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WHAT AFFECTS BRAND EQUITY: THE PRECISE MEASUREMENT WITH CONSUMER CHOICE MODEL

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WHAT AFFECTS BRAND EQUITY: THE PRESICE MEASUREMENT WITH CONSUMER CHOICE MODEL⁴

This paper investigates how different marketing variables (advertising, sales promotion and product assortment) affect brand equity. First, we assess weekly dynamics of brand equity intercepts using discrete choice model based on disaggregate store-level scanner data. Then we use these estimates as the dependent variable to study the impact of different marketing instruments. This paper contributes to the field basically in two ways: we measured brand equity of heterogeneous product taking into account its variety both on choice modeling stage and brand equity drivers estimation stage; we have got quite precise estimates because we were able to exploit very detailed data about choices and marketing instruments. Our research reveals that share of voice of TV commercials affects brand equity positively and promotion intensity – negatively. Expanding product assortment, companies may enlarge brand equity by increasing the number of SKUs in large-format stores.

JEL Classification: M31, M37, L81

Keywords: brand equity, scanner data, marketing-mix instruments, product assortment

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1. Introduction

The past thirty years have seen increasingly rapid advances in the field of brand equity estimation. Brand equity is one of the key marketing concepts, allowing companies to monitor the brand performance. Many studies shed light on the nature of this concept, its sources and outcomes. However, little attention in empirical literature is devoted to the brand equity estimation of heterogeneous products, which may be described by many characteristics. We suppose that for this purpose it is reasonable to estimate brand equities based on consumer choice model. This method proposed initially by Kamakura & Russel (1993) allows us to investigate the consumers utility derived from product consumption and take into account product heterogeneity.

As far as any brand presents itself as the result of firm marketing-building efforts, brand equity may also act as an instrument to assess the efficiency of different marketing investments. It should be noted, that few studies attempts to investigate the influence of marketing variables on brand equity using objective measures. Most methods use the questionnaire data to build the brand equity and to investigate what factors affect it. Therefore, considerable research has been devoted to study how perceived advertising and promotion intensity influence brand equity, rather less attention has been paid to the estimation of the advertising and promotion effect based on objective data of marketing instruments intensity and actual consumers behavior.

The purpose of this research is to estimate the influence of advertising, sales promotion and product assortment on brand equity using real data. To achieve this goal, we first measure brand equity exploiting consumer choice model. The results show highly significant measures of weekly brand equity estimates. Then we study the effect of chosen marketing variables on brand equity. The available data on TV advertising and sales promotion give an opportunity to receive more precise and significant results. We also contribute to the literature including product assortment in explanatory variables.

This paper will proceed as follows: next section describes theoretical background followed by the data and methodology. The research concludes with found results and discussion.

2. Brand equity concept and related research

Historically brands served as signals to distinguish products [Farquar, 1990]. These days brands continue to play this valuable role, but they have also become significant companies' strategic assets allowing to conquer the competitive advantage. In order to monitor successfully the performance of these assets, they should be carefully measured.

As far as brand is abstractive concept, which cannot be compared and measured, the academics have introduced brand equity. However, there is still no consensus how to measure it. A

reason for this is who benefits from brands. Actually, not only companies benefit from brands, customers are also interested in their existence. Brands may act as signals to consumers, identifying the product quality and decreasing the searching costs.

As far as brand existence is beneficial to firms and consumers, the choice of brand equity definition is mainly based on the approach to its measurement – either firm-based or customer-based. From a firm-based viewpoint brand equity is regarded as the sum of the incremental cash flows provided by a brand name. In other words, it shows the difference in revenues of branded goods in comparison with unbranded ones. From some conceptual point of view brand equity is regarded as brand value concept. However, some researchers propose to separate these concepts, as brand equity brings advantages to consumers, while brand value is beneficial to firms [Raggio and Leone 2007].

According to Simon and Sullivan (1993) there are two reasons explaining the advantages of branded products over unbranded ones. Firstly, goods with brand name are more valuable for consumers, consequently they are willing to pay price premium. A second reason consists in some competitive advantages, derived from brand equity existence, for example cost savings. As far as consumers' perceptions, feelings, thoughts and decisions influence strongly brand equity, consumer based brand equity is said to antecedent firm based one and not vice versa. Therefore, the focus in empirical researches has recently moved from brand equity to consumer based brand equity estimation [Christodoulides and de Chernatony, 2010].

