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Measuring changes in preferences and perception due to the entry of a new brand with choice data

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Measuring changes in preferences and perception due to the entry of a new brand with choice data¹

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Abstract:

Context effects can have a major influence on brand choice behavior after the introduction of a new product. Based on behavioral literature, several hypotheses about the effects of a new brand on perception, preferences and choice behavior can be derived, but studies with real choice data are still lacking. We employ an internal market structure analysis to measure context effects caused by a new product in scanner panel data, and to discriminate between alternative theoretical explanations. An empirical investigation reveals strong support for categorization effects and changes in perception, which affect customers in two out of five segments.

Keywords:

context effects, categorization, brand choice models, new brand introduction

JEL-Codes:

M31, C23, C51

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1. Introduction

Besides their theoretical value for understanding individual decision-making and choice behavior, context effects have important practical relevance for both predicting consumer brand choice, and designing and positioning new products. In a brand choice situation, context effects refer to the changes in the choice process and its outcome as a function of the particular brands that are included in the choice set (Chakravarti & Lynch, 1983).

Van Heerde et al. (2004) observe increasing price and cross-price elasticities due to the appearance of an innovative new brand. They explain their findings by perceptual changes driven by range-effects or categorization but offer no proof for this conjecture. Perceptual changes are one of several context effects that have been shown to be related to the introduction of new alternatives. Starting with work of Huber et al. (1982), context effects have been extensively studied in experimental research. Recent research seeks explanations that can be integrated into the value maximization framework. On the one hand, the literature on context effects provides a broad theoretical foundation for market entry effects, which allows us to derive specific hypotheses about how the entry of a new brand affects choice, given the entry position and assumptions with regard to the mechanism that operates on individual decision-making. On the other hand, empirical studies using real choice data to validate experimental findings are still lacking. Until now, not much attention was paid to these effects in studies of changes in market structure due to new brand entries. Rather, they were disregarded in individual brand choice models, in dynamic models of market structure and in most positioning models, despite the fact that they may play a role in explaining observable changes in a market after a new product entry.

We argue that context effects can be observed and measured in real choice behavior. Our study focuses on measuring context effects and revealing their mechanisms in scanner panel data. We propose a framework in which alternative hypotheses about entry effects on individual brand choice behavior can be statistically tested. This framework allows us to discriminate between alternative mechanisms behind context effects, for example changes in perception and preferences. Context effects are a major source of changes in market structure, even if the new product is not innovative, i.e., very similar to existing brands. While other studies majorly focus on really innovative and distinctive new products, this study

investigates the entry of a new brand with only minor changes in the product concept in a fast moving consumer goods category.

Our study demonstrates the external validity of context effects in real choice behavior and overcomes several limitations of experimental research on context effects. A severe shortcoming of all previous experimental studies is their disregard of heterogeneity, which might exist for underlying preferences, as well as for the individual response to an entry. Previous studies have generally been restricted to only two existing brands and a third new brand, and have been designed in a between-subjects mode, which does not allow for determination of what happens to the choice process of a given individual (Steward, 1989). Thus, it has been impossible for the true operating mechanism to be identified. Empirical studies with scanner panel data using the information of more complex market situations, such as ours, have the potential to clarify this issue.

2. Context effects and new product entry

Extensive experimental evidence from context effect research indicates that even a similar new alternative can induce significant changes in brand choice behavior. The availability of a new brand alters the decision context of a consumer and thus influences his decision. Changes in the set of alternatives can induce shifts in choice-probabilities, like the attraction effect (Huber et al., 1982; Huber & Puto, 1983), the similarity effect (Tversky, 1972), and the compromise effect (Simonson, 1989). Numerous theoretical explanations (e.g., Simonson & Tversky, 1992) and different conceptual modeling approaches incorporating context effects into the value maximization framework have been proposed. Recent studies that consider the mechanisms driving context effects reveal an interface for implementing an empirical analysis based on individual level choice data.

