YOGURT MARKET ANALYISIS IN ARMENIA USING HEDONICPRICE MODEL AND PERCEPTUAL MAPPING METHOD

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ABSTRACT

This paper adopts the hedonic price model and perceptual mapping method to study the impacts of attributes on yogurt prices and consumers perception in the Armenian yogurt market. The price of yogurt is modeled as a function of yogurt characteristics and the perceptual map is constructed based on consumer perception towards yogurts' attributes such as healthiness, prestige, price, availability, flavor, artificial additives, packaging, taste, quality and freshness. The hedonic price model helps to reveal the factors that affect the price of yogurt and provides insights into price determination and the strategic communication between manufacturers. The perceptual map model gives manufacturer precise illustration of market situation, information about market gaps which can be used for future marketing strategy. Results show that there is a perceptual gap in the market, because consumers perceive actual acting players in the market as unhealthy. The brand value is a highly effective factor in price determination for consumers, so manufacturers can strengthen it to distinguish product and earn extra premiums.

Key words: yogurt, hedonic price model, perceptual map

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INTRODUCTION

Overview of Yogurt Market

Yogurt is one of the unique products, which has comparably the shortest history among processed and manufactured products in the Armenia. Yogurt is a fermented milk product obtained from the milk or milk products by the lacticacid fermentation through the action of Strepococcus salivarius and Lactobacillus delbrueckii. (FAO/WHO, 1977).

The fundamental features of the yogurt are high digestibility and balanced nutritional content. This features perceived by customers as healthy and suitable for elders, children and people with various diseases. (Johansen, Tormod, Jorun & Hersleth,2010; Luckow, Moskowitz, Beckley, Hirsch & Genchi,2005). Another vital feature appreciated by customer is that it is easy to use. Therefore, yogurt is perfect product for modern lifestyle that distinguishes by a time scarcity for meal preparation.

The closest Armenian product to the yogurt is matsoun, however Armenian households make a precise distinction between yogurt (sweetened, mostly imported , preserving in nice packaging) and matsoun. Among imported dairy products, yogurt forms the largest share. It is worth to be mentioned that the demand for this product was created and developed not by the importers or local distributers but by broad advertisements shown by Russian channels broadcast in Armenia.

Aggregate data available on the website http://comtrade.un.org helps to shed light on the statistics and current trends of the imported yogurts to Armenia. Figure 1 shows value of imported yogurts in Armenia over 10 years in metric tons.

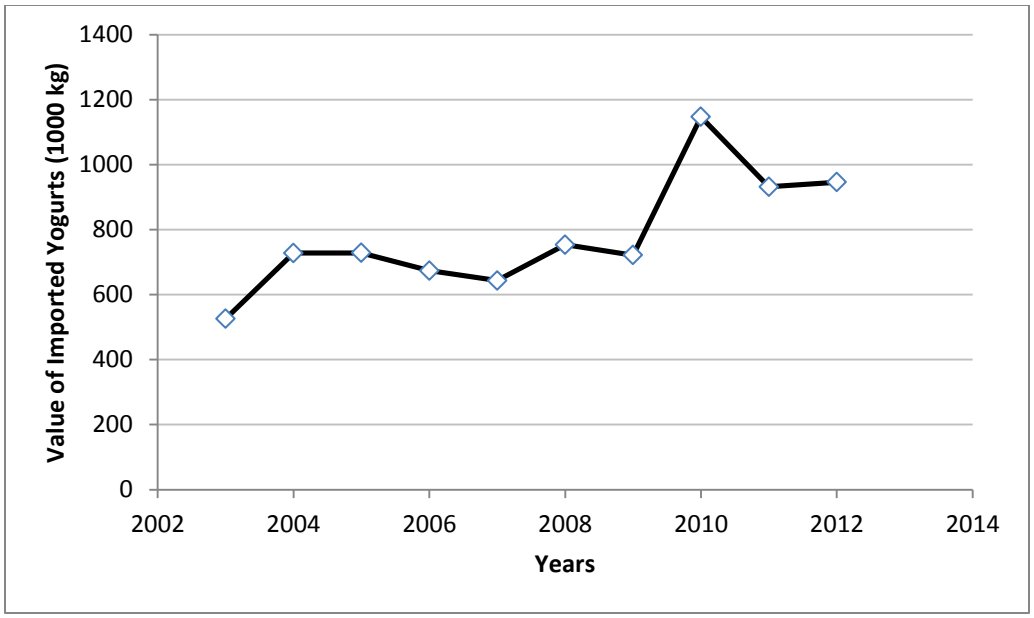

Figure 1 Yogurt import to Armenia from 2003 to 2012 (dollar)
***Source*: Data adapted from http://comtrade.un.org/ 2003;2012.**

Value of imported yogurts oscillated around its mean of 675 thousand dollars until 2009. Started from 2009 value of imported yogurts had risen reaching maximum in 2010 (about 1146 thousand dollar) and going down thereafter.

Figure 2 illustrates past five years percentage of imported yogurts by country; more than 85% of imported yogurts are from Russian Federation, nearly 10% from Germany and the rest from Ukraine and other countries.

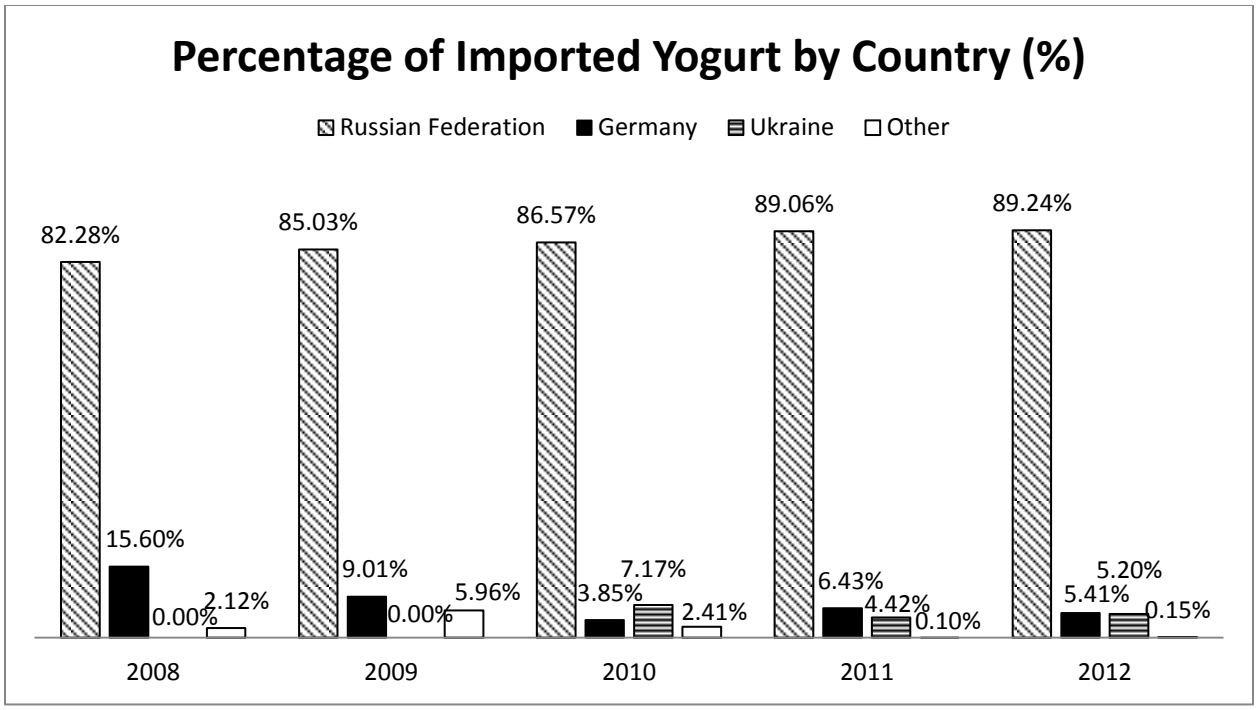

Figure 2 Percentage of Imported Yogurt 2008;2012
***Source*: Data adapted from http://comtrade.un.org/;2008;2012**

The main consumer of the yogurt is children, it is difficult to expect further significant changes in the amounts of imported yogurts, because local producers have started vigorously produce yogurt. The local market producers are Ani Kat, Bonilat, Ashtarak Kat and Marianna. Recently Ani Kat temporally suspended its yogurt production, relying on the internal information, the reason for suspension was low sales and high returns from supermarkets. The Bonilat is new in yogurt market and has managed to grasp only small share of market. The local big players are Marianna and Ashtarak Kat. From the importers side the big players in the Armenia are "Brand Leader"LLC (Ehrmann, Campina .etc) and "Derjava S" CJSC (Danone). Figure 3 illustrates yogurt's market share by brands[1].

[1] The data which used in this paper represents scanner data of yogurt sales from January 1 2011 to December 31 2012 in Star Supermarket Chain and describes in more details in chapter Data.

According to it the top five brands shape nearly 88% of the supermarkets' market. The market leader by sales is Ashtarak Kat(32%) and which is followed by Danone(22%).

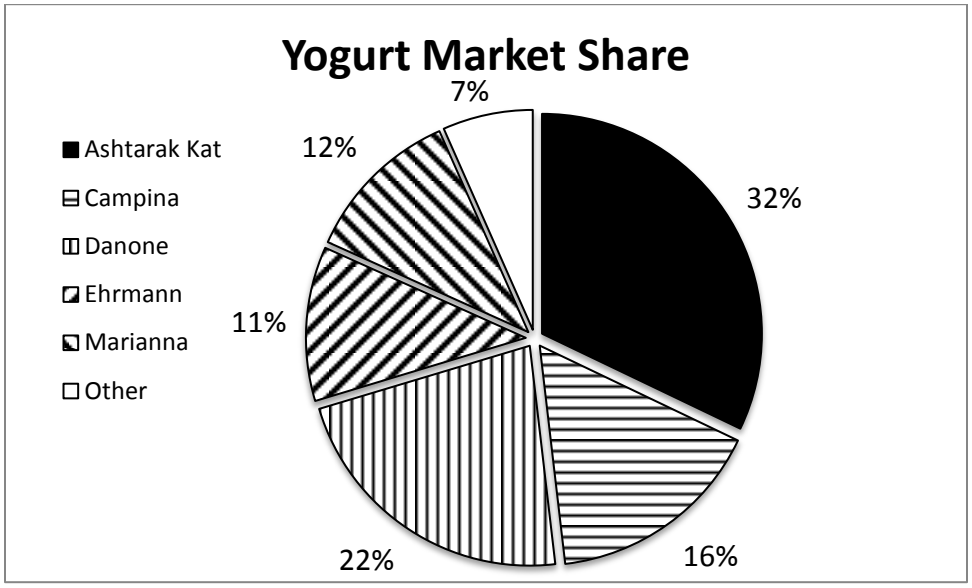

Figure 3 Yogurt market share by sales in the supermarket level
Source: Data adapted from Star Supermarket Chain; 2011,2012

The yogurt market of Yerevan is estimated to consume nearly from 80% to 90% of imported and local produced yogurt. From which approximately 60% has been purchasing from supermarkets.

The retail price in supermarkets is fluctuating from 630 AMD to 7200 AMD per kg for non-drinkable and drinkable yogurts. The sales of both non-drinkable and drinkable yogurt consists nearly 2% of overall food category sales of the supermarkets and 15% of dairy category. The profit margin of yogurt in supermarkets is from 10% to 15%. For locally producers, especially for Ashtarak Kat and Marianna, the supermarkets' management put small margins compare to imported products, whereby making them compatible with imported brands. Because of tough competition both importers and local producers are working with 100% return, the producers use returned product in production of other products for example sweetened curd.

The share of supermarkets in Yerevan is 39%, from which share of main 4 supermarket chains consists nearly 30% (Ameria Group, Retail Trade Sector in Armenia; 2012). In 2012 the main players were Star , Yerevan City, Sas and Moskvichka. From internal source Star Supermarket's share in 2012 between main players was approximately 20%.

Table 1 shows yogurts mean sales, standard deviation, minimum and maximum sales by brands spinning from 2011 to 2012. According to it, not surprisingly, the highest mean has Ashtarak Kat, the second is Marianna. Although Ashtarak Kats' sales are higher, but it has the highest standard deviation, which is conditioned by aggressive promotion strategies implemented by producers and importers.