This paper contributes to consumer-based brand equity field and later we will call it simply brand equity. The majority of researchers agree that brand equity presents the value added by the brand to the product [Farquhar, 1990]. The existing literature demonstrates a consensus in conceptual framework but does not provide a clear guidance on how to measure brand equity.

Christodoulides and de Chernatony (2010) classify brand equity measurement techniques into direct and indirect methods. The indirect approach uses psychometrics tests to assess brand equity through its dimensions, for example, perceived quality, brand loyalty, brand awareness and brand associations [Aaker, 1991; Netemeyer et al., 2004; Yoo et al., 2000]. The direct approach estimates consumer utility to separate value derived from brand from value derived from product itself [Park and Srinivasan 1994; Srinivasan 1979; Srinivasan, Park, and Chang 2005].

The majority of both direct and indirect methods are survey-based [Park & Srinivasan, 1994; Shankar et al., 2008; Srinivasan, 1979; Yoo et al., 2000]. They are very flexible, implying to analyze consumers' feelings, thoughts, attitudes and perceptions, which are hidden from the researchers observing only customers' choices. Also survey-based techniques give a valuable insight into drivers of brand equity, its sources and outcomes and they may provide estimates beyond current market conditions, conducting experiments [Swait et al., 1993]. However, any

survey-based method due to subjectivity may lead to measurement errors, as its accuracy depends on respondents ability to rang their preferences and on their sincerity [Park and Srinivasan 1994]. The choice of respondents is also the critical issue. Many studies [Swait and Louviere 1993; Yoo et al., 2001] interrogate students, not actual consumers of analyzed goods.

An alternative method of brand equity estimation is based on scanner data [Kamakura and Russell, 1993; Sriram et al., 2007]. Scanner data may be more preferable than consumer surveys, because they reflect actual purchases, consequently real choices, not hypothetical ones. This eliminates biases between desirable and actual choices.

Kamakura & Russell (1993) have proposed to use the brand intercept estimates of consumer's utility as the brand equity measure. According to this research brand equity is incremental utility, a component of total one that is not explained by situational factors (that is price and promotion). Therefore, brand equity is a component of consumers' utility apart from marketing mix influence. Using scanner panel data of 300 households, the authors implement the clusterwise logit model taking into account the heterogeneity of consumers. Studying the powder laundry detergent category they find statistically significant estimations for three brand value indicator (total, tangible and intangible) and compare them across nine brands.

Sriram (2007) measure brand equity as the intercept of utility function estimated on the basis of weekly store-level scanner data from toothpaste and dish detergent categories. The modifications of utility function in this paper involves estimation of brand intercept measure on quarterly basis and inclusion of product attributes vector in utility function. They use BLP method to estimate brand equity intercepts. The valuable contribution of the paper is the assessment of the intercept measure validity. The authors consider brand equity in dynamics and reveal the suitability of this measure. In the next stage of the research, the authors investigate how different marketing variables influence estimated brand equity using 3SLS approach. They find that advertising and product innovation have a positive effect on brand equity, while sales promotions are not significant.

Our research follows the method, used in these papers. Using scanner data, we estimate brand equity in dynamics based on consumer choice model. We should note that store-level data are less sensitive to sample selection bias in comparison with individual scanner panel data. However, store-level scanner data are usually aggregated and do not allow to investigate individual choices. We use crucially other type of data, called disaggregated store-level scanner data, which combine the advantages of data used before.

However, we do not identify customers who make purchases that is why we cannot consider consumers' heterogeneity in contrast to the mentioned authors. Comparing to the related research our econometric model is parsimonious, not taking into account consumers' characteristics. As far

as only alternatives features could explain the choices in our framework, we use conditional logit model.

To our mind, not enough attention in literature is dedicated to modelling consumer choice in SKU-level. The majority of papers analyze brand sales, taking into account different sizes. It is reasonable for homogeneous products, for example ground coffee or laundry detergent. When an item can be described by many characteristics, that is different sizes, packages, flavors, additives, its demand estimation becomes more sophisticated and it is important to take into account product features in modelling choice. In our analysis, we would measure brand equity of quite heterogeneous product, bagged tea, not using any aggregation technique. Taking into account product heterogeneity will make our brand equity estimates more precise.