The contingent weight model by Tversky and Simonson (1993) and the weight-change model by Wedell (1991) attribute shifts in preferences to *changes in attribute important weights*. Possible reasons for changes in weights are range-frequency-effects, shifts in attention or salience of attributes (e.g. Huber et al. 1982; Wedell, 1991) or a dynamic choice reconstruction to yield subjective dominance between options (Ariely & Wallsten, 1995). Several researchers identified preference weight changes as the cause for context effects (e.g. Ariely & Wallsten, 1995; Huber et al., 1982; Pan & Lehmann, 1993; Simonson & Tversky,

1992; Wernerfelt, 1995). In contrast, recent studies suggest that *changes in the cognitive representation of stimuli* are the reason for context effects (Dhar & Glazer, 1996; Wedell, 1991; Wedell & Pettibone, 1996). These studies attribute preference shifts to changes in the perception of similarity between choice options represented on underlying perceptual dimensions. They demonstrate the interdependence between violations of preference invariance and violations of perceptual invariance. Due to asymmetric shifts in the perceptual space, certain brands become more desirable. Perceptual distortions can be induced by range-frequency effects (Parducci, 1974), categorization (Pan & Lehmann, 1993), density effects (Krumhansl 1978) and assimilation or contrast effects (Sherif, 1963; Sherif & Hovland, 1961). As opposed to the weight change account, which does not postulate a precise causality between a specific entry position and the direction of change, the value-shift account based on the aforementioned perceptual theories allows precise predictions of perceptual distortions and their implications for preferences and choice. Attempts to discriminate between both mechanisms with experiments yield controversial findings (e.g. Wedell & Pettibone, 1996; Dhar & Glazer, 1996).

3. Method

We apply a brand choice modeling approach to market structure analysis (Chintagunta, 1994, 1999) in order to measure structural changes in preferences with scanner panel data. Our model builds on the mixed logit model (Kamakura & Russell, 1989) and the choice-map approach of Elrod (1988). With test market scanner panel data, and by means of parameter restrictions, a combined pre- and post-entry model can be applied to test hypotheses about contextual changes in preference structures. Two goals are central to this approach: to model preference structures with individual-level scanner panel data taking into account heterogeneity, and to extract a perceptual space which represents both the perceived substitutability and the preferences. A multi-dimensional linear preference structure is recovered from observed brand switching behavior. In this framework, alternative hypotheses regarding changes in preference structure and perceived product positions can be statistically tested using model restrictions.

Following Chintagunta (1994), the preference structure is extracted from the brand intercept β_{0ij} in the random utility of the multinomial logit model. The brand intercept β_{0ij} in household i 's utility $U_{ij} = \beta_{0i} + \beta_i' X_{ijt} + \varepsilon_{ij}$ for brand j on occasion t can be interpreted as the

intrinsic preference an individual assigns to an alternative (Kamakura & Russell, 1992). It is assumed to be relatively stable over time and purchase occasions. Changes in choice probabilities are accounted for by response on situational factors X_{ijt} , for example marketing mix. To account for unobservable heterogeneity in preferences and response, $\theta_i = \{\beta_{0i}, \beta_i\}$ is assumed to be drawn from a discrete distribution with a finite number of supports S and associated probabilities $\rho(\theta_s)$. The brand preferences β_{0i} are decomposed into the positions of all alternatives in a m -dimensional perceptual space of product attributes A and household-specific important weights W_i by $\beta_{0i} = AW_i$. The weights are allowed to differ across segments, whereas product positions are assumed to be common for all individuals. Assuming a type I extreme value distribution for the random term ε_{ij} the conditional choice probability for consumer i in segment s of choosing brand j is

$$P_{ijt} = \exp(a_j w_s + \beta_s' X_{ijt}) / \sum_{l=1}^J \exp(a_l w_s + \beta_s' X_{ilt}). \quad (3)$$