Table 1 Weekly Sales Statistics by Brand (AMD/GRAMM)

Variable	Mean(amd/gramm)	Std. Dev.	Min	Max
Ashtarak Kat	48,033.1	61,263.7	80.0	629,680.0
Campina	18,909.6	22,974.1	100.0	334,500.0
Danone	14,877.4	36,673.3	90.0	731,160.0
Ehrmann	22,441.1	30,456.1	50.0	529,100.0
Marianna	28,806.3	15,500.5	125.0	103,800.0
Other	18,898.8	15,928.3	100.0	93,500.0

***Source*: Data adapted from Star Supermarket Chain;2011, 2012.**

Figure 4 and Figure 5 show market share for drinkable and non-drinkable yogurts respectively, from Figure 4 can be followed that more than half of the markets' share belongs to Ashtarak Kat, and the least share has Ehrmann. From Figure 5 one can conclude that 28% of non-drinkable yogurt belongs to Danone and Ashtarak Kat possesses only 18% .

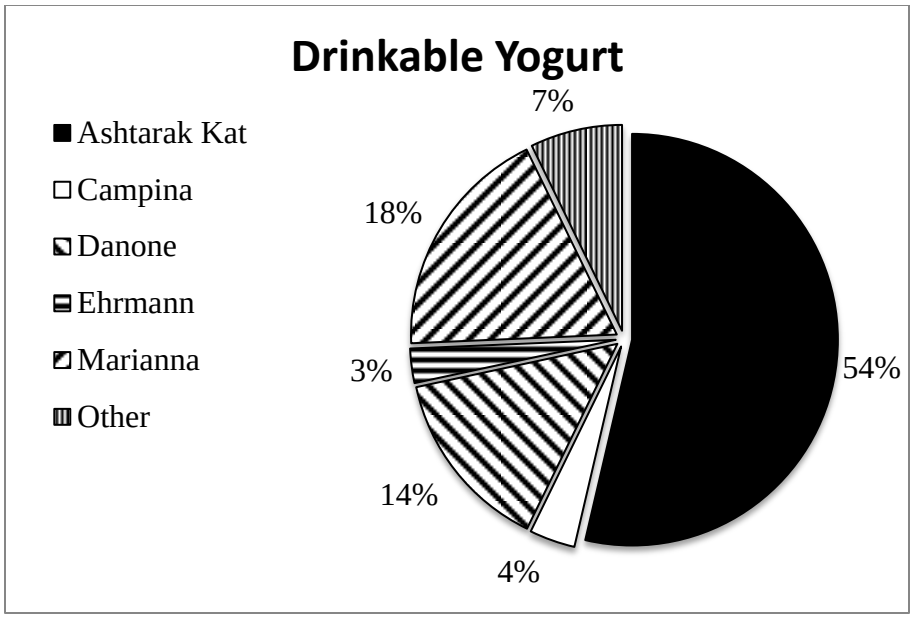

Figure 4 Drinkable Yogurt Market Share By Sales
***Source*: Data adapted from Star Supermarket Chain;2011, 2012.**

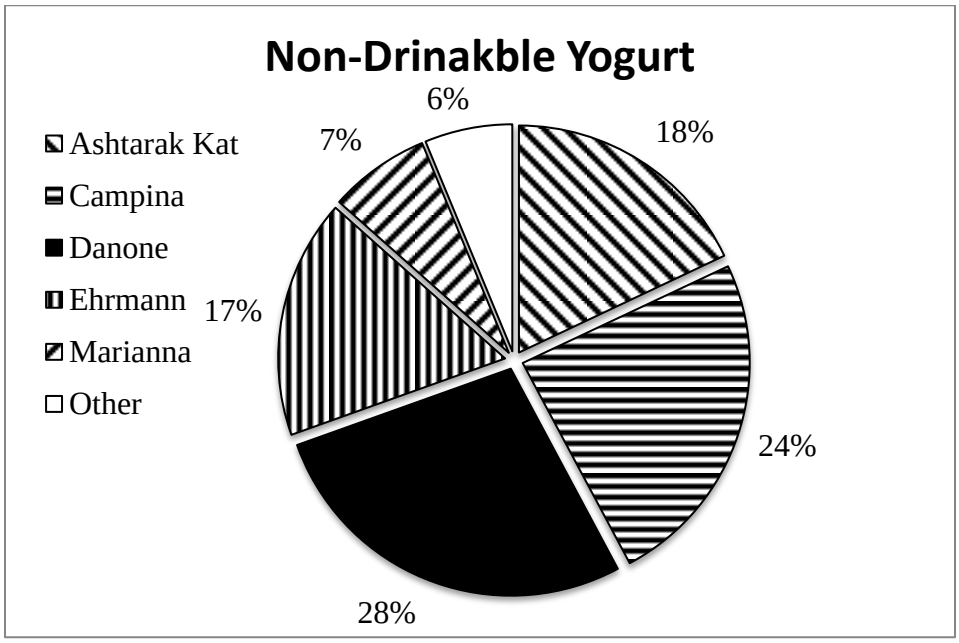

Figure 5 Non-Drinkable Yogurt Market Share By Sales
***Source*: Data adapted from Star Supermarket Chain;2011, 2012.**

Background of the Problem

The testes of consumers are diversified, which is incentive for producers to differentiate their products. Market liberalization and globalization are causing transformation in retail

market. These changes are creating challenges and opportunities in production, in retail and in product marketing. The consumer desire to copy western culture inspired by the advancement in media and advertisement causes to demand value added products. A broad definition of value addition (www.wikipedia.com) is to economically add value to a product by changing its current place, time and from one set of characteristics to other characteristics that are more preferred in the marketplace. The supermarkets are playing significant role in the food supply chain.

Currently supermarkets are providing wide range of products such as yogurt flavored with fruits, coffee, vanilla and etc.

Recently the demand has been growing for low fat yogurts from those who are in slimming diet. In order to be able to meet consumer needs, the producers and retailers need to understand what are the factors that affect price, how consumers perceive the market, what are the attributes that affect consumers choice. As a result economic theory has been adapted to better reflect the consumer preferences and the market situation.

The ability of distribution channel participants (retailer, producer, importer) to value consumer choices, preferences and market perceptions correctly is important if economic efficiency is to be achieved. If there is incorrectness in the valuation it can lead into wrong pricing strategy and marketing strategy which can cost additional money for initiators.

Although a number of actions have been undertaken by the producers and retailers to meet consumers needs, such as promotions, surveys; however the majority of consumers still feel unsatisfied and with undisclosed needs.

Statement of the Problem

To the extent of our knowledge, no estimation of hedonic price and perceptual map illustration in Armenia has been done so far. Related studies used descriptive approach to

describe overall diary market in Armenia. An estimation of hedonic price model will help to better understand quality factors which affect the market price, as well as brand values. An illustration perceptual map will assist to visually understand how the customers perceive top brands in Armenia, is there a perception gap in the market.

Research Question

The primary research questions of this study are

How the yogurts' quality attributes intrinsic prices affect the yogurt price in the Armenia?

How does the Armenian consumer perceive existing yogurt brands?

Purpose of the Study

The **main purpose** of this study are,

I. To identify various quality characters of yogurt which affect the market price
II. To find out the relationship between market price and quality characters in terms of marginal effects and elasticity.
III. To point out the main quality characters which influence consumer choices and preferences.
IV. To illustrate consumer perception of top brands on based of attributes
V. To identify perception gaps in the yogurt market in Armenia

Significance of the Study

The findings of this paper will be of great importance to the yogurt producers, importers by assisting them with their decision-making process relative to price strategy, promotion and meeting consumer needs. Specifically, the findings of this research from hedonic price model

will assist them identify the quality characteristics that interested parties will have focus on designing price strategies. The findings from perceptual map model will assist them to find out gaps in the market, as well as how they can improve their product to better meet consumer perceptions. In addition, the obtained information about brand values will help retailers to identify which brand is appropriate for their pricing strategy.

Limitations

In this study, one supermarket chain, where the majority customers are from low and middle level, was considered as the marketing channel and therefore the study population. So the results can make contradiction for high level supermarkets, because these paper findings are more appropriate for middle and low level consumers. Another limitation of this study is that the data and empirical model do not include consumers' demographic characteristics. A better analysis can be conducted with a hedonic price model that includes consumers' demographic information such as gender, education, age, income and other characteristics. Also data for perceptual map model was obtained from customers which are visiting low-mid level supermarkets, as a result high level customer preferences may not coincide with results from the study.

Organization of the Paper

The rest of the paper is structured as follows. Next a brief reviews of the empirical literature about hedonic pricing and perceptual map is followed by the discussion of the methodology. The data used in this study is discussed in the subsequent section. Then, estimated results are discussed followed by the presentation of yogurt consumers' descriptive analyses in the supermarket level. The final section provides details on the summary, policy and future research recommendations.

LITERATURE REVIEW

Yogurt prices differ considerably from brand to brand. The reasonable question that arises is what factors determine the price of yogurt. This paper intents to assist to a better understanding of the yogurt market by using an approach, which takes into consideration two sides of market, demand and supply. Specifically, for analyze retail prices have been used as a fundamental. The data shows that prices are irregular. In fact the prices are varied from 630 AMD to 7200 AMD per kilogram during 2011 to 2012. Hedonic price model and perceptual mapping method have been used as most consistent tools for this paper.

The Hedonic Price Model

In microeconomics, the Consumer Theory is concerned with the consumer rationality in making consumption decisions. Consumer Theory is a method to analyze how consumers may achieve equilibrium in their preferences and expenditures by maximizing utility as subject to financial constraints (Böhm, Volker; Haller, Han (1987). A vital conflict in this theory is that traditional theory of consumer demand looks on goods as they are simply, what consumers would like more of; in other words the goods are what are thought of as goods(Lancester 1966), which does not take the intrinsic properties of goods into consideration. The letter fact makes impossible to deal with problems such as new commodities and discussion about quality differentiation. In the theory for the particular goods, the intrinsic properties that make for example water different from gold ,have been omitted, as a sequence it is assumed that the consumer who purchase water alone is as rational as a consumer who consumes gold, but one who interchangeably consumes and gold and water, is considered as an irrational. First success, in offering solution for this conflict had Morishima (1956), he offered something similar to that of the hedonic price method. The hedonic theory suggests that goods do not themselves source

for consumer utility, but in opposite, the goods utility is valued as a summation of utilities for each attribute.

The first pioneers, who dared to deny the traditional approach and develop new way was Becker (1965),Lancaster (1966), and Muth (1966). In their works, they showed that consumer utility is not directly from goods, but instead it is from intrinsic properties or characteristics of goods. This fact makes possible for researchers to examine dissimilar goods such as houses, cars, food and other agriculture commodities within the traditional consumer theory scheme.

The literature examination brought out that considerable amount studies have concentrated on the yogurt market. The majority part of this studies have focused on identification of the components of yogurt that are probably appeal for consumers (Bayarri, Carbonell, Barrios, & Costell, 2010;Johansen et al., 2010; K¨ahk¨onen et al., 1997; K¨alvi¨ainen, Roininen, & Tuorila, 2003; Luckow et al., 2005). These studies were conducted in different countries; however the fundamental common finding is that the most influential attributes for yogurt, which is attracting for consumers are fat, sugar, calorie, taste and brand.

The hedonic price approach has been using as a very popular tool for researchers. There are many works in food market, such as Brorsen, Grant, and Rister (1984) studied the price structure in the rice market in the United States. Espinosa and Goodwin (1991) considered a hedonic price model for different quality characteristics of wheat. They found out that standard grading characteristics and a variety quality characteristics of ultimate users influence wheat price. The other research was implemented by Tronstad, Huthoefer,and Monke (1992), they examined apples attributes for U.S. consumers. The outcomes suggest that size, storage method, grade, and seasonality are the most important influences on the price of apples. Other works have been concentrated on wine (Nerlove, 1995; Oczkowski, 1994; Schamel, 2006; Steiner, 2004),

carbonated beverages (Mart´ınez-Garmendia, 2010), fresh meat (Loureiro & McCluskey, 2000;Ward, Lusk, & Dutton, 2008), pasta (Cembalo, Cicia, Del Giudice, Scarpa, & Tagliafierro,2008), eggs (Karipidis, Tsakiridou, Tabakis, & Mattas, 2005; Satimanon & Weatherspoon,2010).

Although a variety of hedonic analysis have been implemented for agriculture and food products, there is only one hedonic price analyze that has been conducted for yogurt market (Domenico Carlucci, Antonio Stasi, Gianluca Nardone, Antonio Seccia; 2013). The data was contained from 692 observations and as the main attributes for yogurt they took package size, container size, material, flavor, fat and brand. As a result they revealed that fat does not affect price, while flavor had only a moderate effect. They found that the price is strongly related to brand and not surprisingly material size has negative effect.