In line with Sriram (2007) we estimate brand equity intercepts in dynamics, however we assess them in weeks, what allows us to receive more detailed results. Estimation of brand equities over time allows researchers to investigate what marketing variables explain its variation. This question has many practical applications, because any brand presents itself as the result of firm marketing-building effort.

- **Advertising** Prior literature shows the evidence that advertising has the positive effect on brand equity. However, past research measure the impact of perceived or actual advertising spending [Buil et al., 2013; Sriram et al., 2007; Yoo et al.,2000]. Sriram et al. (2007) admit that relative advertising measure, for example, share of voice of advertising campaign might be more preferable than the absolute levels, e.g. advertising expenditures. Our research presents available data on TV commercials, which may provide more precise and valuable results.
- **Sales promotion** Many studies reveal that perceived promotion intensity decreases brand equity [Yoo et al.,2000; Valette-Florence et al., 2011], but there is still no evidence that actual sales promotion damages brand health. Also inclusion of percent discount will enrich our understanding of promotion influence.
- **Product assortment** Prior papers in this area use different marketing instruments besides advertising and promotion, that is product innovation [Sriram et al. 2007], store image and distribution intensity [Yoo et al.,2000]. However, little attention is paid to how product assortment may influence brand equity. Is it possible to strengthen brand positions increasing the alternatives? We answer this question filling this knowledge gap.

In this paper, we conduct two-step analysis. In the first step, we measure brand equity using consumer choice model. In the second one, we investigate how different marketing variables (advertising, sales promotion and product assortment) may influence brand equity.

3. Data

Large retail chain located in Perm region, Russia provides us with data on sales, promotion activities and product assortments. To estimate brand equity from consumer choice model we use individual purchases observations available from August to November 2012 (18 weeks). We obtain the information about the chosen stock keeping unit (SKU), the price paid and the available percent of discount in times of promotion from the cheques in every transaction. Using stocks data, we reconstruct the choice set for every purchase occasion with information about non-chosen SKUs, their prices and available discounts. We collect data about non-chosen alternatives to use conditional logit model, because choice set can vary and all dependent variables are alternative-specific.

We estimate brand equity using data on bagged tea purchases. The chosen product category is characterized by the presence of strong brands (some of them are world-wide known) and by high advertising and promotion intensities. Moreover, tea is heterogeneous product, which can be described by many colors, additives and forms. For modelling purpose, we study the purchases with one SKU chosen (the share of these shopping trip is 88%).

The data contain sales from twenty-four stores of different size ranging from corner shops to hypermarkets. Store formats differ in their product assortment, therefore in choice set size. Table 1 sums up number and size of choice sets.

Table 1. Choice set characteristics

Choiceset Number	SKU numbers in choicesets			
	Mean	Std.Dev.	Min	Max
148 982	188	30	143	243

The data on advertising campaigns are provided by TNS-Russia company and consist of gross rating point (GRP) of TV commercials, which measures the target audience coverage. We have divided this indicator into two variables according to the context of commercials: GRP of brand and GRP of SKU. Therefore, the variable GRP of brand indicates the share of voice of commercials for a given brand in a particular week. In some cases, TV commercials have information not only about brands but about some SKUs too. For example, they advertise new collections, flavors or size of their products. For this purpose, we have added the variable GRP of SKU, which indicates the rating of commercials, concerned to specific product. When the model will be assessed, the coefficient of GRP of SKU show us the additional effect of advertising campaign on choice if particular SKU is shown.

We believe that different sizes, flavors, tastes and colors are treated as different products both from consumers and retailers sides. That is why we model the choice between different SKUs, not aggregating them in brand alternatives. This approach allows us to describe each alternative with a large number of characteristics to take into account their variety and heterogeneity. In this research, we have selected the following features to describe the SKU- alternatives:

- tea color (black, green, herbal, mix (i.e. tea blend or variety pack))
- tea taste (bergamot, fruit, citrus, herbal (i.e. peppermint, jasmine, balm, ginger, hibiscus etc.), other taste (i.e. cinnamon, spices, vanilla, caramel, honey etc.), mix (any combination of these flavors) or without flavors)
- package size – the bags quantity
- individual paper package of bag (yes or no)
- pyramidal form of bag (yes or no)

We present tea assortment characteristics in appendix 1. The majority of available tea is black and without any flavors, that is why we make these features base to normalize the utility. The total number of brands in bagged tea category is twenty-nine, and half of them (fifteen brands) had market shares less than 1% in 2012. To decrease the number of estimated parameters it is reasonable to restrict the number of studied brands. Also brand equity intercepts should be measured on the basis of no branded alternative. Prior literature (i.e. Sriram et al, 2007) proposes to use national or store brands as base level. In this research we aggregate brands with small market shares and low marketing-building efforts into the «no brand» group.