The unconditional probability is a weighted average of the logit evaluated at different parameter values (Kamakura & Russell, 1989). The introduction of a new brand can alter the preference structure $\beta_{0i} = AW_i$ and thus choice probabilities. Assuming that individual choices are independent across all purchase incidents, and that preferences are stable before and after the brand entry, two periods $\tau=1,2$ with different choice sets ($J_{\tau=1}$ is a subset of $J_{\tau=2}$) can be identified. The likelihood function of household i can be specified as

$$l(y_i) = \sum_{s=1}^S \left[\prod_{t=1}^{T_{\tau=1}} \left\{ \prod_{j=1}^{J_{\tau=1}} P_{\tau=1,ijt}^{\delta_{ijt}} \right\} \times \prod_{t=1}^{T_{\tau=2}} \left\{ \prod_{j=1}^{J_{\tau=2}} P_{\tau=2,ijt}^{\delta_{ijt}} \right\} \right] \rho(\theta_s). \quad (4)$$

It is assumed that segment sizes $\rho(\theta_s)$ do not change. Parameters are simultaneously estimated with standard maximum-likelihood methods across both periods. Starting with the most restrictive specification, *brand preferences do not change*, brand entry effects can be modeled by reducing parameter restrictions on the preference structure for both periods. Model restrictions can apply either to segment specific preference weights or to brand positions in the perceptual space. Effects are uniquely represented by their specific combination of entry-position, change of preferences or positions and change of choice shares.

The model accounts for the non-stationary nature of marketing-mix variables. The finite mixture specification of heterogeneity allows us to examine context effects on a segment

basis and overcome the restrictive IIA assumption, at least at the aggregate level (Kamakura & Russell, 1989). Given specific preferences, not every customer has to exhibit context effects. The finite mixture logit model with market structure allows the new brand to draw market shares non-proportionally from the existing brands (McFadden & Train, 2000). The interaction of product attributes with random segment preference weights induces correlations amongst the utilities of alternatives, which explicitly reflect substitution patterns and their proximity in the product space (Brownstone & Train, 1999). Although some restrictions must be imposed to ensure identification of the linear preference model, and to fix the invariance in the scale of weights and perceptual dimensions, context effects based on value-shifts of weights changes can be represented.

Two recent modeling approaches to incorporate context effects into the random utility framework are given by Kivetz et al. (2004) and Haaijer et al. (1998). Kivetz et al. (2004) primarily correct for compromise effects in the estimation of part-worth in conjoint experiments by choice set dependent transformations in the utility function. In contrast to their approach, our method is more flexible since it is not restricted to a specific type of context effect. Haaijer et al. (1998) account for random variation in weights or part worth in a choice-based conjoint analysis by means of a random coefficient specification. This allows them to assess the amount of context-dependent variation in utilities, while our approach explicitly identifies distinct effects and their direction.

4. Empirical study

The analysis is based on 104 weeks of US IRI scanner panel data from the ice cream product category. Context effects in this category have already been subject to an experimental investigation by Simonson (1990). We selected only individual panelists to ensure closeness to the psychological phenomena we intend to measure. Including only the most important brands, this gave rise to a sample size of $N=2337$ for the two-period dataset. The market is divided in a high price, high quality premium segment (2, 6, 9 and entry) and a non-premium segment (3, 4, 5, 7 and 8) of brands. Inspection of market shares in the pre- and post entry period (39 and 65 weeks) indicates an increase in share for brand 2 and 6 while brand 9 loses after the introduction of the new brand 1, which is a new product line of low-fat frozen yogurt ice by Ben & Jerry's. Average regular prices remain quite unchanged (Table 1).

