includes significantly such a formulation the according value for the average income of the dataset can be calculated anyhow. With a value of 2455 CHF for the average income 2455 CHF the income elasticity term becomes $(2455/8586)^{-0.42}$=1.69. This means that Swiss costumers with such an income have a VTTS of 88.5 CHF/h for 'conventional' costumers and 33.1 CHF/h for 'discount' costumers. Comparing these values with the outcome of the estimation of the German dataset alone of 69.38 CHF/hour and 16.17 CHF/hour respectively, the hypothesis of preference homogeneity still seems to be insecure. But even in case of equality of these values, it must be remembered that the presence of equal income elasticity for German costumers is only speculation and has to be demonstrated first. Consequently the hypothesis of preference inequality may not be answered definitely, but the present evidence leaves us as rather doubting than being assured.

6. Conclusion and suggestions for further research

The successful joint estimation was only attempted by combining the appropriate consumer segments, namely Swiss discount with German non-discount costumers. Without such segmentation the joint estimation would have lead to a significant drop of model fit and therefore been inappropriate. Even if income elasticity is taken into account for German similar to Swiss costumers, the findings by Severin *et al.* (2001) of stability of retail shopping choice can not unrestrictedly maintained, at least across countries. To give a more confident conclusion on this, a German dataset with a more balanced income distribution would be desirable.

Hence, the adoption of shopping location choice models from different countries may lead to bias in the significance of the model. The intrinsic problem is to know in advance whether the assumption of taste homogeneity is appropriate or not, without conducting an additional survey. Accordingly, qualitative tests, for example by using the Delphi method, might be able to give indications about possible behavioural heterogeneity between different market areas. In the present case qualitative interviews with supermarket executives clearly let us suspect that Swiss and German shoppers value shopping choice related variables differently.

Furthermore it could be shown the presence of consumers segments which rate shopping related variables heterogeneously. This has a strong implication for the decision process. Especially in this field further research would be desirable: The usage of latent class models might provide further incidence for behavioural differences between user segment, but request also considerable more data.

7. Literature

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