After conducting analysis, we have chosen nine brands with highest revenues that form 85% of sales with high advertising and promotional activities. Real brand names are hidden according to confidential policy and we give them the unique numbers. We assess weekly brand equities for nine brands, and estimate them relative to aggregate no brand alternative. Market shares of studied brands are presented in table 2. After assessing brand equities, we study how advertising, sales promotion and product assortment affect them.

Table 2. Market shares of studied brands in studied period (in percentage points)

Brand	Market share
1013	27.22
1016	17.27
1048	11.97
1045	6.01
1028	5.57
1001	5.49
1044	5.4
1027	3.71
1046	1.96
nobrand	15.39

4. Model

To measure brand equity we use discrete choice model, based on the store scanner data. As far as observed variables are alternative-specific the chosen model is conditional logit [McFadden, 1973]. This model gives opportunity to assess the influence of different characteristics of alternatives on the choice.

We model behavior of utility-maximizing individuals with indexes i who make choice from a bundle of alternatives K :

$$U_{ik} = V_{ik} + \varepsilon_{ik}, \quad (1)$$

where V_{ik} – a deterministic part of utility of individual i derived from purchase of alternative k , $k \in K$, ε_{ik} – a stochastic, random component of individual utility.

It is assumed that ε_{ik} is distributed independently and identically (iid) with the type I extreme-value distribution, called the Gumbel distribution. We believe that rationale consumers make choice if and only if the utility of chosen alternative is higher than any other variants

$$p_{ik} = P[U_{ik} > U_{ir}, k, r \in K] \quad (2)$$

Then given the described assumptions the probability of choosing the alternative k is following

$$p_{ik} = \frac{\exp(V_{ik})}{\sum_{r=1}^K \exp(V_{ir})} \text{ for } k = 1 \text{ to } K \quad (3)$$

We study bagged tea product category and assume that households gain the following utility buying the chosen alternative, which is more detailed specification of (1):

$$U_{ikst} = \beta_0 + \beta_{jw}^{BE} Br_j + \beta_2 Price_{kst} + \beta_3 Action_{kst} + \beta_4 Discount_{kst} + \beta_5 GRP_{kw} + \beta_6 GRP_{kw}^2 + \beta_7 GRP_{jw} + \beta_8 GRP_{jw}^2 + \beta_9 X_k + \varepsilon_{ikst} \quad (4)$$

where $k \in j$, $t \in w$; i – index for individual; k – index for chosen alternative (SKU); j – index for brand; s – index for store; t – index for day; w – index for week

$\beta_0 - \beta_9$ – the parameters to be estimated, β_{jw}^{BE} – brand equity

$Price_{kst}$ – price for one bag of alternative k in store s in day t

$Action_{kst}$ – the presence of discount of alternative k in store s in day t

$Discount_{kst}$ – the percent of discount of alternative k in store s in day t

GRP_{kw} – weekly gross rating point of TV commercial of alternative k

GRP_{jw} – weekly gross rating point of TV commercial of alternative k

Vector X_k includes:

- $Color_k$ – the color of chosen alternative k
 - $Taste_k$ – the taste of chosen alternative k
 - $SizePack_k$ – the package size, the number of tea bags in alternative k
 - IP_k – if every tea bag of alternative j is individually packed
 - Pyr_k – if tea package of alternative j is in a form of pyramid
- ε_{ikst} – a random component of utility, i.i.d distributed