Table 1
Choice Shares and Marketing Mix in Pre- and Post-entry Period

Brand	Choice Share			Mean Price		Feature (Frequency)		Display (Frequency)		Price Cut (Frequency)	
	$\tau=1$	$\tau=2$	Δ	$\tau=1$	$\tau=2$	$\tau=1$	$\tau=2$	$\tau=1$	$\tau=2$	$\tau=1$	$\tau=2$
	1 BEN & JERRYS BFY		2.27	+ 2.27	.	2.74	.	0.04	.	0.03	.
2 BEN & JERRYS	2.86	4.34	+ 1.48	2.73	2.73	0.03	0.07	0.00	0.03	0.14	0.16
3 BREYERS	14.66	16.62	+ 1.96	0.89	0.97	0.25	0.19	0.01	0.03	0.24	0.33
4 DEANS FOODS	10.37	7.88	- 2.49	0.87	0.90	0.22	0.18	0.02	0.04	0.16	0.22
5 DREYERS EDYS	7.99	11.28	+ 3.30	1.18	1.17	0.15	0.15	0.04	0.10	0.22	0.26
6 HAAGEN DAZS	21.45	22.96	+ 1.51	2.51	2.59	0.25	0.24	0.03	0.08	0.29	0.30
7 KEMPS	10.61	14.82	+ 4.21	0.93	0.96	0.17	0.19	0.05	0.10	0.25	0.26
8 SEALTEST	20.38	14.82	- 5.56	0.81	0.76	0.21	0.18	0.01	0.03	0.26	0.26
9 SIMPLE PLEASURES	11.68	5.01	- 6.67	2.45	2.60	0.08	0.05	0.02	0.00	0.20	0.16

The number of latent segments was determined using the static two-dimensional model (Chintagunta, 1994) for brands 2-9 and the entire time period. Based on information criteria, the number of segments selected for the following analysis is 5 (Table 2).

Table 2
Model Fit and Number of Segments ($N^*=2378$) for Static Model

Segments	ℓ	BIC	AIC	AIC3	CAIC
3	-2848.89	2969.39	5759.79	5790.79	5969.78
4	-2657.05	2804.75	5390.09	5428.09	5647.51
5	-2447.21	2622.12	4984.41	5029.41	5289.24
6	-2467.02	2669.14	5038.03	5090.03	5390.28

*sample size with 8 brands in both periods

The predicted market shares by the static solution (Table 3) point out that segments 3 and 5 switch predominantly within the premium brands. They are expected to be the major adopters of the new brand and thus potentially influenced by context effects, whereas segments 1, 2 and 4, due to their very distinct preferences, do not choose among the premium brands. The

entry of brand 1 is expected to be located close to the premium brands. It is also not expected to perceive an extreme or significant range extension effect.

Table 3
Predicted Choice Shares Based on Static Solution for the Entire Period
and Original Observations

Brand	2	3	4	5	6	7	8	9
Seg. 1	0.91	66.54	2.79	1.89	13.26	7.30	6.96	0.36
Seg. 2	1.02	11.40	10.38	11.85	3.26	40.12	19.14	2.83
Seg. 3	26.09	1.83	4.35	9.99	9.10	5.92	5.12	37.60
Seg. 4	0.90	6.49	16.15	14.72	11.47	0.04	49.80	0.43
Seg. 5	12.42	4.99	0.57	1.46	73.79	2.61	0.54	3.62
Predicted	8.31	12.78	7.58	8.81	22.96	12.57	18.13	8.85
Actual	3.91	15.85	9.00	10.26	23.25	13.25	16.69	7.78

Table 4 gives a general description of the hypothesis examined in the data. Models H_2 , H_3 , H_4 test for the weight-change hypothesis. Models H_5 , H_6 , H_7 investigate perceptual distortions that might have occurred.

Table 4
Hypothesis and Model Specification

Hypothesis	Description	Specification	
		A	w
H_0	null-model, all preference parameters estimated	$A_{\tau=1} \neq A_{\tau=2}$	$W_{\tau=1} \neq W_{\tau=2}$
H_1	no effect, all parameters fixed across $\tau=1,2$	$A_{\tau=1} = A_{\tau=2}$	$W_{\tau=1} = W_{\tau=2}$
H_2	weight-change for segment $s = 3$	$A_{\tau=1} = A_{\tau=2}$	$w_{s,\tau=1} = w_{s,\tau=2}$ for $s \neq l$ and
H_3	weight-change for segment $s = 5$	$A_{\tau=1} = A_{\tau=2}$	
H_4	weight-change for segment $s = 3, 5$	$A_{\tau=1} = A_{\tau=2}$	$w_{l,\tau=1} \neq w_{l,\tau=2}$
H_5	value-shift for all brands	$A_{\tau=1} \neq A_{\tau=2}$	$W_{\tau=1} = W_{\tau=2}$
H_6	value-shift for sub-group T of brands ($k = 2, 9, 6$)	$a_{k,\tau=1} = a_{k,\tau=2}$	$W_{\tau=1} = W_{\tau=2}$
H_7	value-shift for sub-group T of brands ($k = 2, 9$)	for $k \notin T$	