Perceptual Mapping Method

A hedonic price theory gives insights about how product price can be summarized by its decomposed attributes value, however it is not illustrates how consumer perceives particular brand by its attributes and how they compare it with other similar category brands. For solving this problem marketers usually use perceptual mapping method. A perceptual map is a visual illustration of how target customers view the competing alternatives in a Euclidean space which represents the market (Lilien, Rangaswamy;2003). The perceptual map is constructed by the data that reflect consumer perceptions of brands in the market place. The perceptual map is the function of multidimensional scaling (MDS) and various factorial techniques, such as principal component analysis (PCA), correspondence analysis (CA) and discriminant analysis (DA). In this context a perceptual map is a graphical display in which brands are portrayed in such a way that distances between brands reflect their differences as measured by the variables on which

they are evaluated. These variables can be rank-orderings provided by a sample of consumers, or as detailed as a set of attributes for which each consumer expresses their perception with the brands, either in the form of an indication of brand-attribute associations or rating-scale measurements. This tool is very useful for marketing managers, because they job is to make decisions about product design and brand positioning (DeSarbo and Rao, 1986; Eliashberg and Manrai, 1992),customer value (Wu et al., 2006) and understanding relationship among consumers perceptions (Manrai and Sinha, 1989) the fundament for this decision managers might take from consumer evaluations and choices of perceptual attributes (Kaul and Rao 1995; Van Kleef et al. 2004). A product can be characterized as a bundle of attributes, and each brand receives a score on each attribute (Lancaster 1971). Then the brands can be illustrated graphically in a so-called perceptual map that spans the attributes. The perceptual mapping has confirmed very positively for managers (Cornelius et al. 2010; Johnson and Hudson 1996), and research that suggests improvements to perceptual maps adds to product and brand management abilities (Day et al. 1979; Dillon et al. 1985; Kaul and Rao 1995; Shocker and Srinivasan1979; Van Kleef et al. 2004).

The literature search shows that there are many works which use factor analysis method to explore the market and construct presented way of customer perception. The most works have been targeted food market, for example (Ayaz, Karthikeyan B., Vignesh S., Teotia, Singh; 2009), they focused on tea and coffee market in India, they tried to find customers perception toward two attributes sweetness/bitterness and aroma. The other work concentrated on organic food consumer in China (Titolo Tesi;2009) found out the consumers attitude toward attributes such as safety, healthiness, pure and natural etc. Perceptual mapping method also effectively have been

using from mobile industry represents (Ashutosh Nigam, Rajiv Kaushik;2011). They have illustrated perceptual mapping of prepaid mobile cellular operators.

Although myriad amount of works in both hedonic pricing and perceptual mapping methods the literature review shows that this paper has its own distinctive features. First of all this paper is the first illustration of perceptual mapping in yogurt market in Armenia for supermarket level and there is no other work about yogurt market perceptual mapping. Another distinguishing characteristic of the present study is that it augments the only work in hedonic price model analysis for yogurt market (Domenico Carlucci, Antonio Stasi, Gianluca Nardone, Antonio Seccia; 2013) by including a variable dealing with the quantity sold and the promotion, as well as by separating drinkable and non-drinkable yogurt categories.

METHODOLOGY

Hedonic Price Model

The core difference between the traditional demand theory and the hedonic pricing theory is the uniqueness in moving from the traditional approach, that goods are the straightforward objects of utility and, instead, assuming that it is the properties or characteristics of the goods from which utility is derived (Lancaster 1966). Lancaster suggests that consumption is an activity in which utility or preference orderings are assumed to rank collections of characteristics and only to rank collections of goods indirectly through the characteristics that they possess. The fundaments of this approach can be summarized into three separate assumptions (Lancaster 1966).

1. The good does not give utility to the consumer; it possesses characteristics, and these characteristics give rise to utility.
2. In general, a good will own more than one characteristic, and many characteristics will be shared by more than one good.
3. Goods in combination may carry characteristics different from those pertaining to the goods separately.

Those fundaments served as a base for researchers and scientist for further development of the model. Respectively, Rosen (1974) elaborated a theoretical model determining that the observed price of a product can be considered as the sum of the prices related with each of its quality attributes. Despite the fact that this prices do not explicitly known by the market, they can be estimated by utilizing regression model, which is called the hedonic price model. The hedonic price model is suitable of expressing the price of a product as a function of its quality features.

According to the Rosen(1974) framework, a hedonic price model is described as

$$P(V) = P(v_1, v_2, \ldots, v_i, \ldots, v_n)$$

Where P is the price of observed product and leads both consumers and producers choices relating to set of characteristics bought and sold.

V = v1,v2, . . . , vi, . . . , vn is a vector of n attributes that perfectly describe product quality.

Rosen(1974) explained the partial derivative of the estimated hedonic price function with respect to the specific attribute i ($\frac{\delta P(V)}{\delta V_i}$) as a shadow price, this results can be easily acquired from regression analyze. Then using the regression results, the implicit marginal prices can be estimated, ($\frac{\delta P(V)}{\delta V_i}$)*$\bar{P}$,for each buyer and seller, evaluated at the amounts of characteristics actually bought and sold, where $\bar{P}$ is the mean price.

According to the Rosen(1974) subject to financial constraint consumers maximize utility by choosing available products, and firms maximize profits given the available technology and prices. However this model viable only under the assumption that the market is a perfect and is in equilibrium. Therefore, associated to both supply and demand conditions, shadow prices may not be considered merely as indicators of consumer preferences (Oczkowski, 1994;Rosen, 1974; Schamel, 2006).In addition, even if the market is not perfect, the shadow prices are also affected by the choices of producers who take into account their own market power, price elasticity of demand for each attribute, and the costs (Hassan & Monier-Dilhan,2006).

The empirical specification of the hedonic price model is

$$P = \beta_0 + \sum_{k=0}^{k} \beta_k \, q_{ki} + u_i, \quad (1)$$

Where P_i is observable price, and $q_{k1.}q_{k2} \ldots \ldots .. q_{ki}$ are k observable quality characteristics, $\beta_k\, s$ are regression coefficients, which are associated with each attributes shadow or implicit prices and u_i is error term. The core information included in the estimated hedonic price equation are price of product, quantities of characteristic and implicit price of characteristic (Berndt, 1991). The other functional forms are log-linear, (2) linear-log (3) and log-log (3).

$$\ln(P)_i = \beta_0 + \sum_{k=0}^{k} \beta_k\, q_{ki} + u_i \quad (2)$$

$$P_i = \beta_0 + \sum_{k=0}^{k} \beta_k \ln(q_{ki}) + u_i \; (3)$$

$$\ln(P_i) = \beta_0 + \sum_{k=0}^{k} \beta_k \ln(q_{ki}) + u_i (4)$$

In case of log-linear approach (2), regression coefficients interpreted as growth rates. The coefficient i (i =1, 2, …, m) shows the rate at which the price changes at a certain level, given the characteristic q. In log-log approach (3), the regression coefficients can be interpreted as partial elasticity _i (i = 1, 2, …, m) indicates how many percent the price P changes at a certain level if the i-th characteristic q_i changes by one percent. The term elasticity in hedonic approach also termed as flexibility (McConnell and Strand, 2000).

In the literature there are a few works where hedonic price model have estimated by scanner data. The drawback of such data is that the retailers set the price without considering supplier opinion, so it is easy to encounter in the same supermarket chain two different prices in the two different stores. So we assume that if everything else is constant, the store which has lower price sells more than the highest one. Therefore, we cannot neglect quantity sold variable,

which shows dynamic of sold products. Martinez-Garmendia (2009) is the first pioneers, who has included quantity sold as an independent variable and proved that neglecting this variable entails biased estimation of consumers preferences than (Kim,Chung;2011) used quantity sold variable in their model for eggs market. In the works, where used time series data authors also included seasonality, but in this paper is more preferable do not include seasonality, because interviews with experts from yogurt producing or importing companies in Armenia revealed that they do not have defined price strategy for seasonality. Mostly the price change is conditioned with promotion or if the product approaching to expire date and firm has unsold inventory in warehouse. Stock surpluses can occurred due to false stock planning which we can include to the model only with form of error term or surplus can be result of competitor promotion. So the important reason for price variety is not the seasonality, it is promotions. One of the few works that include promotion effect in hedonic price models was estimated for Finfish and Shellfish Attributes (Larkin, Glen Gold, 2012),they found that promotional efforts by the finfish and shellfish retailers are successful in increasing the average revenue in both finfish and shellfish markets.

Table 2 Variables of the Empirical Model

Variable	Typology	Description
Dependent Variable		
Price	Continuous	Price of yogurt
Regressors		
Quantity sold	Continuous	Quantity sold
Calorie	Continuous	Product calorie
Container size	Continuous	Container size
Ashtarak Kat	Dummy	Brand Ashtarak Kat=1 ; otherwise=0
Campina	Dummy	Brand Ashtarak Kat=1 ; otherwise=0
Danone	Dummy	Brand Campina=1 ; otherwise=0
Ehrmann	Dummy	Brand Ehrmann=1 ; otherwise=0
Marianna	Dummy	Brand Marianna=1 ; otherwise=0

Other	Dummy	Brand Other=1 ; otherwise=0
fat_free	Dummy	1 for fat less than 0.5g; 0 otherwise
Low_fat	Dummy	1 for fat less than 3g; 0 otherwise
High_fat	Dummy	1 for fat more than 3g; 0 otherwise
Promotion	Dummy	1 for promotion; 0 otherwise

The choice of functional form can have an effect on the result and the conclusion reached (Halvorsen and Pollakowshi, 1981). The procedure named as Box-Cox or Box- Tidwell can be used to compare alternative functional form (Berndt,1991). The basic idea behind it is that for comparing goodness of fit of models in which the dependent variable is in log form, it will give wrong result to compare R^2 . The total sum of squares (TSS) in Y is not the same as the TSS for lnY, therefore comparing R^2 is not valid. So for being able to test for the appropriate functional form of the dependent variable, the data should be transformed so as to make RSS (Residual Sum of Square) comparable (Appendix A). From Appendix A one can conclude that RSS for linear model(270.52) is higher than for log-log model (123.62), so for model estimation, double-log form is more suitable. The empirical estimation of the hedonic price model with dependent variable modeled as a function of a set of attributes of product quality characteristics is written as follows.

$$(1)\quad lnprice_{it} = \beta_0 + \beta_1 lnQuantity_{it} + \sum_{j=2}^{3} \delta_j Calorie_{ijt} + \sum_{j=2}^{3} \delta_j ContainerSize_{ijt}$$

$$+ \sum_{j=2}^{5} \gamma_{ijt} Brand_{ijt} + \sum_{j=2}^{3} \delta_j Fat_{ijt} + \vartheta_{it} Promotion_{it} + \varepsilon_{it} \quad (5)$$

The variables included in the empirical model are described in the Table 2. The dependent variable is Price, which is continuous variable and indicates price per gram, the other continuous variable is quantity sold and the rest variables are dummy variables. The ε_{it} is error

term and describes the product quality characteristics which do not included in the model. It is expected negative sign before quantity sold which is not surprising because of law of demand, as well as have been expected the negative sign also for container size and promotion variables.

An equation dealing with the hedonic price analyses for the non-drinkable was specified the same way as for drinkable yogurt. The description of variables are the same as for the (5) equation. The only difference is the container size determination. For the non-drinkable category the small container size is determined when the product size is less than 115 gram, and large if size is more than 115 gram.

Perceptual Mapping Model

The illustration of any perceptual map needs many graphical design decisions to be made, either by the creator of the map or automatically by the software. For example, the style and scale to be used on axes; the labeling to be applied to points and/or lines; and the text of any title or captions. Though those seem insignificant, such decisions are important as they influence on the ability of the map to clearly and accurately represent the underlying data.

The 10 items of the attributes affecting consumer perception about yogurt purchase were subjected to principal component analysis (PCA) using SPSS version 16. Prior to performing PCA, the suitability of data for principal component analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 (Table 3) and above. The kaiser-meyer-olkin value was .75 (Table 4), exceeding the recommended value of .6 (kaiser 1970, 1974) and Bartlett's test of sphericity (Bartlett 1954) reached statistical significance, supporting the factorability of the correlation matrix.

Principle components analysis revealed the presence of three components with eigenvalues exceeding 1, explaining 28.7%, 11.83%, 11.166% of the variance respectively . An

inspection of the scree plot revealed a clear break after the second component (Figure 6).Using Catell's (1966) scree test, it was decided to retain two components for further investigation. this was further supported by the results of parallel analysis, which showed only two components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (10 variables x 175 respondents).

The two-component solution explained a total of 40.101% of the variance, with component 1 contributing 28.27% and component 2 contributing 11.83% (Table 5). To aid in the interpretation of these two components, Oblimin rotation was performed. The rotated solution revealed the presence of simple structure (Thurstone 1947), with both components showing a number of strong loadings and all variables loading substantially on only one component. There is a weak positive correlation between the two factors (r = -.287) (Table 6).