The estimated brand equities will be used in second equation as the values of dependent variable. This allows us to investigate how different marketing variables may influence brand equity. In the second stage of our research, we estimate the following equation:

$$\beta_{jw}^{BE} = \alpha_0 + \alpha_1 Adv_{jw} + \alpha_2 Action_{jw} + \alpha_3 AvDisc_{jw} + \alpha_4 MaxSKU_{jw} + \alpha_5 Variety_j + \varepsilon_{jw}, \quad (5)$$

where $\alpha_0 - \alpha_6$ – the parameters to be estimated

β_{jw}^{BE} – brand equity of brand j in week w estimated in first equation

Adv_{jw} – cumulative GRP of TV-commercials of all SKUs of brand j

$Action_{jw}$ – cumulative number of actions of all SKUs of brand j

$AverDisc_{jw}$ – average discount in all actions of all SKUs of brand j

$MaxSKU_{jw}$ – maximum number of SKU brand j in week w

$Variety_j$ – quantity of different tastes of brand j

ε_{jw} – an error term

5. Results

Table 3.1 shows the summary results of estimated conditional logit model. A reader could find all estimates in appendix 2. We should note that the majority of estimated parameters are highly statistically significant. The coefficients have the expected signs consistent with economics and marketing literature. The price influences choice negatively, while promotion effect is positive. The model reveals the effect of sales promotion existence and the significant influence of percent of discount. Concerning demand characteristics, the probability of SKU to be chosen is higher when the color of tea is black, there are no taste additives, package size is small, bags do not have individual paper packages and bags form is usual (non-pyramidal). GRP of SKU advertising has positive effect on choice and negative effect of square GRP of TV commercials capture the effect of high-pressure advertising. When a company advertise the brand, it decreases the probability of

concrete SKU to be chosen. This may be explained that advertisements raise brand customers' awareness and lead to switch product alternatives within brand. Overall, the advertising effect is positive.

Among nine brand equity estimates, only seven are statistically significant over all weeks. This means that two brands 1045 and 1027 do not differ from no brand group from consumers' point of view. Therefore, we concentrate on further investigation of seven brands, presented in table 3.2. Each brand has eighteen brand equities and this table shows their distribution, all estimated parameters are presented in appendix 2.

Table 3.1 Results of conditional logit model

Variable	Coef.	SE
price	-0.432***	0.009
action	2.744***	0.096
discount	0.019***	0.003
green color ¹	-0.493***	0.008
herbal tea ¹	-0.803***	0.011
mix tea ¹	-2.554***	0.378
colorpackmix tea ¹	-0.103***	0.039
bergamot taste ²	-0.129***	0.012
herbal taste ²	-0.256***	0.013
fruit taste ²	-0.275***	0.016
berry taste ²	-0.526***	0.012
citrus taste ²	-0.470***	0.015
other taste ²	-0.278***	0.016
mix taste ²	-0.419***	0.013
package size	-0.014***	0.0001
individual pack	-0.173***	0.014
pyramids	-0.512***	0.018
GRP SKU	0.071***	0.005
square GRP SKU	-0.002***	0.0002
GRP brand	-0.011***	0.002
square GRP brand	0.0001***	0.00003
Number of observations	28112926	
Log likelihood	-695096	
Pseudo R2	0.1076	

Table 3.2 Brand equity estimates

	Mean	Std Dev	Min	Max
1001	0.659	0.154	0.345	0.927
1013	1.903	0.122	1.690	2.132
1016	1.450	0.085	1.300	1.645
1044	0.553	0.064	0.435	0.684
1046	0.110	0.140	-0.081	0.442
1048	0.964	0.089	0.784	1.149
1028	0.844	0.439	-0.002	1.420

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

1 –black color is base-level

2 – without taste is base-level

High z-statistics of assessed brand equities (appendix 2) justify their weekly dynamics. In the second step of our analysis we use these estimates in further equation to study the effect of marketing variables on brand equity. Appendix 3-6 present variety by brands, cumulative GRP of TV commercials, cumulative sales actions, maximum SKU number by brands and weeks.

To estimate the model we use three specifications: pooled, fixed and random effects regressions. Table 4 shows the results.