5. Results

Table 5 documents fit statistics for all estimated models. BIC and CAIC account for sample size and impose a higher penalty on the number of parameters than AIC and AIC3. Corresponding to BIC and CAIC the value-shift model with regard to the position of the premium brands 2, 6 and 9 best describes the observed changes in brand choice behavior. Model 2, which is equivalent to the static model except that the position of the entry is estimated, is not supported by any criteria. The assumption that the entry of brand 1 does not affect the choice probabilities of the existing brands clearly has to be rejected. The competing weight-change hypothesis is also not supported by the data.

Table 5
Model Selection (minimum value in boldface)

Model	ℓ	BIC	AIC	AIC3	CAIC	#Parameter
H₀	-2397.024	2660.749	4930.047	4998.047	5389.498	68
H₁	-2472.864	2655.145	5039.728	5086.728	5357.289	47
H₂	-2464.963	2655.000	5027.926	5076.926	5359.001	49
H₃	-2468.583	2658.620	5035.165	5084.165	5366.240	49
H₄	-2461.624	2659.418	5025.248	5076.248	5369.836	51
H₅	-2420.669	2653.368	4961.338	5021.338	5366.735	60
H₆	-2441.067	2646.617	4988.133	5041.133	5346.234	53
H₇	-2457.562	2655.356	5017.125	5068.125	5361.712	51

Model 7 is consistent with the value-shift accounts of Dhar & Glazer (1996), Wedell (1991) und Wedell & Pettibone (1996). A change in preferences originates from the categorization of brands due to the new brand becoming available (Pan & Lehmann, 1993). The product space reveals that the distances between brands 2, 6 and 9 have decreased (see following Figure 1).

Categorization corresponds to diminishing differentiation in the premium segment of the market (note that implications for market structure only apply for the sample of individual panelists). Brand 9 loses its outstanding position, which results in smaller choice probabilities in both segments 3 and 5 (Table 6).

Figure 1 Two-dimensional Product Space for Pre- and Post-entry Period for Model 7