Table 3 Correlation Matrix

Correlation Matrix	Taste	Price	Quality	Packaging	Availability	Freshness	Healthiness	Artificial additives	Flavor
Taste	**1.00**	0.12	**0.53**	0.21	0.04	0.27	0.29	0.09	0.25
Price	0.12	**1.00**	0.16	0.20	0.18	0.04	0.02	0.02	0.17
Quality	**0.53**	0.16	**1.00**	**0.34**	0.18	**0.37**	**0.34**	0.04	0.23
Packaging	0.21	0.20	**0.34**	**1.00**	0.13	0.11	0.18	0.06	0.19
Availability	0.04	0.18	0.18	0.13	**1.00**	0.24	0.08	0.01	0.09
Freshness	0.27	0.04	**0.37**	0.11	0.24	**1.00**	**0.37**	-0.03	0.17
Healthiness	0.29	0.02	**0.34**	0.18	0.08	**0.37**	**1.00**	0.20	0.20
Artificial additives	0.09	0.02	0.04	0.06	0.01	-0.03	0.20	**1.00**	0.11
Flavor	0.25	0.17	0.23	0.19	0.09	0.17	0.20	0.11	**1.00**
Prestige	0.26	0.26	0.29	0.17	0.15	0.27	0.22	0.12	**0.41**

***Source*: Data is obtained from survey; 2014**

Table 4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.74
Bartlett's Test of Sphericity	Approx. Chi-Square	899.16
	df	45.00
	Sig.	0.00

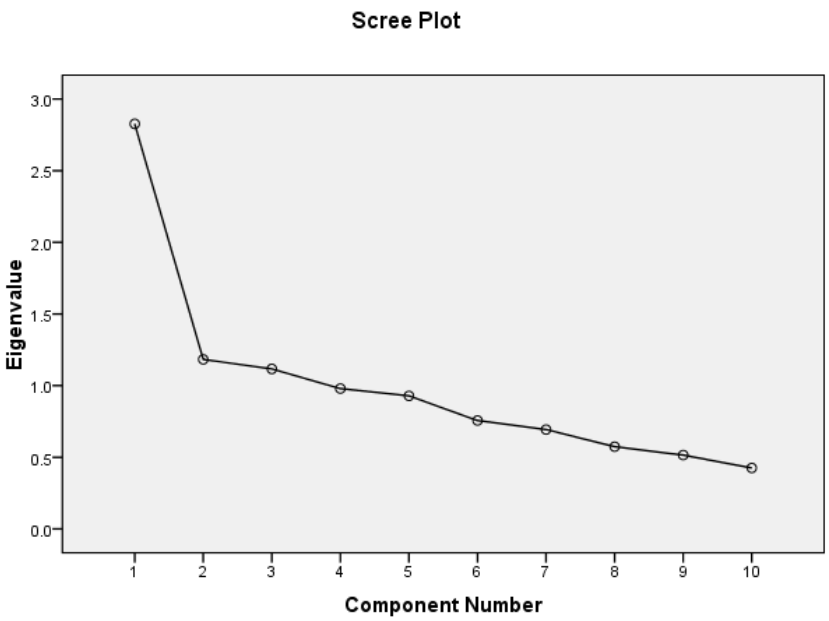

Figure 6 Scree Plot

Table 5 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.83	28.27	28.27	2.83	28.27	28.27	2.41
2		1.18		1.18	11.83	40.10	2.06
3	1.12	11.17	51.27				
4	0.98	9.79	61.06				
5	0.93	9.29	70.35				
6	0.76	7.56	77.91				
7	0.69	6.94	84.85				
8	0.57	5.74	90.59				
9	0.52	5.15	95.74				

10	0.43	4.26	100.00

Extraction Method: Principal Component Analysis.

Table 6 Total Variance Explained

Component	1	2
1	1	0.287088448
2	0.287088448	1

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

DATA

In this paper two types of data have been used. The first data , which answers in first research question, is the weekly scanner data spinning from 01 January 2011 to 31 December 2012 and including of all yogurt purchases (drinkable and non-drinkable) from Star Supermarket Chain. The scanner data collected all 30 stores sells, from which 28 were located in different districts of Yerevan and 2 in marzes. Second data was obtained from surveys, where 200 respondents took participation. The following subchapters describe the data used in more details.

Hedonic Price Model

In the first data prices were measured in Armenian dram per gram of yogurt and sales quantities were measured by the grams also. The initial data for quantity was per piece, for making data per gram each SKU's(Stock Keeping unit) quantity should be multiplied by volume. The data set includes a total both for drinkable and non-drinkable yogurt 11399 observations for 221 SKU. Table 7 shows number of SKU (Stock Keeping Number) and average sales for SKU for drinkable and non-drinkable yogurt.

Table 7 Number of SKU, Average Sales Per SKU

Brand	Number of SKU	Average Sales (Gram)	Average Sales Per SKU
Drinkable			
Ashtarak Kat	29	35,517.44	1,224.74
Campina	11	9,823.61	893.06
Danone	42	6,442.38	153.39
Ehrmann	6	8,628.67	1,438.11
Marianna	10	31,064.55	3,106.46
Other	9	22,195.23	2,466.14
Non-Drinkable			
Ashtarak Kat	3	153,098.30	51,032.77
Campina	32	20,776.17	649.26

Danone	29	27,051.56	932.81
Ehrmann	25	26,923.37	1,076.93
Marianna	5	25,649.72	5,129.94
Other	20	16,976.77	848.84

***Source*: Data adapted from Star Supermarket Chain;2011, 2012.**

As showed in the Table 7 for drinkable yogurts highest sale per SKU has Marianna(3105.46 AMD) and the lowest Danone(153.39). For non-drinkable yogurts highest sale has Ashtarak Kat with spectacular 51,032.77 AMD with only 3 SKU which is due to aggressive promotions, and least has Campina (932.81 AMD).

In the Table 8 is illustrated the descriptive characteristics of the data used.

Table 8 Descriptive Statistic of the Data Used for Drinkable Yogurts

Variable	Obs	Unit of Measurment	Mean(AMD)	Std. Dev.	Min	Max
Price	5639	AMD/Gram	1.79	0.96	0.64	4.78
Quantity	5639	Gram	18733.54	28800.74	80	629680
Ashtarak Kat	1595	AMD/Gram	35517.44	45420.28	80	629680
Campina	386	AMD/Gram	9823.61	7122.82	285	39900
Danone	2354	AMD/Gram	6442.38	6646.71	90	89000
Ehrmann	331	AMD/Gram	8628.67	5139.38	250	25000
Marianna	629	AMD/Gram	31064.55	16003.42	300	103800
Other	344	AMD/Gram	22195.23	19167.79	360	93500
Fat_free	234	AMD/Gram	1.26	0.08	0.99	1.33
Low-fat	5405	AMD/Gram	1.82	0.99	0.64	4.78
Low_cal	5292	AMD/Gram	1.80	0.99	0.64	4.78
High_cal	347	AMD/Gram	1.70	0.42	1.15	3.03
small_size_drink	2092	AMD/Gram	2.27	1.24	0.64	4.78
mid_size_drink	2749	AMD/Gram	1.53	0.61	0.82	3.07

large_size_drink	798	AMD/Gram	1.44	0.54	0.66	2.67
promotion	738	AMD/Gram	2.07	0.83	0.64	4

***Source*: Data adapted from Star Supermarket Chain;2011, 2012.**

The dependent variable price is constructed by dividing sales amount to corresponding volume sales and then deflated by the consumer price index for the Armenia (The numbers about consumer price index was taken from www.armstat.am). The information about products calorie, fat and container size is obtained from the producers and importers. According to the FDA standards (www.fda.com) product is considered fat-free, low fat or high fat if fat in it less than accordingly 0.5g, less than 3g or more than 3g in 100g. The dummy variables have been created correspondingly to FDA definition, however in the data there is no any high fat drinkable yogurt. Ashtarak Kat, Campina, Danone, Ehrmann and Marianna are top yogurt brands in Armenia (Figure 1.3), in "Other" variable have included all other brands, which exist in Armenia. Promotion variable is created by following internal rules of Star Supermarket. In Star Supermarket chains promotions had carried frequent character and the rule of conducting promotion was the price reduction could not be less than 5% of product price and the shortest allowed duration is one week. Consequently, "promotion" variable equal to 1 when for the price range of particular SKU price is less than 5% of SKU's average price. The producers and importers offer products in a broad variety container sizes, especially for drinkable yogurts. That is why three dummy variables which are indicating container sizes respectively for less than 200gram, between 200 and 300, and 300 gram and more have been created. According to FDA definition product is considered as a low-calorie if for 100gram serving size Kcal in it is less than 100 kcal. Variables for calorie ware created based on that definition. Table 9 shows descriptive statistic of the data used for non- drinkable yogurts.

Table 9 Descriptive Statistic of the Data used for Non Drinkable Yogurts

Variable	Obs	Unit of measurement	Mean	Std. Dev.	Min	Max
Price	5760	AMD/Gram	2.00	1.04	0.63	7.2
Quantity Sold	5760	Gram	27,998.04	44,774.96	50	731160
Ashtarak Kat	190	AMD/Gram	1.29	0.11	1.17	1.45
Campina	1879	AMD/Gram	1.66	0.29	0.95	2.35
Danone	1631	AMD/Gram	2.83	1.29	0.63	5.78
Ehrmann	1020	AMD/Gram	1.83	1.20	1.02	7.2
Marianna	450	AMD/Gram	1.43	0.01	1.4	1.44
Other	590	AMD/Gram	1.79	0.67	1.3	3.45
Fat_free	1336	AMD/Gram	1.61	1.05	1.02	7.2
Law-fat	2826	AMD/Gram	1.95	0.84	0.63	5.43
High-fat	1598	AMD/Gram	2.42	1.19	1.25	5.78
low_cal	4628	AMD/Gram	1.73	0.72	0.63	7.2
high_cal	1132	AMD/Gram	3.13	1.33	1.17	5.78
small_size_nondrink	3577	AMD/Gram	1.91	1.02	0.64	7.2
large_size_nondrink	2183	AMD/Gram	2.16	1.05	0.63	5.43
Promotion	1304	AMD/Gram	1.70	0.91	0.63	6.82

***Source*: Data adapted from Star Supermarket Chain;2011, 2012.**

Because non-drinkable yogurts do not distinguish by diversity of container sizes, in this paper size have separated into two parts; small when container is less than 115 gram and large if container more than 115gram. The other variables were created in the same way as for drinking yogurts.

Perceptual mapping model

For obtaining second data, which will allow as to use principal component analysis(PCA) method and construct perceptual map the survey have conducted and was collected a data set containing 200 respondents. From preliminary conducted online survey have been taken 10 attributes (Taste, Price, Quality, Packaging, Availability, Healthiness, Artificial Additives, Flavor, Prestige), which describe main influential factors for consumer perception about brand image. Then in base of face-to-face interview the interviewer asked respondent for particular brand to scale each attribute from 1(very bad) to 5 (very well). I have included in questionnaire top 5 yogurt brands in Armenia (Ashtarak Kat, Campina, Danone, Ehrmann, Marianna). Sample of the questionnaire is in **Appendix B**. The Table 10 represents the descriptive statistic of used data by brands and attributes.

Table 10 Descriptive statistic of used data by brands and attributes

Brand_Name		Taste	Price	Quality	Packaging	Availability	Freshness	Healthiness	Artificial additives	Flavor	Prestige
Ashtarak Kat	Mean	3.99	3.52	3.91	4.06	4.39	4.18	3.80	3.01	4.21	4.17
	Std. Dev	1.10	0.86	0.95	1.00	0.83	0.90	1.03	1.14	0.89	1.00
Campina	Mean	4.03	3.86	3.90	4.15	4.32	3.93	3.52	3.04	4.38	4.41
	Std. Dev	4.03	0.97	1.02	0.87	0.83	1.01	1.00	1.02	0.76	0.81
Danone	Mean	4.33	3.86	4.23	4.39	4.20	4.09	3.69	3.21	4.54	4.66
	Std. Dev	0.84	1.08	0.89	0.81	0.84	0.93	0.96	1.05	0.69	0.64
Ehrmann	Mean	4.10	3.75	3.91	4.34	4.16	3.89	3.48	3.16	4.44	4.40
	Std. Dev	0.93	0.96	0.80	0.78	0.83	0.93	0.88	1.01	0.74	0.75
Marianna	Mean	3.82	3.54	3.87	4.06	4.38	4.14	3.73	3.13	4.10	4.09
	Std. Dev	1.23	0.91	1.01	0.92	0.83	0.89	0.98	1.11	0.93	0.97
Total	Mean	4.04	3.69	3.96	4.18	4.30	4.07	3.66	3.11	4.31	4.32
	Std. Dev	1.07	0.96	0.95	0.90	0.84	0.93	0.98	1.07	0.84	0.89

***Source*: Data is obtained from survey, 2014**

According to Table 10 the highest mean between brands for the Taste attribute has Danone, the lowest Marianna. For the Price and Quality attribute Campinas' and Danones' mean values are equal, however for the Packaging and Availability attribute the highest mean has Danone. Ashtarak Kat perceived as a brand which has highest mean for attributes Freshness and Healthiness. And for the rest three attributes again Danone has the highest mean values.