Table 4. Regression results

	pooled		fixed effect		random effect	
	Coef.	SE	Coef.	SE	Coef.	SE
Intercept	0.225***	0.063	0.075	0.447	0.484	0.254
Cum. grp of brand advert	-0.0001***	0.00001	0.0001	0.00004	0.00003	0.00003
Cum. promotion actions	-0.316***	0.017	-0.208***	0.034	-0.204***	0.032
Cumulative average discount	0.027***	0.002	0.014**	0.005	0.014**	0.005
Maximum SKU number	-0.014**	0.005	0.057*	0.023	0.021	0.018
Variety	0.099***	0.007	-	-	0.024	0.026

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Using Wald-test (Prob > F = 0.00), we determine the existence of fixed effects. We believe that we should take into account brand individual characteristics studying their brand equities. Therefore, we interpret results only for the fixed effect model. Generally, advertising measured in GRP of TV commercials has no effect on brand equity. As expected, the effect of sales promotion is negative, every additional action will diminish brand equity by 0.2. However, the effect of discount is positive, and growth of average discount by 1% will lead to 0.014 brand equity rise. The variety of assortment, measured by the maximum number of SKUs presented in chain, have positive influence on brand equity. The raise of maximum SKU number by 1 contributes to 0.057 growth of brand equity. This conclusion has significant management implications, brands may increase the SKU quantities in the large format stores to raise its brand equity.

6. Conclusion & Discussion

Brand equity measurement is one of the most valuable and significant strategic companies' concept to monitor and track the health of their brands. This instrument is also helpful for setting targets and measuring brand performance. Although the significance of brand equity concept is widely acknowledged both by academia and industry, there has no evidence of widespread its usage by companies. The main reason is believed to be the absence of the reliable approach to define and measure brand equity. This concept may be viewed from two major perspectives: firm-based or

consumer-based. This paper belongs to consumer-based brand equity field and contributes to the methods using data on consumer choice and objective data of marketing instruments.

The estimated conditional logit model proves the reasonability to assess brand equity on weekly basis. We use these estimates to study how different marketing variables, that is advertisement, sales promotion and product assortment influence brands. Our contribution to the literature consists in investigation of assortment impact on brand equity, of advertising, measured by GRP of TV commercials and actual sales promotion intensity with the percent of discount.

Our research reveals that GRP of TV commercials have positive impact on brand equity. Sales promotion influence negatively, while the higher the discount percent, the higher consumers perceptions about brand. As for product assortment, the company may raise its brand equity increasing the number of SKUs in stores with large formats.

However, we do not take into account that consumers may forget past advertisements. Also the positive effect of the increase of the SKU numbers may be explained by shelf length. In future research the measure of assortment variety should be more precise. As far as we do not observe the consumer identity, our model is parsimonious, not taking into account the consumer heterogeneity, the brand loyalty and the purchase history. Obtaining this type of data would be the next step to overcome limitations of this research. Moreover, the structure of choice may be hierarchal, that is the customers choose brands first, then they consider other characteristics, what is reflected in more comprehensive, nested logit models. Nevertheless, the estimated results tend to be very promising, contributing to brand equity field both from academia and industry sides.

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Appendix 1 Tea assortment characteristics

Variable	Mean	Std. Dev.	Min	Max
black color	0.62	0.48	0	1
green color	0.23	0.42	0	1
herbal tea	0.14	0.35	0	1
mix tea	0.001	0.03	0	1
colorpackmix tea	0.01	0.1	0	1
without taste	0.5	0.5	0	1
bergamot taste	0.07	0.25	0	1
herbal taste	0.08	0.27	0	1
fruit taste	0.06	0.24	0	1
berry taste	0.11	0.31	0	1
citrus taste	0.07	0.25	0	1
other taste	0.04	0.21	0	1
mix taste	0.07	0.26	0	1
package size	35.15	27.61	10	120
individual pack	0.26	0.44	0	1
pyramids	0.16	0.37	0	1

Appendix 2 Results of conditional logit model

Variable	Coef.	SE	z stat.
price	-0.432	0.009	-50.27
action	2.744	0.096	28.53
discount	0.019	0.003	5.95
green color	-0.493	0.008	-59.11