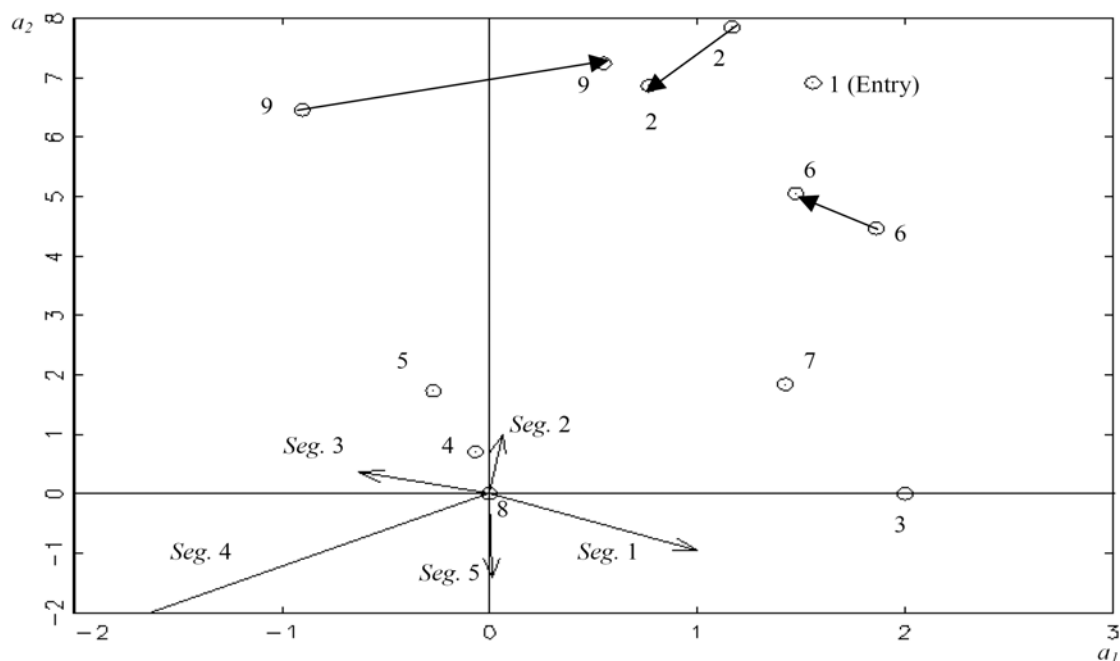


Table 6
Predicted Choice Shares in Pre- and Post-entry Period Based
on Model 7 and Original Observations

Brand	2	3	4	5	6	7	8	9	1
Seg. 1	0.98	63.60	2.92	2.15	16.13	6.29	7.66	0.26	
Seg. 2	2.39	12.38	12.31	9.72	0.15	41.97	17.18	3.89	
Seg. 3	22.03	1.36	3.81	8.32	4.66	3.25	4.69	51.89	
Seg. 4	0.01	3.59	12.72	13.17	9.12	0.02	58.27	3.10	
Seg. 5	5.05	2.21	0.77	1.44	82.33	0.27	1.24	6.68	
Predicted	6.12	12.82	7.38	7.76	20.19	12.09	20.17	13.47	
Actual	2.86	14.66	10.37	7.99	21.45	10.61	20.38	11.68	
Seg. 1	0.93	67.53	3.01	2.01	11.92	6.28	6.50	0.33	1.49
Seg. 2	0.39	9.60	10.02	12.85	4.90	40.18	21.04	0.80	0.22
Seg. 3	22.24	1.65	4.78	10.57	13.52	4.01	5.66	26.97	10.59
Seg. 4	0.35	7.84	18.84	15.90	12.57	0.03	44.40	0.04	0.04
Seg. 5	14.36	3.27	1.14	1.89	63.98	0.38	0.96	3.85	10.16
Predicted	7.42	13.87	8.51	9.71	20.11	11.82	17.88	6.42	4.25
Actual	4.34	16.62	7.88	11.28	22.96	14.82	14.82	5.01	2.27

In contrast to brand 9, brand 2 benefits from categorization. It becomes more attractive to segment 5 and thus increases its market share. Parameter estimates for model 7 and the static model are reported in the Appendix.

6. Summary

The study demonstrates the application of the proposed method to test for alternative entry effects in real choice behavior. As opposed to other recent empirical modeling approaches, it allows for discrimination between alternative mechanisms considered by context effect research. The method offers several advantages compared to an experimental approach to investigate entry effects. It utilizes real world choice data to infer preferences and examines effects on the within-subject base. It avoids measuring response language effects because it is based on real choice data (Lynch et al.,1991). By accounting for heterogeneity, not all subjects must exhibit preference or perceptual effects. Insight can be gained into consumer behavior in a realistic market setting with a variety of brands appealing to different segments.

However, it is the very nature of scanner data that gives rise to the main limitations of this approach. Influences beyond the marketing variables considered in the model (price, price cut, feature and display) might also have caused the observed shifts in choice shares, for example advertising campaigns or other changes in consumer behavior. The probability to get significant and stable results on the effects of these variables grows with an increasing time horizon in the data. Limitations also result from the assumption of a linear utility function. The translation of typical entry positions studied in experiments is a nontrivial task. Whereas other studies define alternatives by physical attributes, we extract a perceptual space.