ESTEMATED RESULTS

Hedonic Price Model

The data have been estimated by model mentioned above and Stata 10.1 have been used for running this model. Before starting result interpretation, it is worth to examine some of issues, which are inherent to models having econometric nature. During estimation of result it is obligatory to check the data against autocorrelation, and multicollinearity. These two issues may lead the results to be biased.

Multicollinearity means the existence of a "perfect," or exact, linear relationship among some or all explanatory variables of a regression model (Gujarati;2003). If data suffered from multicollinearity the estimated coefficients cannot be estimated with great precision or accuracy. There are several method that allows to gauge strength of multicollinearity in the data. In this paper for estimation variance inflation factor (VIF) is used. Following to rule of thumb if VIF is more than 10 it may be reason for concern(**Gujarati; 2003**). Table 11 shows VIF output, from it can be concluded that our data does not suffer from multicollinearity.

Since the data used in this paper contains a panel nature data with weekly time series and cross sectional observations the results can be suffered from serial correlation which makes the standard errors biase, so the data needs to be identified against autocorrelation. There are proposed a number of tests for serial correlation, however I choose the test discussed by Wooldridge (2002). First of all it is very easy to implement and it requires comparably few assumptions. Wooldridge's method uses the residuals from a regression in first-differences (David M. Drukker;2003). The null hypothesis for Wooldridge's method is no first –order autocorrelation and if data's F value is higher than F critical for specific degree of freedom the test reject null hypothesis. In the table 6.3 is illustrated output for Wooldridge's, from the output

there is no doubt that the data suffered from autocorrelation. In the literature there are known many solutions for correcting autocorrelation. For this paper Prais-Winston have been shoosen as an estimation method, which is a modification of Cochrane-Orcutt estimation in a manner that it does not lose the first observation and leads to more efficient results (Prais,Winsten;1954). Appendix C shows output from Stata before and after correction from autocorrelation for both drinkable and non-drinkable yogurts. From the Appendix C we can conclude that Durbin Watson estimators correct from 0.14 to 2.59 and from 0.09 to 2.32 for drinkable and non-drinkable yogurt models correspondingly. As well as there are changes in coefficients and standard errors.

Table 11 Test Result for Multicollinearity for Drinkable Category

Variable	VIF	1/VIF
Ashtarak_Kat	2.76	0.36
Campina	2.65	0.38
Fat_free	2.62	0.38
Ln_Quantity	2.36	0.42
L3.ln_Qantity	2.18	0.46
Large~_drink	1.97	0.51
Other	1.89	0.53
Small~_drink	1.85	0.54
Marianna	1.72	0.58
Low_cal	1.41	0.71
Ehrmann	1.37	0.73
Promotion	1.14	0.88
Mean VIF	**1.99**	

Test Result for Multicollinearity for Non-Drinkable Category

Variable	VIF	1/VIF
Campina	2.52	0.40
Ehrmann	2.17	0.46
Small_Size~k	1.9	0.53
Low_cal	1.85	0.54
Marianna	1.63	0.61
Fat_free	1.59	0.63

Other	1.58	0.63
Ln_Quantity	1.51	0.66
High_fat	1.5	0.67
Ashtarak_Kat	1.27	0.79
Promotion	1.17	0.85
Mean VIF	1.7	

Table 12 Test for Autocorrelation for Drinkable Category

```
Wooldridge test for autocorrelation in panel
data
H0: no first-order autocorrelation
F(  1,     102) =     41.949
Prob > F =      0.0000
```

Test for Autocorrelation for Non-Drinkable Category

```
Wooldridge test for autocorrelation      in      panel    data
H0: no first-order autocorrelation
F(  1,     98) =    255.267
Prob > F =      0.0000
```

Table 12 shows autocorrelation corrected estimates of coefficients, standard errors and marginal implicit prices. The letter is calculated by multiplying the average price to the partial derivative of price with regard to each product attribute (Rosen, 1974). According to Table 13, all variables except *Large_container_size* dummy variable are statistically significant at 1% significance level and *fat_free* dummy variable which is statistically significant at 10% significance level, R^2 equal to 52.21%, which means 52.21% of the variation of independent variable (*lnprice*) is explained by model. Also the empirical model shows a good overall significance F(11, 5309)=537.26 and relative P-value=0.000, which means that the all the independent variables (Xs) are jointly statistically significant at the 1% significance level.

Table 13 Model Coefficients, Associated P-Values, Standard Errors, Marginal Implicit Prices

Variable	Coefficient		Marginal Implicit Prices[2]
Constant	1.1902		
	(0.0000)	*	
Quantity Sold			
ln_Quantity	- 0.0127		
	(0.0000)	*	
Container Size (base: middle size)			
Small_Container _Size	0.4094		77.78
	(0.0000)		
Large_Cont~e	- 0.1139	**	- 21.65
	(0.0110)		
Product Calorie (base: high_cal)			
low_cal	- 0.2592		-49.25
	(0.0000)	*	
Brand Value(base: Danone)			
Ashtarak_Kat	- 0.9280		-176.31
	(0.0000)	*	
Campina	- 0.3432		-65.21
	(0.0000)	*	
Ehrmann	- 0.4790		-91.00
	(0.0000)	*	
Marianna	- 0.9912		-188.33
	(0.0000)	*	
Other	- 0.8425		-160.08
	(0.0000)	*	
Fat Amount(Base:low_fat)			
fat_free	- 0.1518		-28.84
	(0.0820)	***	
Conducted promotion			
promotion	- 0.1902		-36.15
	(0.0000)	*	

Note- Marginal Implicit Prices are calculated as: $\frac{\delta P}{\delta V_i} * \overline{P}$ *, where* V_i*-s is the attributes in the model, and the* $\overline{P}$ *is the mean price at 190 AMD per100 gram.*

[2] For making Marginal Implicit Prices more representable, I use for price AMD per 100 Gram, instead of AMD per Gram

R^2=52,21%, F(11, 5309)=537.26 P-value=0.000
,,***- indicate significance level 1%,5%,10% respectively*

Demand Elasticity

The double log form allows as interpret variables in terms of elasticity. As expected from law of demand the variable related to quantity sold has negative effect on price and the coefficient equal to (-0.01), which means a 1% increase in yogurt quantity results in a 0.01% decrease in yogurt price, everything held constant. The functional form of the model (double-log) allows interpret coefficients of binary variables in terms of percentage change in price due to the presence of a given quality attribute (*ceteris paribus).*

Brand Purchased

The dummy variable associated with the brand value can be interpreted as when the sold yogurt brand is *Ashtarak Kat*, compared to yogurt which brand is Danone, the price decreases by 0.93%,which is actually comparable brand value; *Campina*, compared with *Danone* has 0.34% less brand value, everything held constant. The same way *Ehrmann 's* brand value is by 0.48% less than Danone's brand value, *ceteris paribus. Marianna* also has by 0.99% percent less value, compare to *Danone's* value. From those results we can conclude that *Danone* brand value is considered as a prestige and consumers are ready to pay higher for it. The marginal implicit prices for each brand value are -176.31,-65.21,-91.00,-188.33 and -160.08 *AMD per 100 Gramm* for *Other* brands .

Product Characteristics

The *fat free* yogurt, compared to *low fat* yogurt, decreases the price by 0.15% . The marginal implicit price for this variable is -28.84 AMD per 100Gramm. The coefficient associated with the conducted *promotion* has negative effect on price (-0.19), which is binary variable; therefore the price tends to decrease by 0.19% if the yogurt is sold during promotion,

compare to the purchase in a normal price. The marginal implicit price related to promotion variable equal to -36.15 AMD per 100Gramm. The parameter associated with the *small container*, compare to *medium size container* tend to increase price on average 0.41%, on other hand large size container tends to decrease price by 0.11%. The marginal implicit prices for small and high container sizes equal to 77.78 and -21.65 respectively. Similarly *low calorie* product, compare to *high calorie* product has negative effect on price by 0.24% and marginal implicit price equal to -49.25 AMD per100Gramm.

Table 14 Estimated Coefficients for the Hedonic Price Model at the non-drinkable category

Variable	Coefficient		Standard Error	Marginal Implicit Prices
Constant	1.3042		0.1317	
	(0.0000)	*		
Quantity Sold				
ln_Quantity	- 0.0114		0.0008	
	(0.0000)	*		
Container Size (base: middle size)				
Small_Container _Size	- 0.1228		0.1173	-24.56
	(0.2950)			
Product Calorie (base: high_cal)				
low_cal	- 0.3919	*	0.1392	-78.38
	(0.005)			
Brand Value(base: Danone)				
Ashtarak_Kat	- 0.6936		0.2472	-138.72
	(0.005)	*		
Campina	- 0.1903		0.1378	-38.06
	(0.167)			
Ehrmann	- 0.1490		0.1580	-29.79
	(0.346)			
Marianna	- 0.5915		0.1945	-118.29

	(0.0020)	*		
Other	- 0.6003		0.1758	-120.05
	(0.0010)	*		
Fat Amount(Base:low_fat)				
fat_free	0.0531		0.1226	10.62
	(0.6650)			
high_fat	0.2446		0.1126	48.91
	(0.030)	**		
Conducted promotion				
promotion	- 0.1344		0.0025	-26.88
	(0.0000)	*		

Note-Marginal Implicit Prices are calculated as: $\frac{\delta P}{\delta V_i} * \bar{P}$ *, where* V_i*-s is the attributes in the model, and the* $\bar{P}$ *is the mean price at 200 AMD per 100 gram.*
R^2=39.70%, F(11, 5497) = 329.02 P-value=0.000
,,***- indicate significance level 1%,5%,10% respectively*

Table 14 shows estimates of coefficients, standard errors and marginal implicit prices for non-drinkable category. R^2 equal to 39.70%, which means 39.70% of the variation of independent variable (*lnprice*) is explained by model. Also the empirical model shows a good overall significance F(11, 5497) = 329.02 and relative P-value=0.000, which means that the all the independent variables (Xs) are jointly statistically significant at the 1% significance level.

Demand Elasticity

As expected from law of demand the variable related to quantity sold is statistically significant at 1% significance level and has negative effect on price and the coefficient equal to (-0.07), which means a 1% increase in yogurt quantity results in a 0.01% decrease in yogurt price, everything held constant.

Brand Purchased

The dummy variable associated with the brand value of *Ashtarak Kat* is statistically significant at 1% significance level and can be interpreted as compared to yogurt which brand is

Danone, the brand value decreases by 0.69%, everything held constant. The parameters associated with *Campina* and *Ehrmann* are statistically insignificant at 5% significance level. The variable associated with *Mariannas'* brand value is statistically significant and has by 0.59% percent less value, compare to *Danone's* value. The marginal implicit prices for *Ashtarak Ka*t is -138 AMD per 100 gram, for *Danone, Campina, Ehrmann, Marianna* and *Other* brands -38,-29,-118 and -120 AMD per 100 gram correspondingly .

Product Characteristics

The parameter associated with the *fat free* yogurt is statistically insignificant. The *high fat* variable is statistically significant at 5% significance level and compared to *low fat* yogurt, increases the price by 0.24%. The marginal implicit price for these variables are 12 and 49 AMD per 100 gramm. The coefficient associated with the conducted *promotion* has negative effect on price (-0.13), which is binary variable also, therefore the price tends to decrease by 0.13% if the yogurt is sold during promotion, compare to the purchase in a normal price, everything held constant. The marginal implicit price related to promotion equal to -27 AMD per 100 Gramm. The parameter associated with the *small container* is statistically insignificant at 5% significance level.. The *low calorie* variable is statistically significance at 5% significance level and compare to high calorie product has negative effect on price by 0.28%, *ceteris paribus.*

Perceptual Mapping Model

The first step for perceptual map starts by giving the locations of the product alternatives. In the second step it introduces for each respondent either an ideal brand or a preference vector into the map. Preference vector indicates the direction in which preference is increasing in the map.

Figure 7 shows both products and attributes combined together. It is a mapping model based on the assumption that respondents who have common perceptions of a set of alternatives may have widely differing preferences for these alternatives.