herbal tea	-0.803	0.011	-74.39
mix tea	-2.554	0.378	-6.75
colorpackmix			
tea	-0.103	0.039	-2.63
bergamot taste	-0.129	0.012	-10.7
herbal taste	-0.256	0.013	-19.23
fruit taste	-0.275	0.016	-17.36
berry taste	-0.526	0.012	-43.44
citrus taste	-0.470	0.015	-30.78
other taste	-0.278	0.016	-17.8
mix taste	-0.419	0.013	-33.39
package size			-
	-0.014	0.0001	102.11
individual pack	-0.173	0.014	-12.71
pyramids	-0.512	0.018	-28.75
GRP SKU	0.071	0.005	15.28
square GRP			
SKU	-0.002	0.000	-10.56
GRP brand	-0.011	0.002	-6.92
square GRP			
brand	0.0001	0.00003	5.17
1001_w31	0.558	0.077	7.24
1001_w32	0.534	0.057	9.34
1001_w33	0.543	0.055	9.93
1001_w34	0.598	0.061	9.77
1001_w35	0.852	0.061	14.03
1001_w36	0.885	0.056	15.71
1001_w37	0.927	0.056	16.43
1001_w38	0.840	0.054	15.43
1001_w39	0.801	0.054	14.9
1001_w40	0.676	0.054	12.61
1001_w41	0.639	0.054	11.75
1001_w42	0.625	0.055	11.34
1001_w43	0.461	0.059	7.76
1001_w44	0.345	0.062	5.56
1001_w45	0.615	0.066	9.34
1001_w46	0.646	0.062	10.5
1001_w47	0.707	0.057	12.31
1001_w48	0.605	0.063	9.55
1013_w31	1.771	0.046	38.32
1013_w32	1.690	0.036	47.24
1013_w33	1.691	0.035	48.65
1013_w34	1.779	0.034	52.42
1013_w35	1.947	0.035	55.03
1013_w36	2.042	0.036	56.43
1013_w37	2.132	0.037	57.86
1013_w38	2.019	0.035	57.06
1013_w39	2.080	0.036	57.65
1013_w40	1.922	0.038	50.02
1013_w41	1.879	0.039	48.37
1013_w42	1.926	0.039	49.08
1013_w43	1.925	0.039	49.47
1013_w44	1.817	0.037	48.47
1013_w45	1.960	0.040	49.05
1013_w46	1.891	0.037	50.52
1013_w47	1.896	0.039	49.18
1013_w48	1.884	0.040	47.54

1016_w31	1.300	0.117	11.14
1016_w32	1.372	0.074	18.63
1016_w33	1.319	0.097	13.57
1016_w34	1.430	0.062	22.97
1016_w35	1.534	0.050	30.52
1016_w36	1.505	0.047	32.1
1016_w37	1.645	0.048	34.1
1016_w38	1.441	0.041	34.94
1016_w39	1.395	0.043	32.74
1016_w40	1.390	0.050	27.58
1016_w41	1.413	0.051	27.46
1016_w42	1.461	0.055	26.41
1016_w43	1.440	0.055	26.01
1016_w44	1.500	0.057	26.18
1016_w45	1.523	0.056	27.24
1016_w46	1.513	0.056	27
1016_w47	1.523	0.049	31.11
1016_w48	1.397	0.050	28.03
1044_w31	0.577	0.066	8.67
1044_w32	0.435	0.053	8.28
1044_w33	0.455	0.051	8.94
1044_w34	0.552	0.048	11.39
1044_w35	0.549	0.051	10.86
1044_w36	0.509	0.051	9.9
1044_w37	0.684	0.050	13.81
1044_w38	0.470	0.051	9.19
1044_w39	0.530	0.052	10.29
1044_w40	0.621	0.049	12.8
1044_w41	0.532	0.050	10.61
1044_w42	0.584	0.049	11.93
1044_w43	0.580	0.048	11.99
1044_w44	0.530	0.048	11.01
1044_w45	0.636	0.049	12.85
1044_w46	0.530	0.049	10.78
1044_w47	0.571	0.051	11.26
1044_w48	0.612	0.052	11.76
1046_w31	1.284	0.096	13.3
1046_w32	1.048	0.079	13.31
1046_w33	1.158	0.080	14.47
1046_w34	1.341	0.078	17.29
1046_w35	1.468	0.075	19.46
1046_w36	1.181	0.087	13.51
1046_w37	1.270	0.076	16.61
1046_w38	1.134	0.076	14.86
1046_w39	1.339	0.080	16.78
1046_w40	1.348	0.078	17.27
1046_w41	1.437	0.071	20.27
1046_w42	1.306	0.074	17.77
1046_w43	1.201	0.072	16.67
1046_w44	1.309	0.072	18.08
1046_w45	1.427	0.075	18.94
1046_w46	1.446	0.071	20.35
1046_w47	1.369	0.069	19.71
1046_w48	1.269	0.075	16.87
1045_w31	-0.018	0.076	-0.24
1045_w32	-0.039	0.057	-0.68