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Appendix:

Table A.1
Parameter Estimates - Preference Structure (standard errors in parentheses)

	Static Model				Model 7			
	pre-entry		post-entry		pre-entry		post-entry	
Preference Weights	w_1	w_2	w_1	w_2	w_1	w_2	w_1	w_2
Seg. 1	1*	-0.923 (0.041)	-	-	1*	-0.952 (0.048)	-	-
Seg. 2	0.091 (0.219)	1*	-	-	0.062 (0.368)	1*	-	-
Seg. 3	-0.440 (0.252)	0.628 (0.088)	-	-	-0.629 (0.245)	0.368 (0.075)	-	-
Seg. 4	-2.066 (0.121)	-3.203 (0.237)	-	-	-2.265 (0.072)	-3.549 (0.052)	-	-
Seg. 5	0.952 (0.296)	-0.759 (0.108)	-	-	0.013 (0.411)	-1.409 (0.132)	-	-
Positions	a_1	a_2	a_1	a_2	a_1	a_2	a_1	a_2
Brand 2	0.742 (0.362)	6.931 (0.356)	-	-	1.166 (0.128)	7.852 (0.277)	0.769 (0.386)	6.866 (0.228)
Brand 3	2.078 (0.097)	0*	-	-	2.000 (0.147)	0*	-	-
Brand 4	-0.061 (0.171)	0.713 (0.175)	-	-	-0.069 (0.121)	0.704 (0.151)	-	-
Brand 5	-0.218 (0.299)	1.770 (0.272)	-	-	-0.270 (0.243)	1.732 (0.219)	-	-
Brand 6	1.954 (0.304)	4.817 (0.296)	-	-	1.862 (0.095)	4.467 (0.159)	1.473 (0.254)	5.055 (0.136)
Brand 7	1.580 (0.461)	1.804 (0.430)	-	-	1.425 (0.251)	1.841 (0.560)	-	-
Brand 8	0*	0*	-	-	0*	0*	-	-
Brand 9	0.208 (0.393)	6.906 (0.242)	-	-	-0.903 (0.259)	6.457 (0.218)	0.549 (0.315)	7.247 (0.465)
Brand 1	-	-	-	-	-	-	1.558 (0.118)	6.911 (0.179)

*parameter fixed to ensure identification

Table A.2
 Parameter Estimates – Response (standard errors in parentheses)

Model		Static Model	Model 7
Segment size			
	Seg. 1	0.105	0.107
	Seg. 2	0.251	0.261
	Seg. 3	0.192	0.222
	Seg. 4	0.231	0.236
	Seg. 5	0.222	0.174
<i>Seg. 1</i>	PRICE*	1.528 (0.175)	3.072 (0.115)
	PCUT	3.044 (0.117)	2.127 (0.177)
	FEAT	0.165 (0.408)	-0.040 (0.427)
	DISP	-0.741 (0.388)	-0.081 (1.153)
<i>Seg. 2</i>	PRICE	-6.114 (0.121)	-6.522 (0.443)
	PCUT	5.662 (0.225)	6.437 (0.113)
	FEAT	0.391 (0.368)	0.319 (0.302)
	DISP	0.204 (0.428)	0.014 (0.438)
<i>Seg. 3</i>	PRICE	-1.301 (0.135)	-1.052 (0.152)
	PCUT	3.479 (0.098)	3.051 (0.232)
	FEAT	-0.239 (0.293)	-0.157 (0.422)
	DISP	-0.180 (0.213)	-0.082 (0.355)
<i>Seg. 4</i>	PRICE*	9.243 (0.035)	10.707 (0.264)
	PCUT	3.202 (0.539)	3.665 (0.689)
	FEAT	0.647 (0.284)	0.659 (0.166)
	DISP	1.021 (0.603)	1.150 (0.386)
<i>Seg. 5</i>	PRICE*	4.301 (0.039)	6.116 (0.380)
	PCUT	1.813 (0.148)	2.289 (0.172)
	FEAT	0.270 (0.388)	-0.006 (0.347)
	DISP	3.865 (0.693)	2.690 (0.204)

* Positive price coefficients can be explained with the segmentation of the market in premium and non-premium brands. Some consumers (segments 1, 4, 5) regard the price level as an indicator for higher quality. Promotional price cut coefficients are all significant and have the expected positive signs.

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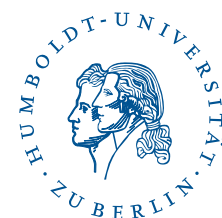
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