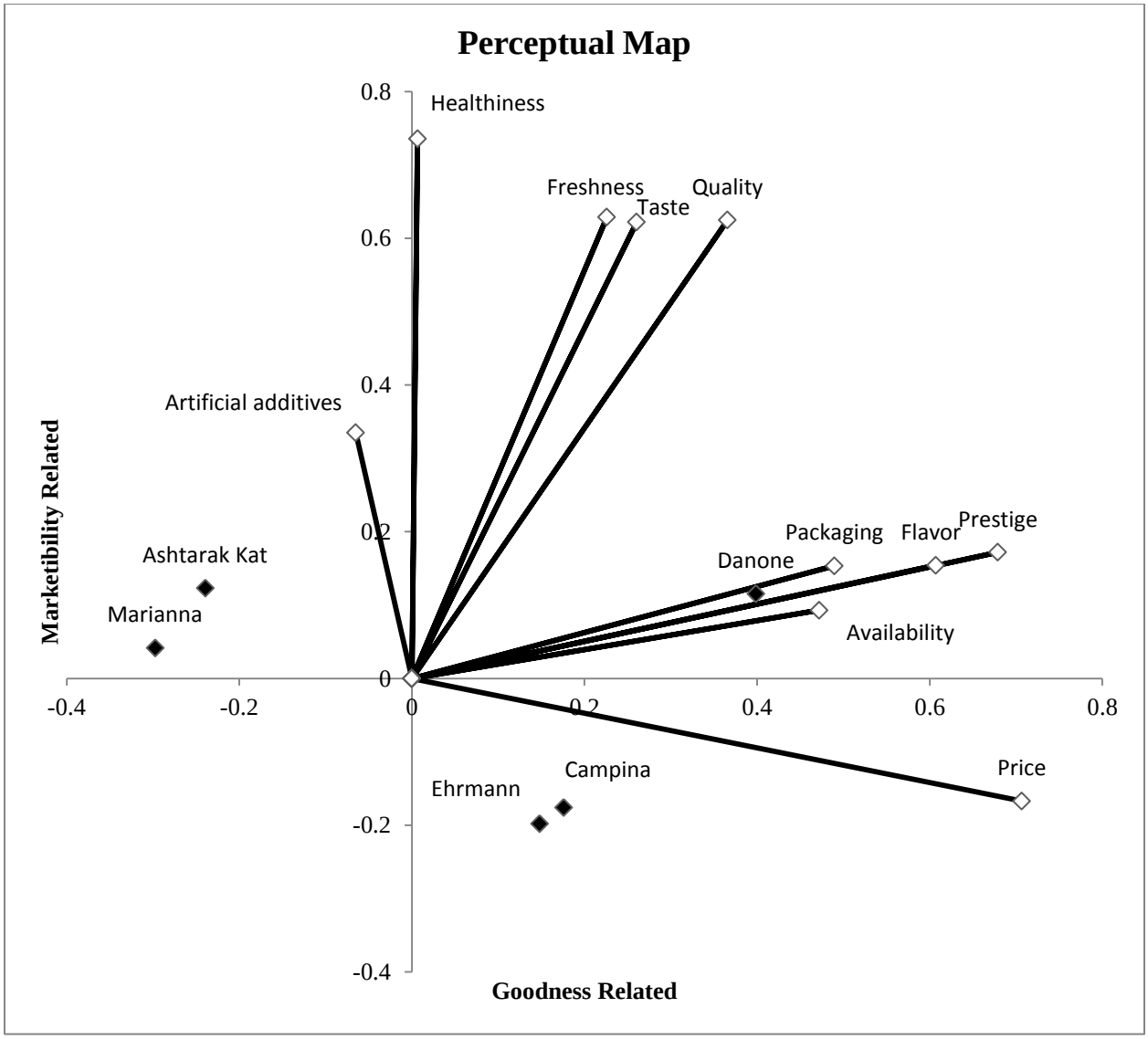

Figure 7 Perceptual Map

For result interpretation the most important factor is to define axis. From the Figure 6 one can conclude that vertical axis indicates goodness related attributes. They are artificial additives, freshness, taste, quality, healthiness. The goodness related attributes shows how good is products

for consumer. The horizontal axis can be defined as marketability related attributes; they are packaging, flavor, prestige, availability and price. The marketability related attributes indicate how good marketing work done in eyes of consumers.

Length of the line from the origin to the arrow is an indicator of the variance of that attribute explained by the 2D map. The longer this line, the greater is the importance of that attribute in explaining variance. From the figure one can conclude that healthiness, price and prestige are the most important attributes, the least important is artificial additive. From the consumer perspective the prestige and having various flavors are perceived similarly, therefore the producer which has broad range of flavors is considered prestige.

From the figure is easy to make conclusions about competition in the market. Not surprisingly all five brands studied in the scope of this paper in base of healthiness and freshness come to 0. Ashtarak Kat and Marianna are perceived as players in the same market place, which is for consumer who is price sensitive and for product choosing decision the most important factor is price. Campina and Ehrmann compare to Ashtarak Kat and Marianna considered more prestige, with comparable good quality and packaging, however more pricy. Danone has been able to distinguish itself from other players by perceiving in consumers mind the best in most of attributes.

Figure 7 shows that there is a perceptual gaps in the market. There is no player in the middle upper section; new player may be able to capture that place in the market by doing accent on healthiness in its advertising campaigns. Recently Sas Supermarket have started to import new species of yogurts which can fill right upper gap in the market.

RESPONDENSTS DEMOGRAPHIC ANALYSIS

The main purpose of this part of the paper is to describe main demographic statistics of respondents. The survey was conducted in order to find out main descriptive statistic for yogurt target market, the total number of respondents is 200 (Appendix B). As a target scope for survey zeroed respondents from 18-70 age range and as a yogurt purchaser a respondent who purchase yogurt twice or more during the month. Figure 7 illustrates respondents yogurt purchase habits.

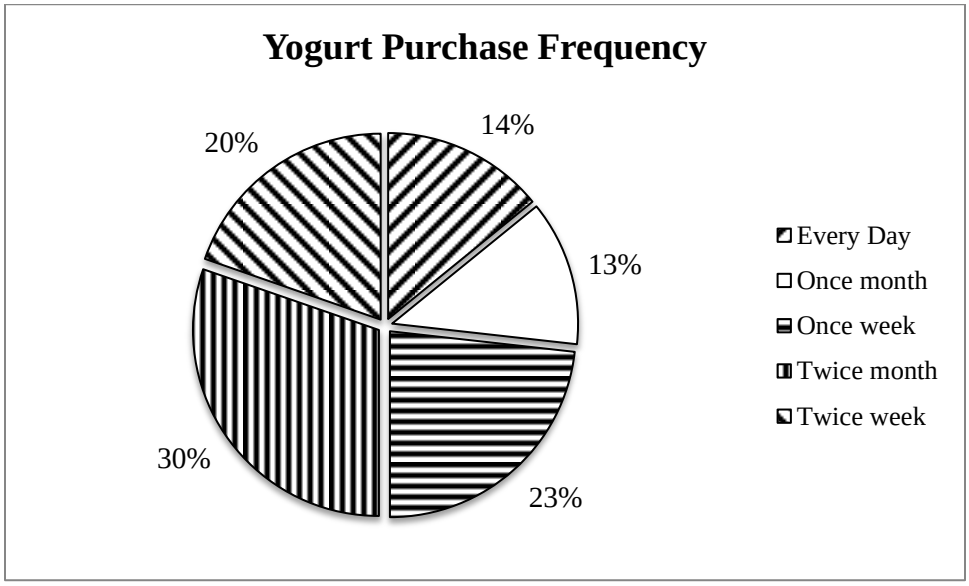

Figure 8 Yogurt Purchase Frequency
***Source*: Data is obtained from survey, 2014**

According to it only 13% of respondents purchase less or equal one yogurt per month, this part of respondents considered as an out of study in the scope of this paper. The big share consists of respondents who buy yogurt no less than twice month, however only 14% of respondent purchase yogurt every day. Among yogurt users (the respondents who purchase yogurt more than once month) only 20% is male buyers the rest 80% big chunk is female.
The Table 15 shows mean statistical information about age, number of family members ,average amount of adults and children in the yogurt users family.

Table 15 Mean Statistical Information

Variable	Mean	Std. Dev.	Min	Max
Age	35.4	14.0	11	70
Family members	4.1	1.4	1	8
Number of adults	3.1	1.2	1	7
Number of children	1.0	1.0	0	4

According to Table 15 mean age of yogurt buyers is 35 and the family is consists on average 4 people and the average yogurt user family has 1 child.

To find out who is the main consumer of yogurt in questionnaire the question about for whom respondents purchase the yogurt more frequently have been included; Figure 9 illustrates the answers. More than half respondents purchase yogurt for child and only nearly 2% for the elders.

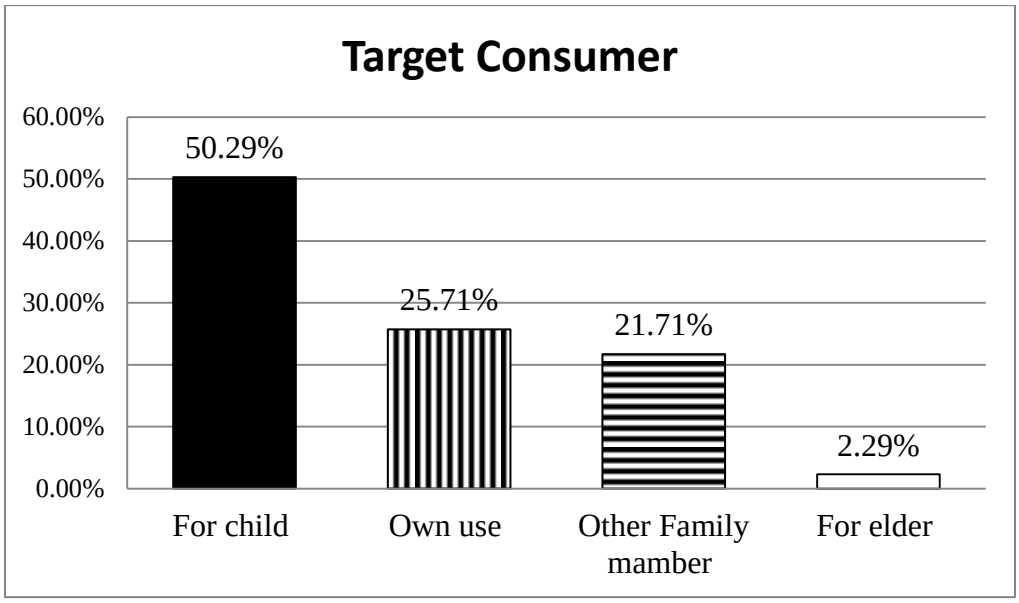

Figure 9 Target consumers for yogurt
***Source*: Data is obtained from survey, 2014**

The pie chart (Figure 10**)** illustrated below shows current situation of yogurt buyers.

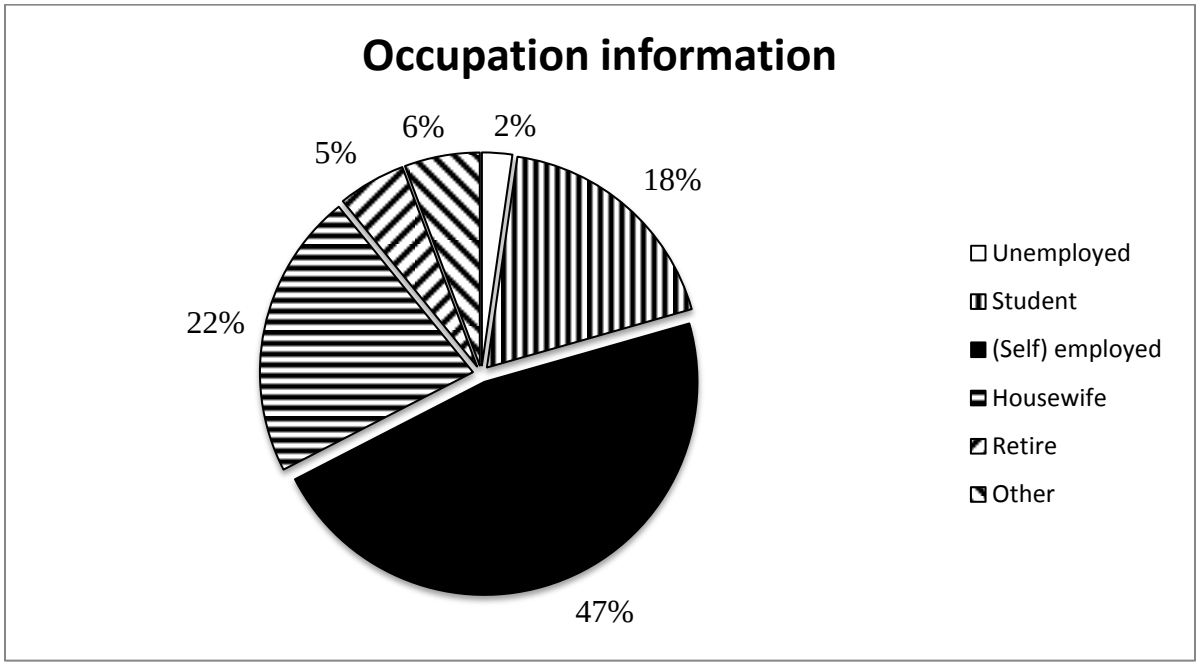

Figure 10 Respondents Situation
***Source*: Data is obtained from survey, 2014**

According to Figure 10 the 47% of respondents have the job or self-employed, 22% are housewives. The students consists 18% and only 2% of respondents do not have job.