1045_w33	-0.081	0.057	-1.42
1045_w34	-0.072	0.056	-1.29
1045_w35	0.240	0.049	4.87
1045_w36	0.368	0.040	9.15
1045_w37	0.442	0.040	10.91
1045_w38	0.198	0.042	4.73
1045_w39	0.211	0.043	4.92
1045_w40	0.086	0.052	1.66
1045_w41	0.038	0.055	0.69
1045_w42	0.150	0.053	2.85
1045_w43	0.064	0.054	1.19
1045_w44	0.073	0.052	1.4
1045_w45	0.065	0.056	1.17
1045_w46	0.075	0.053	1.4
1045_w47	0.097	0.055	1.75
1045_w48	0.086	0.058	1.49
1048_w31	0.963	0.058	16.69
1048_w32	0.921	0.044	21.1
1048_w33	0.940	0.042	22.36
1048_w34	0.916	0.042	21.84
1048_w35	1.149	0.041	28.24
1048_w36	1.135	0.041	27.95
1048_w37	1.066	0.045	23.44
1048_w38	0.867	0.050	17.47
1048_w39	0.953	0.051	18.81
1048_w40	0.980	0.051	19.1
1048_w41	0.977	0.050	19.56
1048_w42	0.784	0.044	17.66
1048_w43	0.873	0.044	19.95
1048_w44	0.905	0.043	21.19
1048_w45	0.969	0.045	21.76
1048_w46	0.965	0.043	22.63
1048_w47	0.992	0.044	22.46
1048_w48	0.990	0.046	21.48
1027_w31	-0.049	0.114	-0.42
1027_w32	-0.117	0.087	-1.35
1027_w33	-0.165	0.086	-1.91
1027_w34	-0.104	0.083	-1.25
1027_w35	-0.060	0.085	-0.71
1027_w36	0.101	0.081	1.24
1027_w37	0.065	0.086	0.75
1027_w38	-0.034	0.085	-0.4
1027_w39	0.075	0.082	0.92
1027_w40	0.070	0.077	0.91
1027_w41	0.027	0.078	0.35
1027_w42	-0.019	0.081	-0.23
1027_w43	0.018	0.081	0.23
1027_w44	-0.036	0.079	-0.46
1027_w45	-0.081	0.084	-0.97
1027_w46	0.032	0.077	0.42
1027_w47	-0.016	0.084	-0.19
1027_w48	0.056	0.085	0.66
1028_w31	0.901	0.091	9.89
1028_w32	0.889	0.067	13.21
1028_w33	0.830	0.066	12.54
1028_w34	0.795	0.067	11.89

1028_w35	0.874	0.068	12.88
1028_w36	1.073	0.064	16.77
1028_w37	1.174	0.062	18.79
1028_w38	0.936	0.064	14.53
1028_w39	1.233	0.061	20.28
1028_w40	1.402	0.053	26.64
1028_w41	1.420	0.051	28.11
1028_w42	1.293	0.049	26.37
1028_w43	1.207	0.051	23.54
1028_w44	0.471	0.043	11.06
1028_w45	0.272	0.041	6.62
1028_w46	0.245	0.040	6.17
1028_w47	0.185	0.042	4.45
1028_w48	-0.002	0.045	-0.04
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Number of observations		28112926	
Log likelihood		-695096	
Pseudo R2		0.1076	
<hr/>			

Appendix 3 Variety of studied brands

ID_Brand	Variety
1001	24
1013	21
1016	29
1028	13
1044	4
1046	5
1048	6

Appendix 6 Maximum SKU number of brands by weeks

ID_Brand	Weeks																		mean	st.dev.
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		
1001	23	24	25	25	25	25	25	25	25	24	22	22	22	21	21	22	22	22	23	1.5
1013	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	0
1016	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	0
1028	12	12	12	12	13	13	13	13	13	13	12	12	12	12	12	12	12	12	12	0.5
1044	10	10	10	10	9	9	9	9	9	9	9	10	10	10	9	9	9	9	9	0.5
1046	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0.3
1048	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	13	13	13	14	0.4
mean	18	18	18	18	18	18	18	18	18	18	18	18	18	18	17	17	17	17		
st.dev.	12	12	13	13	13	13	13	13	13	12	12	12	12	12	12	12	12	12		

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