For producers and importers one of the most important factor for organizing their production is knowledge about consumers flavor preferences. Figure 11 shows consumer preferences by flavor. It shows that huge amount of respondents (38%) prefer strawberry, nearly 15% usually purchase peach flavored, respondents which have tropic fruit preferences and respondents which have no special preference consist each 14% .

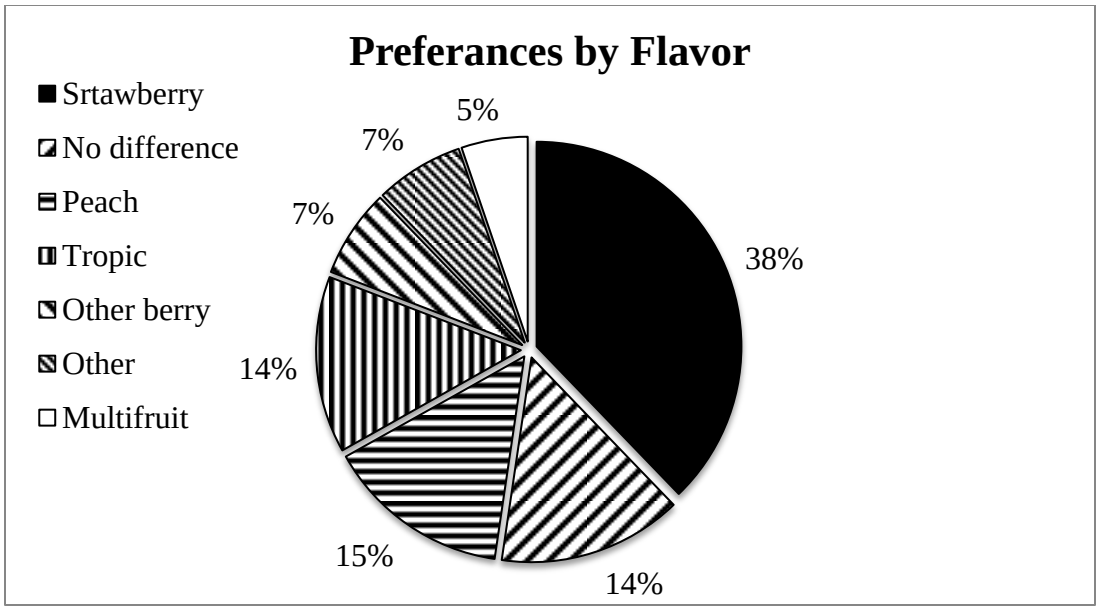

Figure 11 Preferences by Flavor
***Source*: Data is obtained from survey, 2014**

During the survey I also tried to find out what percentage of yogurt users pay attention to information in the label, such as expire date or nutrition.

It turns out that only 43% of respondents are interested in nutrition information, but the good news is that nearly 90% of respondents usually pay attention on expire date.

In Armenian market the product which is closest to the yogurt is matsoun, so in the question does matsoun can be considered as a substitute for yogurt, only 23% answered positively, the rest deem yogurt as an different product.

CONCLUSION AND RECOMMENDATIONS

One of the fundamental factors influencing firms to succeed in competition is consumers' perceptions of value on their products. This was a development to a turn from traditional marketing era to consumers' oriented era with supermarkets increasingly dominating the market. In this research, a quantitative estimate has been made for the relationship between quality attributes and prices of yogurt products. This paper shows that yogurt is a highly differentiated food product, and its quality attributes on which market competition is based are related to packaging size, fat content, calorie, promotion conducted, quantity sold and brand value. The implemented hedonic price model gives a measure of the market value of these attributes, also called implicit prices that can be useful in exploration of some important features of this industry and to bring some intuition on the manufacturers and retailers strategies.

From the results of the analysis it is noticeable that price for drinkable yogurt is vastly affected by packaging size, calorie, brand value, quantity sold and promotion while fat content seems to have only trivial effects. The price for the non-drinkable yogurts is greatly affected from quantity sold, calorie, some of brand values and promotion at the same time packaging size and some of brands (Campina, Ehrmann) and low fat content have slight effect.

Based on the results of this paper, it is possible to identify the main profitable competitive strategies that could be selected by manufacturers involved in the Armenian yogurt market. The following is a set of policy recommendations for manufacturers and importers stemming from the findings of this study:

1. Intensify brand value, which is a cornerstone in affecting yogurt price. By strengthening brand value manufacturer will be able to increase prices, therefore to get more margins. However this strategy requires heavy investment and long term in promotional activities,

so large producers and importers have a greater probability of success, but small producers also can choose such strategy on a regional basis.

2. Consider price competition. By scrutinizing the results of this study, manufacturers will be able to compare each quality intrinsic prices with costs and to have a more elaborated overall view for actual margins by selecting different pricing strategies.
3. Manufacturers should offer more exotic flavor, because consumer connect broad variety of flavor with prestige and put accent of marketing campaigns on persuasion of consumer about healthiness of the particular yogurt brand.

While the findings obtained from this study provided useful information and insights into yogurt market in Armenia, a few recommendations for future research are worth mentioning for the sake of building upon the present study. First, the present study does not include the consumer demographic characteristics, such as income, age, occupation .etc. However the future study can include those characteristics, since price is affected from those attributes.

Second, the data represents scanner data from middle, low level supermarket. Instead, future research can examine high end level consumers behavior. This high age contribution will permit to explore market situation more comprehensively.

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Johansen, S. B., Tormod, N., Jorun, Ø., & Hersleth, M. (2010). Acceptance of calorie-reduced yoghurt: Effects ofsensory characteristics and product information. Food Quality and Preference, 21, 13–21.

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Luckow, T., Moskowitz, H.R., Beckley, J., Hirsch, J., & Genchi, S. (2005). The four segments of yogurt consumers:Preferences and mind-sets. Journal of Food Products Marketing, 11, 1–22.

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Appendix A

Box-Cox procedure implemented by STATA

```
. * Linear Regression result


. regress   price  quantity Small_Container_Size Large_Container_Size low_cal
fat_free high_fat prom Ashtarak_Kat Campina Ehrmann Marianna Other if drinkable ==1


      Source |       SS       df       MS              Number of obs =    5639
-------------+------------------------------           F( 11,  5627) = 2926.88
       Model |  4451.76028    11   404.70548           Prob > F      =  0.0000
    Residual |  778.056309  5627  .138271958           R-squared     =  0.8512
-------------+------------------------------           Adj R-squared =  0.8509
       Total |  5229.81659  5638  .927601382           Root MSE      =  .37185


------------------------------------------------------------------------------
      Price  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    quantity |   6.41e-07   1.99e-07     3.23   0.001     2.51e-07    1.03e-06
Small_Cont~e |   1.044668   .0131664    79.34   0.000     1.018856    1.070479
Large_Cont~e |  -.2708464    .020162   -13.43   0.000    -.3103718    -.231321
     low_cal |  -.3604287   .0242972   -14.83   0.000    -.4080607   -.3127967
    fat_free |  -.1981508    .039886    -4.97   0.000    -.2763427    -.119959
    high_fat |  (dropped)
        prom |  -.3222589   .0157489   -20.46   0.000    -.3531328    -.291385
Ashtarak_Kat |   -1.98467   .0150768  -131.64   0.000    -2.014226   -1.955114
     Campina |  -.7654987   .0318695   -24.02   0.000    -.8279752   -.7030222
     Ehrmann |  -.9851298   .0243012   -40.54   0.000     -1.03277   -.9374901
    Marianna |  -1.568074   .0187017   -83.85   0.000    -1.604736   -1.531411
       Other |  -1.190152   .0284297   -41.86   0.000    -1.245885   -1.134419
       _cons |   2.735772   .0257973   106.05   0.000       2.6852    2.786345
```

```
------------------------------------------------------------------------------


. * Log-log form regression results


. regress  ln_Price ln_Quantity Small_Container_Size Large_Container_Size low_cal
fat_free high_fat prom Ashtarak_Kat Campina Ehrma

> nn Marianna Other if drinkable ==1


      Source |       SS       df       MS              Number of obs =    5639

-------------+------------------------------           F( 11,  5627) = 5093.81

       Model |  1237.23597    11  112.475998           Prob > F      =  0.0000

    Residual |  124.249382  5627  .022080928           R-squared     =  0.9087

-------------+------------------------------           Adj R-squared =  0.9086

       Total |  1361.48536  5638  .241483745           Root MSE      =   .1486


------------------------------------------------------------------------------

    ln_Price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

 ln_Quantity |  -.0118052   .0020728    -5.70   0.000    -.0158686   -.0077418

Small_Cont~e |   .4092891   .0054666    74.87   0.000     .3985726    .4200057

Large_Cont~e |  -.0850271   .0080584   -10.55   0.000    -.1008247   -.0692296

     low_cal |  -.2781666   .0098067   -28.36   0.000    -.2973916   -.2589416

    fat_free |  -.1888994   .0159716   -11.83   0.000      -.22021   -.1575889

    high_fat |  (dropped)

        prom |  -.1199229   .0062467   -19.20   0.000    -.1321689   -.1076769

Ashtarak_Kat |  -.9273665   .0066143  -140.21   0.000    -.9403331      -.9144

     Campina |   -.330367   .0127383   -25.93   0.000    -.3553389    -.305395

     Ehrmann |  -.5079978   .0097532   -52.09   0.000    -.5271178   -.4888778

    Marianna |  -.9760525   .0078914  -123.69   0.000    -.9915226   -.9605823

       Other |  -.8677174   .0114418   -75.84   0.000    -.8901478   -.8452869

       _cons |     1.1844   .0192441    61.55   0.000     1.146674    1.222125

------------------------------------------------------------------------------
```

```
. * Get Geometric mean

. means  real_p

    Variable |    Type        Obs        Mean       [95% Conf. Interval]
-------------+-----------------------------------------------------------
      real_p | Arithmetic   11399    1.895102        1.876614   1.913589
             |  Geometric   11399    1.695932        1.681904   1.710078
             |   Harmonic   11399     1.54418        1.532535   1.556002
--------------------------------------------------------------------------

. *Rescale linear dependent variable and log of dependent variable

. generate  real_p_adj= real_p/1.695932
(9817 missing values generated)

. *Log form of adjusted price

. generate ln_real_p_adj=log( real_p_adj)
(9817 missing values generated)

. *Regress adjusted dependent variables

. regress    real_p_adj  q_w Small_Container_Size Large_Container_Size low_cal
fat_free high_fat prom Ashtarak_Kat Campina Ehrmann
> Marianna Other if drinkable ==1

      Source |       SS       df       MS              Number of obs =    5639
-------------+------------------------------           F( 11,  5627) = 2926.88
       Model |  1547.80021    11   140.70911           Prob > F      =  0.0000
    Residual |  270.516752  5627  .048074774           R-squared     =  0.8512
```

```
-------------+------------------------------           Adj R-squared =  0.8509
       Total |  1818.31697  5638  .322510991           Root MSE      =  .21926

------------------------------------------------------------------------------
  real_p_adj |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         q_w |   3.78e-07   1.17e-07     3.23   0.001     1.48e-07    6.07e-07
Small_Cont~e |   .6159844   .0077635    79.34   0.000     .6007649    .6312039
Large_Cont~e |  -.1597036   .0118885   -13.43   0.000    -.1830096   -.1363976
     low_cal |  -.2125255   .0143268   -14.83   0.000    -.2406115   -.1844394
    fat_free |  -.1168389   .0235186    -4.97   0.000    -.1629445   -.0707333
    high_fat |  (dropped)
        prom |  -.1900188   .0092863   -20.46   0.000    -.2082235   -.1718141
Ashtarak_Kat |  -1.170253     .00889  -131.64   0.000    -1.187681   -1.152826
     Campina |  -.4513735   .0187917   -24.02   0.000    -.4882125   -.4145344
     Ehrmann |  -.5808781   .0143291   -40.54   0.000    -.6089687   -.5527876
    Marianna |  -.9246088   .0110274   -83.85   0.000    -.9462266   -.9029909
       Other |  -.7017686   .0167634   -41.86   0.000    -.7346314   -.6689058
       _cons |   1.613138   .0152113   106.05   0.000     1.583318    1.642958
------------------------------------------------------------------------------


. regress    ln_real_p_adj  q_w Small_Container_Size Large_Container_Size low_cal
fat_free high_fat prom Ashtarak_Kat Campina Ehrma

> nn Marianna Other if drinkable ==1


      Source |       SS       df       MS              Number of obs =    5639
-------------+------------------------------           F( 11,  5627) = 5122.94
       Model |  1237.87848    11  112.534407           Prob > F      =  0.0000
    Residual |  123.606876  5627  .021966745           R-squared     =  0.9092
-------------+------------------------------           Adj R-squared =  0.9090
       Total |  1361.48536  5638  .241483746           Root MSE      =  .14821

------------------------------------------------------------------------------
```

```
ln_real_p_~j |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         q_w |  -6.22e-07   7.91e-08    -7.86   0.000    -7.77e-07   -4.67e-07
Small_Cont~e |   .4122663   .0052479    78.56   0.000     .4019784    .4225541
Large_Cont~e |   -.086012   .0080362   -10.70   0.000     -.101766   -.0702579
     low_cal |  -.2798797   .0096844   -28.90   0.000    -.2988649   -.2608946
    fat_free |  -.1921139   .0158978   -12.08   0.000    -.2232796   -.1609481
    high_fat |  (dropped)
        prom |  -.1156068   .0062772   -18.42   0.000    -.1279126   -.1033011
Ashtarak_Kat |  -.9278182   .0060093  -154.40   0.000    -.9395988   -.9160376
     Campina |  -.3300702   .0127026   -25.98   0.000    -.3549722   -.3051683
     Ehrmann |   -.510748    .009686   -52.73   0.000    -.5297363   -.4917598
    Marianna |  -.9796881   .0074541  -131.43   0.000    -.9943011   -.9650752
       Other |  -.8685158   .0113315   -76.65   0.000    -.8907299   -.8463017
       _cons |   .5608168   .0102823    54.54   0.000     .5406596     .580974
------------------------------------------------------------------------------
. * Formal test of significant difference between 2 specifications
. *= N/2log(RSSlargest/RSSsmallest)
```

Appendix B
Questionnaire

Section A

A1. Store address _____

A2. Interviewer ID |___|___|

A3. Interview Data: |____|____| |____|____|

A4. Gender

Male	1
Female	0

A5. How often do you use yogurt?

Once month	1
Twice month	2
Once week	3
More than twice a week	4
Every Day	5
Don't Know	88
Refuse to answer	99

[Interviewer! If amount of purchase less than twice monthe go to A6.1, otherwise A6.

A6.1. **Please, could you say reason do not using yogurt?**

\other

Unhealthy food	1
Unnecessary consumption	2
other	3
(Don't Know)	88
(Refuse to answer)	99

A6. Whom you are buying for?

Personal use	1
For child	2
For elder	3
Other family member	4
(Don't Know)	88
(Refuse to answer)	99

Section B

B1. **Do you look on expire date?**

Yes	1
No	0
(Don't Know)	88
(Refuse to answer)	99

B2. **Do you look on label information? (fat,sugar,calorie)**

Yes	1
No	0
(Don't Know)	88
(Refuse to answer)	99

B3. **What brand or brands do you prefer?**

_____

_____

_____

_____

B4. **What flavor (flavors) do you prefer?**

_____

_____

B5. **What other flavors would you like to be produced?**

_____

_____

B6. Can matsoun be considered as a yogurt substitute?

Yes	1
No	0
(Don't Know)	88
(Refuse to answer)	99

C1. Please tell me your age?

[TO BE FILLED IN BY INTERVIEWER]

|____|____| year old

(Don't Know)	88
(Refuse to answer)	99

C2. Please tell me, how many people, including you, live currently in your household?

[INTERVIEWER! WRITE DOWN THE NUMBER.]

|____|____| PEOPLE

(Don't Know)	88
(Refuse to answer)	99

C3. How many of these people are adults (age 18 and older)? [A10]

[INTERVIEWER! WRITE DOWN THE NUMBER.]

|____|____| PEOPLE

(Don't Know)	88
(Refuse to answer)	99

C4. From list which one is the best describing your situation ?]

Retired	1
Student	2
Housewife	3
Unemployed	4
(Self) employ	5
Other	6
(Don't Know)	88
(Refuse to answer)	99

Appendix C
STATA outpur before and after autocorrelation

```
------------------------------------------------------------------------------------------

. * Before correcting from autocorrelation


. regress  ln_Price ln_Quantity Small_Container_Size Large_Container_Size low_cal prom
Ashtarak_Kat Campina Ehrmann Marianna Other f

> at_free high_fat if drinkable ==1


      Source |       SS       df       MS              Number of obs =    5639

-------------+------------------------------           F( 11,  5627) = 5093.81

       Model |  1237.23597    11  112.475998           Prob > F      =  0.0000

    Residual |  124.249382  5627  .022080928           R-squared     =  0.9087

-------------+------------------------------           Adj R-squared =  0.9086

       Total |  1361.48536  5638  .241483745           Root MSE      =   .1486


------------------------------------------------------------------------------

    ln_Price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

 ln_Quantity |  -.0118052   .0020728    -5.70   0.000    -.0158686   -.0077418

Small_Cont~e |   .4092891   .0054666    74.87   0.000     .3985726    .4200057

Large_Cont~e |  -.0850271   .0080584   -10.55   0.000    -.1008247   -.0692296

     low_cal |  -.2781666   .0098067   -28.36   0.000    -.2973916   -.2589416

        prom |  -.1199229   .0062467   -19.20   0.000    -.1321689   -.1076769

Ashtarak_Kat |  -.9273665   .0066143  -140.21   0.000    -.9403331      -.9144

     Campina |   -.330367   .0127383   -25.93   0.000    -.3553389    -.305395

     Ehrmann |  -.5079978   .0097532   -52.09   0.000    -.5271178   -.4888778

    Marianna |  -.9760525   .0078914  -123.69   0.000    -.9915226   -.9605823

       Other |  -.8677174   .0114418   -75.84   0.000    -.8901478   -.8452869

    fat_free |  -.1888994   .0159716   -11.83   0.000      -.22021   -.1575889
```

```
    high_fat |  (dropped)

       _cons |     1.1844   .0192441    61.55   0.000     1.146674    1.222125

------------------------------------------------------------------------------

. * After correcting from autocorrelation for drinkable yogurts


. prais  ln_Price ln_Quantity Small_Container_Size Large_Container_Size low_cal
Ashtarak_Kat Campina Ehrmann Marianna Other fat_fre

> e high_fat  prom if drinkable ==1,corc

note: high_fat dropped because of collinearity


Number of gaps in sample:  317   (gap count includes panel changes)

(note: computations for rho restarted at each gap)


Iteration 0:  rho = 0.0000

Iteration 1:  rho = 0.9233

Iteration 2:  rho = 0.9326

Iteration 3:  rho = 0.9326

Iteration 4:  rho = 0.9326


Cochrane-Orcutt AR(1) regression -- iterated estimates


      Source |       SS       df       MS              Number of obs =    5321

-------------+------------------------------           F( 11,  5309) =  527.26

       Model |  16.8986233    11  1.53623848           Prob > F      =  0.0000

    Residual |  15.4684541  5309  .002913629           R-squared     =  0.5221

-------------+------------------------------           Adj R-squared =  0.5211

       Total |  32.3670774  5320  .006084037           Root MSE      =  .0539

------------------------------------------------------------------------------

    ln_Price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]

-------------+----------------------------------------------------------------
```

```
 ln_Quantity |  -.0126743   .0008864   -14.30   0.000    -.0144119   -.0109367
Small_Cont~e |   .4093773   .0288026    14.21   0.000     .3529124    .4658422
Large_Cont~e |  -.1139318   .0448424    -2.54   0.011    -.2018414   -.0260223
     low_cal |  -.2591966    .053608    -4.84   0.000    -.3642903   -.1541029
Ashtarak_Kat |  -.9279637   .0288072   -32.21   0.000    -.9844376   -.8714898
     Campina |  -.3432179   .0696131    -4.93   0.000    -.4796882   -.2067477
     Ehrmann |  -.4789579    .052954    -9.04   0.000    -.5827696   -.3751463
    Marianna |  -.9912235    .039174   -25.30   0.000    -1.068021   -.9144264
       Other |  -.8425368   .0634607   -13.28   0.000    -.9669459   -.7181276
    fat_free |  -.1518056   .0873628    -1.74   0.082    -.3230727    .0194615
        prom |  -.1902438   .0033573   -56.67   0.000    -.1968255   -.1836621
       _cons |   1.190222   .0559924    21.26   0.000     1.080454     1.29999
-------------+----------------------------------------------------------------
         rho |   .9326219
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.140734
Durbin-Watson statistic (transformed) 2.590198


. * Before correcting from autocorrelation for non-drinkable yogurts

. reg  ln_Price ln_Quantity  Small_Size_nondrink  low_cal  Ashtarak_Kat Campina
Ehrmann Marianna Other fat_free high_fat prom if drinkable ==0


      Source |       SS       df       MS              Number of obs =    5760
-------------+------------------------------           F( 11,  5748) =  857.69
       Model |  566.667308    11  51.5152098           Prob > F      =  0.0000
    Residual |  345.242404  5748  .060063049           R-squared     =  0.6214
-------------+------------------------------           Adj R-squared =  0.6207
       Total |  911.909713  5759  .158345149           Root MSE      =  .24508


------------------------------------------------------------------------------
```

```
    ln_Price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 ln_Quantity |  -.0784158   .0029661   -26.44   0.000    -.0842304   -.0726011
Small_Size~k |   .0147023    .009187     1.60   0.110    -.0033076    .0327123
     low_cal |  -.2951829   .0110472   -26.72   0.000    -.3168396   -.2735262
Ashtarak_Kat |   -.492155   .0203578   -24.18   0.000    -.5320639   -.4522461
     Campina |  -.3367732   .0109336   -30.80   0.000    -.3582072   -.3153393
     Ehrmann |  -.2752778     .01246   -22.09   0.000    -.2997041   -.2508514
    Marianna |  -.5047709   .0153499   -32.88   0.000    -.5348626   -.4746793
       Other |  -.4821789   .0134045   -35.97   0.000    -.5084568    -.455901
    fat_free |   .0203265   .0096576     2.10   0.035     .0013939    .0392591
    high_fat |   .1722712   .0088224    19.53   0.000     .1549759    .1895665
        prom |  -.2159863   .0083559   -25.85   0.000    -.2323671   -.1996055
       _cons |   1.830463   .0269107    68.02   0.000     1.777708    1.883218
------------------------------------------------------------------------------

. * After correcting from autocorrelation for non-drinkable yogurts

. prais  ln_Price ln_Quantity  Small_Size_nondrink  low_cal  Ashtarak_Kat Campina
Ehrmann Marianna Other fat_free high_fat prom if drinkable ==0,corc


Number of gaps in sample:  250   (gap count includes panel changes)

(note: computations for rho restarted at each gap)


Iteration 0:  rho = 0.0000

Iteration 1:  rho = 0.9469

Iteration 2:  rho = 0.9849

Iteration 3:  rho = 0.9851

Iteration 4:  rho = 0.9851

Iteration 5:  rho = 0.9851


Cochrane-Orcutt AR(1) regression -- iterated estimates
```

```
      Source |       SS       df       MS              Number of obs =    5509
-------------+------------------------------           F( 11,  5497) =  329.02
       Model |  7.65368258    11  .695789325           Prob > F      =  0.0000
    Residual |  11.6246907  5497  .002114734           R-squared     =  0.3970
-------------+------------------------------           Adj R-squared =  0.3958
       Total |  19.2783733  5508  .003500068           Root MSE      =  .04599

------------------------------------------------------------------------------
    ln_Price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 ln_Quantity |  -.0113956   .0007526   -15.14   0.000     -.012871   -.0099202
Small_Size~k |  -.1228072   .1172809    -1.05   0.295    -.3527242    .1071098
     low_cal |  -.3919475   .1391777    -2.82   0.005    -.6647909   -.1191041
Ashtarak_Kat |   -.693635   .2471724    -2.81   0.005    -1.178191   -.2090793
Campina |  -.1903202    .137783    -1.38   0.167    -.4604293    .0797889
     Ehrmann |  -.1489573   .1579564    -0.94   0.346    -.4586144    .1606998
    Marianna |  -.5914948    .194452    -3.04   0.002    -.9726976    -.210292
       Other |  -.6002989   .1758218    -3.41   0.001    -.9449791   -.2556187
    fat_free |   .0531051   .1225743     0.43   0.665     -.187189    .2933991
    high_fat |   .2445755   .1126296     2.17   0.030      .023777     .465374
        prom |  -.1344375   .0024757   -54.30   0.000    -.1392909   -.1295841
       _cons |   1.304158   .1317414     9.90   0.000     1.045892    1.562423
-------------+----------------------------------------------------------------
         rho |   .9851023
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.098153
Durbin-Watson statistic (transformed) 2.323305

. *_____________________________________________________________________________
```